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Doctoral Thesis

Accountable, Operable Knowledge: Toward Value Representations of Individual Knowledge in Accounting

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TOWARD VALUE REPRESENTATIONS OF INDIVIDUAL KNOWLEDGE IN ACCOUNTING

PhD Series 27-2018

Anne Krebs

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Doctoral School of Business and Management

PhD Series 27.2018

CBS COPENHAGEN BUSINESS SCHOOL
HANDELSHØJSKOLEN

Accountable, Operable Knowledge

Toward Value Representations of Individual Knowledge in Accounting

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Representations of Individual Knowledge in
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To my dearly loved children Sille and Julius

Preface

More than 20 years of work as an architect with a number of teams left me with experience-based knowledge of teams, and how to staff and operate them to produce something that did not exist: a new building, a new product or urban planning. Team members were mostly assigned at the basis of their professions and starting from scratch we could make an idea materialize. From design and elevations communicated in two dimensions, we could allocate the resources to make it happen in three dimensions.

Changing profession 15 years ago, this unaware tacit knowledge came about in a job position, where the study of intellectual capacity and its effects in operations in order to develop new educations for a private institution became important. To identify knowledge in the existing portfolio of educations, courses were decomposed in some ordered manner to create communication between the demand side – the stakeholders’ future need for candidates’ supply of knowledge – and the supply side, my institution. If the supply and demand side were ordered and consistently expressed, the idea was that the creation of new educations would capture valuable input for the planning of the future educations.

Exploring the software market for tools to support such operations, I realized how inadequately knowledge operations were dealt with. This inspired me to develop a concept for the structuring and the allocation of knowledge in organizations (Krebs, 2000; Krebs, 2001; Krebs, 2003; Krebs, 2004; Krebs, 2005; Krebs, 2012; Krebs, 2014; Krebs, 2015). These reflections entailed a scoping of the initial steps, staking out the ground for the research leading to this dissertation, grappling with the relations between the material and the immaterial world, and aiming for an organizationally useful operationalization of “knowledge”.

My experience in processes of design informed the wish to produce an artefact to establish infrastructures to carry mediations and connections between separate business entities, because every micro process from dissemination and sale of ideas – over development of tools to realize them – to the manufacturing or realization– were conducted through networks and the ones able to attract the optimal knowledge and competence were very competitive. The market did not offer software products in 1997 to coordinate and distribute knowledge globally, a fact that prompted my interest. In December 1999 I handed in an application to the Danish authorities to patent my concept for Intellectual Capital Accounting.

The relevant rest is a story of opportunities and thankfulness. I am thankful to the Danish state’s founding of industrial Ph.D. studies and its long-lasting interest in Intellectual Capital (Petty & Guthrie, 2000), to the innovative courage of a great global, Danish company to engage in a longitudinal, co-developing case of 24 months, to CBS’ excellent Department of Operations Management and its competent and kind global researchers, to my colleagues and supervisors, my friends and my family - have every one of them made indispensable contributions to the thesis in their different ways. I am grateful to every single one of them.

Especially to my two supervisors professor Jan Mouritsen, CBS, head of the famous Danish pilot project with participation of some two dozen Danish firms sponsored in 1998 by the Danish government, and Kim Sundtoft Hald, professor (mso), Ph.D.associate dean, diploma programmes (HD) , CBS, for having indefatigably sparred with me. I happened to participate in the Danish Government-driven 1998 project, representing one of the firms and making for the first time the acquaintance with Jan Mouritsen and the notion of Intellectual Capital.

I am very grateful to colleagues' expressed opinions when parts of the content of the thesis, being conducted as a monograph, have been exposed to peers in conference proceedings (Krebs, 2012; Krebs, 2014) during the years of its production. The curiosity toward management of intangibles and the wish to operate the capital has prevailed, because I am convinced of Intellectual Capital's potential to make the world a better place.

Anne Krebs

Summaries

English Summary

Concerned with the management and control of the forces that drive the “knowledge economy”— the research question of the thesis is: How can individual knowledge become operable in dispersed, global contexts to support knowledge-based management decisions at a distance?

The conceptual part of the thesis proposes generic, global measurement units in The Intangible Currency, (TIC), to represent the values of individual knowledge resources distributed in a web-based system of non-financial accounting, Intellectual Capital Management Control System, (ICMCS). It suggests methods for knowledge accounting on which to manage allocation of individual knowledge in dispersed firms.

The thesis is in three parts. The first part, which applies the theory Design Studies Research, (DSR), conceptualizes the artefacts TIC and ICMCS. The second part produces case-based empirical validations of the two artefacts in a global company. The artefacts are technically and socially tested producing 2x2 tests. The development and implementation process of ICMCS is qualitatively tested and socially analyzed by Actor Network Theory, (ANT) and TIC is quantitatively tested by the use of proxies, because individual knowledge and competence is invisible and ICMCS has not been implemented yet. By four hypotheses the calculative properties in TICs are explored to analyze in an ANT perspective whether the calculative devices, containing no price mechanism, is able to keep the non-financial network of accounting together. The 2x2 validations were successful except for the 4th moment of translation, the mobilization, {{267 Callon, Michel 1986}} in the social validation of ICMCS, where the roll-out was stopped by top management decisions.

The third part discusses the used methods, the results and their limitations and alleys for further research. Furthermore, it proposes contributions to literature in IC, Accounting, KM and OM by the concept of TICs as generic calculative devices and measurement units for individual knowledge and competence and the ICMCS as the IC system of accounting, which is assumed to coordinate and distribute Human Capital (HC) by means of clicks mirroring managerial decisions about movements (flow) in the capital.

The remaining part of the summary is placed in 6 sections as follows; Firstly, the theoretical problem is presented and secondly a discussion of the empirical relevance is conducted. Thirdly, the research design is briefly described and the main results from the empirical testing presented. The summary is finished by references to the main contributions to theory and practice, and by some limitations and possible avenues for further research.

The theoretical problem

In order to answer the research question, mechanisms of control and accounting of knowledge may inform decisions at a distance about knowledge and provide knowledge-based data on which to decide and manage knowledge globally. Several theoretical problems emerge, which can be ordered in three sections: the existing understanding and use of knowledge (1), the firm-centered, disclosure-oriented context of IC (2) and level of analyze and intervention (3),

Ad 1) The notion of knowledge is found to be processual intermixing knowledge and competence. The constructs are used indiscriminately substituting each other. This is a problem, because personal knowledge is tacit, embedded in persons with changing temper and locally interpreted {{305 Hong, J. F. L. 2012; 546 Gourlay, S. 2006}}. An objectification of knowledge is identified as necessary for accounting {{716 Dresch, Aline 2015}}

Ad 2) The research context preferably is found to be the firm focusing at disclosures {{365 Guthrie, J. 2012}}. This is a problem, because firms exist in connected contexts and exchange knowledge with the context. The firm-centered disclosures are useless to this context. {{689 Dumay, J. 2013; 718 Secundo, Giustina 2018; 616 Andon, Paul 2015}}.

AD 3) IC literature applies mean figures when measuring knowledge, which is mainly identified as organizational knowledge {{260 Nonaka, Ikujiro 2005}}. This is problematic, because where is organizational knowledge and who is going to be managed? Furthermore, mean figures are not instrumental in managerial perspectives.

To sum this up the existing theorizing of IC is characterized and problematized as firm-centric (1), situated (2), co-present (3), organizational knowledge (4) tacit knowledge inside individuals (5), disclosures-oriented (6), ostensive view on knowledge as outputs ex post (7) and as using mean metrics (8).

The thesis theorizes HC/IC in generic dispersed contexts (incl. stakeholders) (ad1), objective view (ad2), present at a distance (ad3), as individual knowledge (ad4), in knowledge and competence objects (ad5), in stocks as the result of managed flows and auditable Intellectual Capital Accounting, (ICA) reports (ad 6) and in a performative view on knowledge as an input ex ante (ad7) and in absolute, individual metrics (ad8).

The empirical relevance of the problem

The international institution, the World's Economic Forum in Davos has for more years in various publications expressed the leaders' major concern for competitiveness to be linked to HC/IC i.e. the right individual knowledge and competence, the right place at the right time {{678 Hanouz, M. D. 2017; 635 McGrath, R. G. 2013}}. The global CEOs perceive this as a strategic problem, but it seems to be a problem for daily operations as well, because the acquired knowledge already paid for, existing individual HC, cannot be found and does not become thoroughly exploited (global case documents). Recruitment hires and rehires already paid for unexploited capacity.

Moreover, firms are urged not to consider competitiveness to be constructed, nor conserved, but to maintain an alert high readiness for strategic flexibility {{635 McGrath, R. G. 2013}}. IC resources as individual knowledge are considered strategic assets in operations, and this perception constitutes the bearings of the objective to visualize and value the IC assets in logics of accounting that enables the coordination and distribution of these assets in operations, also ex ante and in due time. The operation of the capital will be attained through allocative practices using calculative devices, which display and make accessible global individual knowledge and competence objects, in practice the noted knowledge and competence of the persons signed up in the firms'/networks' IC systems of accounting.

Collaborations, for instance across borders of industry and university improves productivity and competitiveness (Confederation of Danish Industry (DI))¹ and DI refers to future agendas for cross- boulder collaborations, too. Viewed in a knowledge perspective the agendas are calls for digitalization of individual knowledge and competence, connectivity and managerial tools to encourage collaborations.

The issues are addressed pragmatically in order to provide practical answers and tools for work in industry for IC management through HC allocations.

The research design

In the effort to create global reliable output to management, IC flow and IC stock perspectives have been conceptualized by the help of Design Science Research, DSR, into a non-financial system of accounting by the application of an objectified, generic measurement unit.

In order to do this, the global context and requirements in logics of accounting define the properties for the objects of knowledge together with the future knowledge-based managerial actions. Due to the theoretical possibility to measure managerial decisions and actions, practices of allocation of knowledge have been chosen as the theoretical focus. In operations, we find the direct relation between an accounting of the (potential) value adding decision to use individual knowledge and competence, and the stock of HC. This establishes instrumental rooms for accounting. Allocations create movements in the HC, which are considered as flows and a class of problems in the DSR terminology (p.20).

The thesis used DSR for the concepts, and Actor Network Theory, ANT, for the analyzing of the empirical part to validate the concepts, because the literature gab indicated a conceptualizing work of objectifications and system thinking. ANT was helpful to socially validate the concepts, because the logic of accountancy framing the issue of allocation/team setting is seen through a flow/ stock perspective and TICs were designed to keep the system of accounting together. Was the measurement unit strong enough to keep the system together in dispersed global contexts? How were human and non-human actors going to act during the processes of implementation?

DSR helped the conceptualization of TIC by the identification of elements of design. The design of the system as a system of control is inspired by IFSR's IC guidelines and Mintsberg's

¹ <https://di.dk/English/AboutDI/Pages/confederation.aspx>

typology for coordinating mechanisms {{686 Mintzberg, H. 1980}}. The subjective view of knowledge was discarded and replaced by the artefactual view of knowledge{{139 Bohn, R. E. 1998}}. Competences defined as the individual capacity to activate knowledge were theorized inspired by learning theories {{377 Bloom, B. S. 1970; 379 Biggs, J. B. 1982}}. This brings about separate objects of knowledge and competences brought together in the TIC, and the ICA system, which focuses on individual knowledge and knowledge as both flows and stocks.

The design of the tests was influenced by the fact that TICs, being unimplemented and IC accounting practices inexistent, the concept and theories of “self-management” and “management at a distance” was used as proxies for the TIC. Four hypotheses were developed and discussed with descriptive statistics on 40 respondents in order to verify TIC’s properties to connect and keep the valuing system connected without the notion of “prices”, but through the offering of non-financial valuation devices.

Subsequently, the ICA system was analyzed qualitatively. The analysis focused on the four moments of translation (Callon, 1986) following the human and non-human actors.

The main results achieved in the empirical testing

IC theorizing is mainly disclosure-oriented and does not offer tools for management of IC in dispersed contexts. These results, by contrast, intend to deliver useful managerial tools to operate the capital.

As is, allocations are driven by co-presence, text based CV’s and job descriptions in processes of recruitment, teams, retention, down-sizing, talent management and promotion {{625 Rivera, Lauren A. 2012; 617 Andreou, Andreas N. 2007; 248 Lindgren, R. 2004; 703 Mura, M. 2013; 251 Cordery, J. L. 2010}}. The processes are incomplete only partly representing HC, the individual knowledge and competence (job descriptions), they focus on culture and they are lengthy and costly. The simple task to find and contact the best capacity is difficult.

If TICs work, the search in databases for allocations of HC will be more complete noting individual knowledge and competence objectively, separately and independently of boundaries and the search results are comparable independently of time and location. Actions to allocate and connect the demand and the supply of individual knowledge and competence directly, omitting other types of transactions, are enabled.

When conducting the search and allocation of TICs in ICMCS, the actions construct flows in the HC. Managerial ex ante decisions are traced constructing IC budgets, accounts and reports, accounting for the planning and the management of the capital. An access to updated HC and a choice to compare and allocate is offered connecting demand and supply directly. The outputs ex post are constructed to be generic, auditable and comparable.

The surveys in the global case company, GCC, tested the above concepts and showed the respondents’ strong willingness to use the calculative properties in TICs and, as a consequence, their will to act differently. They became calculating selves {{190 Miller, P. 2001}}. Therefore, coordination and distribution of knowledge in dispersed settings is supposed to happen.

However, a case-based qualitative, longitudinal system development process of 24 months revealed various company agendas, which terminated the deployment of the IC software a few days after its launch. Therefore, evidence of the operated IC assets in the GCC pilot did not get completed, although a positive attitude to and demand for operational IC transparency and willingness to operate TICs was expressed in the surveys.

The quantitative result shows “how informants anticipate their future behavior having access to calculative HC/IC elements; that is, studying how informants believe they will adapt the calculative elements embedded in TIC, why they will, and to what extent these value representations make them calculate and let the calculations impact their behavior.” (130).

Key conclusions from the qualitative case analysis are that the 4th moment of translation, the mobilization was unsuccessful because key actors after the launch decided to prevent the testing of the system and the analysis shows, how the non-financial network of the ICA system lost a trial of strength to the financial network. The analysis suggests that the economic downturn explains the result of the mobilization.

The main results are tools to manage the hidden values in organizations.

The main contributions to theory and practice

Firstly contributions to theory: IC research is moved from being firm-centered and disclosure oriented to a global context of IC accounting. Managerial IC tools are constructed to add data based rational decisions to the financially based decisions.

The findings resulted in cautious recommendations for the class of problems of HC allocations in dispersed companies. The contributions are the generic measurement unit, The Intangible Currency™, TIC and the Intellectual Capital Management Control System, ICMCS, which have been materialized in web-based software and technically and socially proven.

The artefacts may enable provident management of individual knowledge and competence in dispersed settings based on outputs from IC calculations expressed in TICs..” (p.256)

The Intangible Currency™ , TIC represents individual knowledge and competence in the N-F measurement unit, translating the values to numbers from 1 to 5.

[Knowledge (1–5), Creative Competence (1–5), Performance Competence (1–5)] †

TIC is the core component in the N-F accounting system, which is made instrumental by the use of TICs in flows and stocks, scenarios, allocations, teams, and strategic processes in shared structural networks generating real-time IC accounts and budgets. Clicks from daily operations based on managerial decisions allocating or assessing TICs generate simple and aggregated IC value representations ex post and ex ante in diverse units of dispersed organizations or connected networks. The system is perceived as organizational equipment technology designed to add enabling elements of IC control to financial control systems.

The contributions are proposed in the theories of IC, Accounting, KM and OM, operations management as follows:

IC Theory; Allocation of individual HC at a distance can happen; The measurement unit, TICs, The Intangible Currency, contains embedded generic features to make IC operations ex ante possible in the capital through mechanisms of control, which create visible and controllable flows of HC in the capital. TICs enable value comparisons and benchmarks in HC stocks in the capital across borders to allocate satisfying resources independently of time and space. This constitutes the proposal of useful IC value representations in recognizable notions of auditable reporting.

Accounting; HC has been framed as an accountable capital represented in flows and stocks. The conceptualization of N-F logics of accountancy is presented in figure-based ICA. The framing enables ICA input and output to be developed and managed as global, objective, comparable and auditable data.

Knowledge Management; The artefactual notion of knowledge allows for the separation into two phenomena: knowledge and competence enabling the construction of manageable, context free, objective objects, which are able to travel. KM decisions based on ex ante, in-the-making (real time) and ex post qualitative control of individual HC input, and the coordination and distribution of individual knowledge and competence have been made possible in operations through the calculative management of TICs.

Operations Management; The thesis proposes IC budgets for management and development of HC capacity; Conditions for the creation of precise and earlier planning processes of allocation of remote individual knowledge and competence based on access to and calculative practices in the total corporate IC in dispersed business units have been created. Management of and through individual knowledge and competence values in dispersed companies like HC planning, control, and evaluation of IC figures across units may be enacted in TICs, for global supply chains, for example, adding the IC accounting control aspect to the financial systems of control.

Secondly contributions to practice: Practice is offered managerial tools to manage the hidden values and assets in the firms. It consists of shared planning spaces, where the knowledge stocks in TICs enables management by recruitment, HC development, retention and talent management, because management exactly knows the species and quantity of the supply and demand of knowledge and competence and of the future gabs of knowledge and competence in their IC. This is due to the outcome of Module III, which shows the firm's future demand for knowledge and generates strategic knowledge budgets. Managers may add more knowledge or more creative competence to distant teams, because the overview of project portfolio indicates irregularities according to the allocative planning.

Allocations for cross border collaborations can become addressed through dispersed networks of TICs, where matches of supply and demand independently of time and locations can happen in operational teams, conditioned by the individuals signing up their knowledge and competence in TICs in the networks.

In order to also address the requirements for innovation and growth in the Industrial PhD's legislative framing it is mentioned that the contributions are supposed to create growth by enabling systematized distribution and coordination of HC values across boundaries and by making cross border collaboration easier.

The artefacts can be used as follows:

TIC $\frac{\text{I}}{\text{C}}$

The measurement unit, TIC, allows free agents and combinations of agents (public/private organizations) to supply and demand for HC in emerging markets independently of time and space, and conserves, in the power of distributed individuals, the unconstrained initiative to innovatively combine, access, and collaborate with numberless objects of knowledge and competence, concretized and connected to individuals. This flexibility means for instance fast, decentralized access to open innovation and/or the addition of fast, designed and controlled supply of HC (disruption) into existing processes. It means awareness of strategic knowledge, competitive HC advantages and the data may influence decisions of recruitment or layoffs.

ICMCS

The measurement unit, TIC, enables global companies and networks to allocate individual knowledge and competence in dispersed contexts, controlling and accounting for the movements in IC. Traditional and new HRM technologies for recruitment, talent management, retention, etc., may become interfaced and represented in TICs making the output from these technologies controllable.

In microeconomics, data can be shared about IC transparency, accessibility, planning, development, collaboration and capacity. In teams real-time Business Intelligence about movements in the IC are available (p 226) and they generate timely management information of processes that are currently unmanaged. Annual reports of ICA supplementing financial annual reports are automated and can be disclosed to provide "availability of relevant information to managers and stakeholders ... to provide more useful accounting information" (Andon et al., 2015).

Global Search Machines

In global search machines, TIC may constitute an "Internet of knowledge" taking remote verification of matches between the demand and supply of knowledge and competence from the existing third party endorsements found for instance in LinkedIn to global, absolute, objective metrics.

The limitations of the thesis and possible avenues for further research

When the case-company's offer is a position 3-400km away from the university and a longitudinal research process of 24 months is carried out, there are limitations represented by travel activities, time and money, because it is more expensive, takes more time than having the CC nearby. Although a world dominating firm in most aspects, the GCC was hit by the global turn-down, which caused my dismissal and delayed the collected data release. The down-turn created some limitations in GCC's accessibility and the project's corporate legitimacy. Core

staff was dismissed, whole factories closed down and so was the final empirical part of the social test of ICMCS (the 4th translation).

Initially, the company's conditions framed of the research by giving access to the company and by financing some costs, but left the search for units to collaborate with the project to the researcher thereby creating several months of "sales" work inside the GCC, before the concrete interventions could begin. This came to represent reductions in the time-line.

The limited number of respondents (40) in the quantitative social validation of TICs may also, as for numbers, call for broader testing.

So, there are limits for the concrete business volatility in processes of implementing, which impeded parts of the validation (chapter 9), because the interventional actions were illegitimated by exogenous contextual events. Therefore, the thesis tends to keep an open window for another implementation.

The cautious generalizability of the conclusion of TICs is based on the modest field-proven quantitative testing of the social interface between calculative properties of TICs and individuals becoming calculative. But, ICMCS, by contrast, remains partly socially unproven due to the economic downturn and is referred to further testing.

Further research may explore, how TICs are allocated and accounted for between units when globally recognizable and visualized. Especially, it may be studied, how knowledge assets add value to organizations, because individual knowledge and competence in 3 measured dimensions can be traced and measured. Relations between the financial and the intellectual capitals may be explored to find predictive relations between ICM, competitiveness and growth.

Practice and further research may verify and test whether the management of IC based on TICs and ICMCS offers deciding generalized parameters for productivity, competition, and growth.

Danish Summary

Afhandling handler om styring af individuel viden og kompetence kapacitet i virksomheder og netværk og fremsætter et forslag til, hvordan en global systematisering og rapportering af Human Kapitalen kan finde sted med henblik på at forbedre udnyttelsen den totale intellektuelle kapacitet. Den foreslår, hvordan en ikke-finansiell regnskabspraksis kan etableres og gennemføres.

Dette er interessant og vigtigt af flere grunde. Den sidste verdensomspændende finansielle krise udløste en del videnskabelig aktivitet og denne afhandling skal også ses i dette lys, fordi den søger nye veje til stabilisering af den finansielle værdirepræsentation ved at foreslå en regnskabsmetode for individuel viden og kompetence, hvis output er driftsbaserede viden regnskaber i en ikke-finansiell måleenhed, som er i stand til generisk og globalt at repræsentere værdien af den intellektuelle kapital i virksomheder. I dag er det sådan, at årsregnskaberne, som er finansielt baserede, kun kan redegøre for en mindre del virksomhedernes markedsværdi, hvilket konstateres, når virksomhederne bliver solgt. Gennemsnitligt er den immaterielle del af købssummen i de sidste 10 år vokset fra under 50 % til mere end 80 % over den bogførte værdi. Det angiver, at en stigende del af en virksomheds værdi ikke anses for at være repræsenteret i økonomistyringssystemer og derfor ikke underkastes, eller overhovedet kan underkastes, systematisk ledelse. Værdien og det der skaber den, er usynlig. Det skaber visse usikkerheder. Topledere i verden har i undersøgelser givet udtryk for bekymring over firmaernes Intellektuel Kapital igennem flere år, da man frygter ikke at have den relevante kapacitet til rådighed på det rette tidspunkt, i de rette mængder og på rette sted, ikke at kunne finde den, at miste den eller ikke vide, hvad den kan eller skal kunne. Man frygter flaskehalse og ineffektivitet i det globale rekrutteringsmiljø, som allerede begrænser produktioner, bl.a. ved at skulle bemandede for dyrt eller slet ikke at kunne bemandede.

Ud over de immaterielle værdiers manglende synlighed og tilgængelighed er der interne problemer med intellektuel kapital. Undersøgelser har dokumenteret at den intellektuelle kapacitet ikke bliver koordineret og distribueret, hvis de relevante aktører er adskilt mere end 15-30 m. Man finder altså sine samarbejdspartnere inden for meget snævre rammer. I spredte netværk som internationale virksomheder, eller i samarbejdende netværk (fx med blandede offentlige og private aktører) udnyttes intellektuel kapital ikke optimalt, fordi den er svær at finde og allokere. Teoretisk formodes et bedre finansielt resultat at kunne opnås ved forbedrede allokering processer og ressource-samarbejde på tværs i af forretningsenheder. Tvister, fejl og mangler formodes reduceret. I digitale samarbejder registreres netop misforståelser og fejl som nye barrierer for optimalt samarbejde, fordi der mangler viden om viden i processerne.

Alle disse ting har medvirket til at skabe interesse for at udvikle et koncept for ledelse af individuel viden og kompetence, da eksisterende teknologier på markedet ikke kan håndtere disse spørgsmål. De kan ikke synliggøre og værdisætte individuel kapacitet i en generisk og troværdig repræsentation og derfor er det f. eks. vanskeligt med de nuværende teknologier at allokere ressourcer på tværs af barrierer som fx virksomhedsgrænser, kulturer, sprog, lande, fag og sektorer.

Afhandlingen problematiserer eksisterende ledelsesteknologier for viden og ledelse af individuel viden og kompetence, og foreslår en forståelse af disse styringsmekanismers rækkevidde og potentielle effekt baseret på en ontologisk diskussion af, hvad viden i virksomheder er. Den indledende litteraturbaserede diskussion af, hvad organisatorisk viden er, viser at den dominerende litteratur opfatter viden som processuel og situationsbestemt. Dermed låses videnstyring fast til tid og sted og allokering vanskeliggøres i en global situation, hvor man fx ønsker at optimere anvendelsen af den tilkøbte viden hos medarbejdere mange steder i verden.

Forskellige teorier beskæftiger sig med viden uden at skelne mellem viden og kompetence, der optræder som begreber, der anvendes i flæng. Økonomisk baserede teknologier som f.eks. Balanced Score Card anvender menneskelige ressourcer retrospektivt og på et aggregeret plan i gennemsnitlige tal. Anvendelsen i flæng af begreberne viden og kompetence anses i denne afhandling for den måske vigtigste pointe, fordi organisationens rolle som optimal enhed for koordinering og distribuering af viden ikke synes at gælde mere. Magten over viden er blevet forskubbet fra det organisatoriske til det individuelle plan af den teknologiske udvikling og af nye måder at producere på, som ofte involverer operationer over geografiske, kulturelle, sektorielle og sproglige grænser. Når begreberne anvendes i flæng eller sammenblandet, kan en objektivisering af viden og kompetence ikke ske.

Videnledelse - Knowledge Management - er domineret af denne situationsbestemte, teoretiske opfattelse af viden, som forhindrer koordination og distribution af individuel viden og kompetence. Udkommet af ovennævnte litteratur studie er derfor en kritik af det situationsteoretiske standpunkt og en fremhævelse af en tilsvarende, men ældre teori, som anser viden for genanvendelig i organisationer og i andre sammenhænge. Dette baner vejen for en adskillelse, objektivisering og udvikling af operationelt relevante taksonomier for hhv. viden og kompetence. Efter adskillelsen af de to begreber konstrueres en måleenhed for individuel viden og kompetence, som er uafhængig af tid og sted. Der fremsættes et forslag om en "Den Immaterielle Møntfod"TM, DIM (eng: TIC), en ikke-finansiell måleenhed, der repræsenterer værdier af kvalitet og kvantitet af individuel viden og kompetence uafhængigt af tid og sted. Dermed kan den individuelle kapacitet, med hvilken en medarbejder træder ind i eller ud af en organisation eller et fysisk eller digitalt samarbejde, registreres i tal uafhængigt af tid og sted, d.v.s. både før eller efter brug. Ligesom det økonomiske paradigme i århundreder har anvendt de strukturelle fordele ved tal frem for tekst, anvendes tal også her med samme strategiske sigte, nemlig at blive i stand til ufortolket at repræsentere usynlige værdier og udføre automatiserede værdirepræsentationer (regnskaber, budgetter, forecasts, performance measurements, KPIs mm) som bliver sammenlignelige og reviderbare.

Dermed er afhandlingen indskrevet i det videnskabelige domæne, Intellectuel Kapital, som specielt interesserer sig for økonomiens underliggende værdier og deres evne til at skabe værdi i virksomheder. Herigennem udvikles et organisatorisk narrativ, som forklarer og muliggør produktion og anvendelse af (ny) viden, produkter og processer.

Den immaterielle måleenhed anvendes i et nyt koncept for et regnskabssystem, som via koordinering, distribution og repræsentation af individuel viden og kompetence skaber

værdirepræsentationer af intellektuel kapital, som allokeres og anvendes på tværs. Konceptet, som er blevet overført til et software program, indføres i en global case virksomhed for at teste fire hypoteser vedrørende dets anvendelighed.

Den globale case virksomhed rådede ikke over teknologier, som gav den viden om, hvilken viden, den havde, og hvor. Indadtil har case virksomheden defineret et behov for en øget kvalitet i selvlædelse med henblik på at optimere fjernledelse. Med disse elementer som legitimerende formål gennemførtes interventioner i virksomheden i 24 måneder, der omfattede ibrugtagning af måleenheden, Den Immaterielle MøntfodTM, DIM og det ikke-finansielle kontrolsystem.

Systemet genanvender den regnskabsmæssige tænkning og terminologi samt de internationale finansielle guidelines for immaterielle værdier fra økonomisk regnskabspraksis i genereringen af DIM's ikke-finansielle data, som bliver materialiseret til output som viden-budgetter, viden-regnskaber og viden-forecasts, etc. Softwaren er udviklet i tre hovedmoduler²; modul I, som måler og registrerer eksisterende viden og gør den tilgængelig, modul II, som håndterer brugen og kontrollen af viden og kompetence i drift og udvikling af kapitalen, samt modul III, som forvalter den strategiske planlægning og produktion af fremtidig viden. Der er desuden regnskaber, budgetter, og rapporteringer i real-tid på forskellige aggregationsniveauer.

Design Science Research teori organiserede afhandlingen. I casen anvendtes blandede metoder. En kvalitativ, sociologisk metode, Actor Network Theory, blev brugt til empirien. Den analyserer de 24 måneders systemudviklingsproces på det operative plan skridt for skridt. En kvantitativ metode anvendtes i en global respondent gruppe på 40 geografisk spredte, højtuddannede medarbejdere inden for jura. Her gennemførtes 2 spørgeskemaundersøgelser for at afdække, om de kalkulative elementer i DIM ville blive anvendt af respondenterne. Analysen viste, at den geografisk spredte gruppe angav at være klar til at beregne, vælge og ændre adfærd ved anvendelse af DIMs og en øget strukturel transparens i den intellektuelle kapital. Koordination og dermed også distribution af individuel viden og kompetence er en følge heraf, fordi konceptet for DIM indeholder de nødvendige oplysninger til at gøre respondenterne "beregne" (Calculating Selves).

Den langvarige case fortalte historien om flere agendaer i virksomheden og deres kamp mod hinanden og søger at blotlægge de små, daglige handlinger, der skabte kontekst og identiteter, som skiftede gennem det lange interventionsforløb. Da forskningsprojektet var udsprunget af en investeringsagenda, som ændredes i de første 12 mdr. af dramatiske ydre, globale forretningsomstændigheder, så blev idriftsættelsen af softwarepiloten i den globale population stoppet under implementeringen. Så på trods af, at respondenterne udtrykte afgørende vilje til at anvende møntfoden, DIM og kalkulere allokering af viden og kompetence rationelt, hvilket forventedes at koordinere og distribuere IC ressourcerne mere optimalt, blev projektet ikke fuldført i overensstemmelse med projektplanen. En afledt konklusion er, at værdirepræsentationerne i det økonomiske rationale er kontekstafhængige og dermed ikke troværdige, fordi fortolkningen og brugen af dem er afhængig af tid og sted. Tallene i case-

² Annex A2

virksomhedens budgetter startede som udtryk for investeringer, der i takt med at konteksten ændrede sig, til sidst udelukkende blev set som omkostninger, der skulle reduceres hurtigt.

Afhandlingen viser, at Den Immaterielle Møntfod formodentligt kan handle som en "market device", netop sådan en størrelse, der i teorien sammen med aktører kan skabe et kvalitativt viden-marked. Måleenheden kan informere om kvaliteten af individuel kapacitet – også på afstand. Det sluttes i afhandlingen, at det ikke-finansielle regnskabssystem, ICMCS, gennem medarbejdernes egeninteresse i at bruge DIMs til allokering af individuel viden og kompetence formentligt vil koordinere og distribuere individuel viden og kompetence i spredte virksomheder og netværk.

Dermed kan det konkluderes, at IC ved brug af forslagene til regnskabsførelse af den intellektuelle kapital, kan gøres egnet til både ledelse og selvledelse, fordi værdierne gøres synlige og målbare og derfor kan indtræde i værdirepræsentationer, som ledelse af individuel viden og kompetence kan udøves på grundlag af. Endvidere konkluderes det, at DIMs fungerer i en global kontekst, fordi den objektiviserer målemetoden uden anvendelse af fortolkninger eller estimater. Det betyder, at lokale forhold ikke influerer på værdiansættelserne. Et andet vigtigt element i konceptet er repræsentationen af både eksplicite og tavse videnobjekter i en generisk kontekst. Det kan konkluderes, at tid og sted ved allokeringer ikke har indflydelse på identifikationen, fordi kortlægningen af både eksplicit og tavs viden anvender metoder, som udmærker sig ved at kunne mediere både den vertikale og den horizontale placering i videnkorpus uafhængigt af tid og sted.

Det medfører, at de ikke-financielle, men kvalitative værdiansættelser for økonomiens underliggende værdier, viden og kompetence, er globalt brugbare. Anvendt i ICMCS producerer DIM gennem ledelsen af viden og kompetence automatiserede værdirepræsentationer af viden regnskaber, viden budgetter og dynamiske KPIs på forskellige styringsniveauer, som kan sammenlignes. Ledelsesbeslutninger vedr. allokering af viden kan gennemføres på afstand.

Det konkluderes endvidere, at ICMCS kan tilvejebringe beslutningsgrundlag for ledelse af individuel viden og kompetence i geografisk spredte virksomheder, fordi medarbejderne forbinder sig til de kvalitative værdiangivelser i DIM og vil handle rationelt, idet de vil optimere anvendelsen af viden og kompetence i deres eget arbejde gennem en mere omfattende og præcis allokeringspraksis. Handlingerne formodes at koordinere og distribuere viden og kompetence på afstand. Men det fremhæves samtidigt, at der kan opstå svagheder i beslutningsgrundlaget afstedkommet af konceptet, som i visse situationer kan vise sig at være for grovkornet eller slet og ret mangle vigtige informationer for en gennemført global transparens i kapitalen.

Afhandlingen viser, at konceptet er i stand til at generere ens fremstillede automatiserede ikke-finansielle værdi-repræsentationer på grundlag af den gennemførte drift og udvikling i virksomheden, som i tal vil synliggøre usynlige IC værdier. Dermed skabes en mulighed for at supplere de økonomiske rapporter, som formodes kun at redegøre for en mindre del af værdierne, med ikke-finansielle regnskaber, som dokumenterer bevægelserne i og værdien af den Intellektuelle Kapital.

Det ligger uden for rammerne af denne afhandling at forsøge at forstå eller vurdere sandsynligheden for en direkte kobling mellem de finansielle og ikke-finansielle regnskaber, således at viden, kompetencer og erfaring direkte kan kobles til finansielle regnskaber. Dette er måske muligt, men forudsætter en meget betydelig forskningsindsats inden for en række relaterede felter, som afhandlingens forslag til DIM og ICMCS muliggør.

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Part I

Chapter 1

Introduction

For 50 years or more, researchers from various disciplines have reflected on the role that plays individual knowledge in business. They have published great books and articles about the phenomena from interdisciplinary angles discovering tacit and invisible elements and some of these elements have been ordered in the scientific domain Intellectual Capital, IC, among other things comprising constructs from economy, accounting and knowledge management (Edvinsson & Sullivan, 1996; Nonaka & Takeuchi, 1995; Penrose, 1995; Penrose, 1995; Polanyi, 1974; Saint-Onge, 1996; Stewart, 1997; Sveiby, 1997). The word “capital” connotes to assets and financial expectations of monetary values. Many scientific efforts have been assigned to the exploration of assumed IC assets and to the development of management models for the capital, but they have not enjoyed much dissemination in practice. The idea of an IC still exists in science and the capital still has no shared measurement unit or standard with which to operate and document IC values in companies (Zambon, 2016). The financial capital has numbers representing monetary units in currencies reporting globally about values, but IC hasn’t. This thesis will work out an attempt to eliminate this drawback by offering a conceptual proposal of an intangible currency.

The thesis submits a “currency” to visualize and value individual knowledge in operations. “Human Capital”, HC, often occurs as an element in IC. The currency representing the value of individual knowledge is proposed to get distributed in non-financial accounting systems and shows how HC value representations in digits are proposed to translate the world into generic numbers about individual knowledge and competence in operations.

To find ways to manage the hidden intellectual power is important, because the intellectual concepts that structure control systems through the economic thinking, financial mechanisms and practices undergoes serious crises causing troubles and creating instabilities in the world (Ariely, 2009; McCloskey, 2005; Winston & Teichgraber, 2005). Economic crises are object of many reflections and influence the agendas in for instance global institutions like the Global Economic Forum to mention a recurrent global event, which explores potential causes and effects of actual societal developments and tries to identify and overview occurrences and attitudes threatening global stability (Hanouz & Samans, 2017).

The thesis proposes to add another paradigm of control to the paradigm of economic control in operations in order to find ways to stabilize control by operating the hidden intellectual power. It is envisaged to systematically control the use and development of individual knowledge in operations. The speed of processes has been accelerated through technologies to a point where too many failures are being committed³. The failures do not stay local anymore, but are distributed and repeated through technology, so they arrive fast, are pervasive and often get “too big to fail” (Sorkin, 2010). Assuming they are avoidable, the thesis tends to develop mechanisms able to identify the need for individual knowledge in processes *ex ante* and provide the needed knowledge promptly, efficiently and generically. Under condition that some failures are due to the lack of the right knowledge and competence at the right time and place, the thesis proposes a technology, which is designed to find and let leadership add the right individual knowledge and competence to collaborating processes across company boundaries in and between firms and networks. Systematic management of IC, by some researchers considered to be

³ http://www3.weforum.org/docs/GRR17_Report_web.pdf, January 2017

predictive (Abhayawansa & Guthrie, 2010; Brooking, Board, & Jones, 1998) may stabilize the quality of financial control through forward-looking results widening the horizons for planning.

In addition to this, the speed of development of knowledge it-self has become exponential (Bontis, 2001), but knowledge and especially the new knowledge does not get distributed very fast. Reports and research point out difficulties for companies and collaborating networks to find the right knowledge in the right time. Establishing efficient collaborations across disciplinary, geographical and cultural borders are described as costly and difficult (Harvard Business Review Press, 2011; Maznevski & Chudoba, 2000) Tasks like “climate change mitigation and adoption”, “regional or global governance”, “urban planning”, “inequality” and “unemployment” are identified, footnote 1, as failed global tasks and their solutions are characterized by their interdisciplinary, dispersed conditions illustrating some aspects of weak global practices⁴.

It is the concern of the thesis to propose calculative mechanisms designed to make such failures avoidable through systems of knowledge control rendering individual knowledge globally accessible ex ante in trustworthy value representations within and between companies, but also to account for the practical use of individual knowledge and its contribution to projects ex post.

The economic methodology translating values into numbers and digits does not include the translation of the values of individual knowledge (Kaplan & Norton, 1995). Despite the relatively considerable cost of manpower in companies, this resource remains as an input partly uncontrolled; within the legal/economic framing of companies costs are reduced by lay-offs or enhanced when staffing, but the kind of knowledge considered to add most value to operations now and in the future often remains uncontrolled. Both theory and practice refer to knowledge as the most valuable resource in companies (Bontis, 2001; Stewart, 1997) or in networks, but still, such values stays invisible and more or less unmanaged. No other valuable resources remain unmanaged, but are visualized in various financial systems of control, Enterprise Resource Planning, ERP systems, Customer Management Systems etc. Several theories assign the notion of knowledge with positive expectations to enhance economic growth (Saint-Onge, 1999; Stewart, 1997; Sveiby, 1997) and to fuel innovation and development (D. J. Teece, 2007; Thompson, 1965; Tushman, Smith, Wood, Westerman, & O'Reilly, 2010), but individual knowledge control systems using standards for measurement of individual knowledge or generic performance measurement systems controlling input and output of individual knowledge resources using causal logics explaining the knowledge-based operations between the two, are still to be designed. This adds to the relevance of the thesis.

IC researchers have explored how values are created in firms constructing a field language with elements that slowly have been ordered in relation to each other in shared understandings, still with some discrepancies being a young domain (Guthrie, Ricceri, & Dumay, 2012; Petty & Guthrie, 2000). IC research uses both quantitative and qualitative methods influenced by inherent ontological premises interpreted to conserve the research in ostensive approaches (Dumay, 2013). The literature arranges these steps of development in “stages” or “waves” identifying consciousness and raising activities striving to communicate the importance of IC for adding value to companies as the first wave (Petty & Guthrie, 2000). The second wave added consolidation to the domain as a legitimate research field by gathering evidence for its further development (Guthrie et al., 2012) and the third wave strengthened IC practices inside organizations by case based studies of IC practices in operations (Dumay & Chiuicchi, 2013).

⁴ See footnote no 1

Literature shows, how individual knowledge as a theoretical notion did not enjoy much attention in the IC domain focusing often at organizational knowledge (Dumay, 2013; Guthrie et al., 2012; Hong, 2012; Mabey & Nicholds, 2015; Wieland, Handfield, & Durach, 2016). Some researcher have however focused on individual knowledge mentioning knowledge roles (Davenport & Prusak, 1998; Davenport, 2013) and defining knowledge as individual capabilities, “Individual knowledge can be characterized by personal intellectual abilities⁵ (Davenport and Prusak, 1998; Zhang, 2009)”. If some knowledge is more relevant for solving one task than other knowledge, and if the media offering relevant knowledge in organizational processes is individuals within and between companies, then individual knowledge qualifies as an object of research as well as the carrier or the owner of this knowledge.

To manage individual practices of knowledge, knowledge requires mechanisms of shared control entailing an accounting view as viable for the visualization and distribution of values of knowledge.

1.0 Research Question

Globalized Internet technologies generates new conditions for knowledge-based decisions taking the context of management of knowledge, KM, from systems within firms to systems in and between firms (merged) adding complexity to an envisaged paradigm of control of individual knowledge through distances of time, space and cultures. These contextual elements differ from most contexts in existing IC research by 2 factors; the change of focus from organizational to individual knowledge and the change from the company specific to a generic perspective. The IC domain, which generally defines knowledge as assets in operations, institutes a search for theoretical development toward an operating orientation by calling for a 4th wave (Dumay, 2013; Guthrie et al., 2012). Dumay, however, maintains the company orientation and the situated mean outputs: “Thus, an “account” of IC practices can be delivered rather than IC measures. It is practice that helps researchers and practitioners to internalize what works (and what does not) inside a specific organization rather than research that can be generalized to all organizations” (Dumay & Garanina, 2013, p. 21). In contrast, this thesis intends to quit the company-based time and space limitations and considers design of the input of individual knowledge more helpful, because internalizations of yesterday’s complex solutions in ever changing contexts are not supposed to fit the to-morrows and adjustments take competitive time (McGrath, 2013). This poses the question about how managers are enabled to take fact-based decisions and exert direct management of remote, individual knowledge ex-ante.

Individual knowledge owned by employees and collaborators is considered as valuable input to operations inconsequential of who owns the knowledge where, i.e. whether the knowledge is owned by an individual inside or between companies, thus “free agents” too. The context illustrates short-comings in the economic translation of the world, because this input, its assets and its values are invisible in financially based systems of control and furthermore underline values in external potential assets, which are out of control. The research context connects the level of analysis to knowledge per se and to individual owners of knowledge inside and between firms in contrast to focusing on to processes within the single firm (Dumay & Garanina, 2013; Dumay, 2013) or to complex values of knowledge like the IC elements Customer or Structural capital (Edvinsson & Sullivan, 1996; K. Kreiner & Mouritsen, 2003).

⁵“(.)the intangibles that add value to most products and services are knowledge-based: technical know-how, product design, marketing presentation, understanding the customer, personal creativity, and innovation. The powers of knowledge that we have described -- speed, complexity, a sense of history and context, judgment, and flexibility -- are precisely those needed in a rapidly changing, increasingly competitive global economy” Reprinted by permission of Harvard Business School Press. Excerpt of Working Knowledge: How Organizations Manage What They Know by Thomas H. Davenport and Lawrence Prusak. Copyright 2000 by the President and Fellows of Harvard College; All Rights Reserved

In practice an interest for individual capability has been displayed for many years in annual surveys⁶ concurrently conducted by a consulting firm with extended representations in the world, Price Waterhouse Cooper, PWC. Global leaders tick off global recruitment and availability of the adequate knowledge or HC in IC as the most important concerns. For several years these surveys between global CEOs have labeled and ranked their most important concerns as issues of risks within the IC.

So, taking both theoretical and practice oriented views in consideration an interest for management of individual knowledge seems to be generally present and viewed as important.

The different views have led to a heartfelt interest to explore the following question

How can individual knowledge become operable in dispersed, global contexts to support knowledge-based management decisions at a distance?

The question did not get framed by specific functions in or between firms, but comprises decisions relying on the idea of accounting like representations of HC stocks and flows in the capital. Decisions addressing processes of recruitment, allocations for (innovative) projects or strategic development of the capital represent decisions supposedly taken on basis of knowledge about the demand for knowledge in the processes. Supporting the position of the financial paradigm as inept for visualization and valuing of human capital, HC, in the intellectual capital (Kaplan & Norton, 1995), the thesis does not follow the notion of stocks in the approach, where “stock is concerned with calculating a dollar value of intangibles (Guthrie and Ricceri, 2002, pp. 5-9)” (Boedker, Guthrie, & Cuganesan, 2005), but tends to define HC stocks within the non-financial paradigm. However, being aligned to the notion of flow: “The second approach, the flow approach (Guthrie and Ricceri, 2002, pp. 9-13) views IC as being concerned with identifying the knowledge resources that drive value creation, rather than assigning a specific \$-value to the resources. It is based on the notion that future financial performance is better predicted by non-financial than by financial indicators” (Boedker et al., 2005, p. 515), knowledge allocations are considered part of operations and allocation of resources part of the team settings representing HC flows. Allocation of resources focuses on individual knowledge. The theme from operations management, OM, “allocation/team setting” is chosen as the explanatory focus and level of analysis for the development of the non-financial accounting concept, because both theoretical stock and flow consideration are represented: For the manager to decide the most satisfying assignment of knowledge to tasks an ostensive overview of the offered knowledge supply in stocks is needed. Knowledge representations must be updated to serve practice. Managers – or self-managers – will decide which individual knowledge optimally fuels business processes in order to generate the most satisfying results. This choice is considered the crucial managerial choice. Forward-looking knowledge-based ex ante decisions (i.e. allocations) may rest on an overview over reliable, fast, updated and accessible information about the values in available knowledge. Backward-looking knowledge-based decisions may happen on the basis of metrics showing how allocated knowledge and competence in teams has performed. The best decisions create the best matches between supply and demand. The question is which properties remotely are able to constitute reliable, satisfying, updated and accessible information about available knowledge for decision making and which (managers’) decisions create the highest added financial values.

Seeking to identify these knowledge resources, stocks are consequently understood as the total amount of available, individual knowledge (K. Kreiner & Mouritsen, 2003). Decision makers allocating knowledge

⁶ <https://www.pwc.nl/nl/assets/documents/pwc-annual-report-2013-2014.pdf> , <http://www.pwc.com/gx/en/about-pwc/global-annual-review-2015/campaign-site/pwc-global-annual-review-2015.pdf>

resources to tasks are perceived to constitute flows. The total amount of knowledge-based decisions represents the total flow.

This is the ideas for the thesis' conducted in design science research, DSR, to conceptualize HC calculability for allocations by concretizing, visualizing and valuing elements of individual knowledge and competence in an accounting logic for global operations. "Allocations" were above identified as the "Class of Problems" in the DSR terminology, which is defined in the following quote:

"..as the organization of a set of problems, either practical or theoretical that contain useful artifacts for action in organizations(..)considering the reality of the area of operations management in particular. The definition of the concept of Class of Problems offers the possibility for the treatment of theoretical problems because a problem can also correspond to ways of testing a theory in organizational practice. It also offers the possibility of formalizing artifacts present in the practice of a given organization that must be evaluated in other environments. This feature also allows for the use of traditional research methods (Case Study, Action Research, Modeling, Survey) to formalize existing artifacts, i.e., these research methods can be conducted based on the logic and premises of Design Science." (Dresch, Lacerda, & Antunes, 2015, p. 104).

The main contributions tend to propose systematically and objectively valued, intangible objects (HC elements in IC; individual knowledge and competence) designed as calculative devices in a non-financial accounting paradigm, which strives for auditability. That the nascent main contribution leaves the financial paradigm for valuing is assumed to be a critical new proposition for exchange of values in the world. The proposed IC measurement unit designed to be free of context and thus independent of time and space is believed to represent values of individual knowledge and competence generically. It is applied as a valuing element in a non-financial accounting system, which through managers' decisions and actions constructs non-financial value representations of individual or accrued knowledge values ex ante/ex post in operations. Through practices of allocation the IC accounting system is designed to offer generic additional tools for management of companies and network and consequently, to communicate and circulate auditable IC values as disclosures to markets.

The thesis is arranged in three parts as follows: The concept-centric {{709 Webster, J. 2002; 711 Wee, B. V. 2016}} IC literature review in the first part identifies directions to pursue in order to visualize and value individual knowledge in global, dispersed contexts. The gap between IC literature and potential answers to the research question is defined and sought addressed through DSR methodologies and the identification of the class of problems. The conceptual design of a non-financial measurement unit and its accounting system finishes Part I.

In the second part the two chapters describe the testing of the concepts of the measurement unit and the non-financial accounting system in an interventional case-based context. Each chapter is initiated by the presentation of the theory and methods used for the validations. The non-financial measurement unit is exposed to co-development in GCC and it is separately tested for its ability to work. It is explored, if the properties in the proposed device are satisfyingly attractive to keep the non-financial control system together and working. Furthermore, processes of conceptual and technological adjustments and customizing of the measurement unit and the accounting system are conducted in the company. The ANT analysis of the system-deployment in a pilot-project is carried out in parallel in longitudinal inductive processes in the GCC.

The third part discusses the findings and their assumed potential for management to exert knowledge-based, satisfying operations having access to dynamic and objectively valued HC representations ex ante

and ex post. Finally, the proposals are resumed and reflections over limitations and future research finish the thesis.

Chapter 2

Concept-centered Literature Review and Valuing Paradigms

2.0 Introduction

The outcome of this chapter tend to clarify properties and conditions for coordination of values in the IC element human capital, HC, in operations and identify potential design elements to conceptualize the coordination of HC, so managerial decisions can become knowledge-based in dispersed contexts. Description of the state of art in the IC theory initiates the chapter focusing especially on mechanisms for coordination of individual knowledge⁷. It is followed by the study of mechanisms of coordination of values in the material paradigm, well accounted for and theorized by economically based thinking. These considerations are followed by the IC literature review and comparisons of valuing paradigms. The outcome from the concept-centric review (Webster & Watson, 2002; Wee & Banister, 2016) is summarized in the following section.

2.1 IC Literature

Unfortunately, it is impossible to study individual knowledge accounting in the contexts in which it operates as did A.G Hopwood (Hopwood, 1983), because IC accounting based on individual knowledge in operations does not exist. But operations contexts can be studied. As an introduction to the IC literature review this subsection introduces in a broader outlined overview some main characteristics forming the contextual elements in the following concept-centric IC review, taking inspiration also from Hopwood:

“..questions raise about the relationship of accounting to the context in which it operates are ones that are high on the problem agendas of accounting practitioners and consultants. By trying to disentangle the processes by which particular accountings arise, function and change, such research offers the potential to relate knowledge to the specifics of the accounting condition with which such practitioners have to deal..” (Hopwood, 1983, p. 298)

He calls attention to the relations between accounting and the context and its mutual performativity, which then allows for the disentanglement of the visible context to study potential elements of importance for an objectification of individual knowledge in order to conceptualize knowledge accountancy.

The prevailing ostensive view in IC research (Dumay & Garanina, 2013; J. Mouritsen, 2006) deals with identification and labelling of IC elements with which to describe and understand the capital in stock-related configurations as disclosures in annual reports, organizational knowledge overviews and event-driven organizational processes in periodic comparisons (Andriessen, 2004b) ; The construction of Intellectual Capital Statements’ (Bukh, Larsen, & Mouritsen, 2001; J. Mouritsen, Bukh, Larsen, & Johansen, 2002), various value representations, explications of complex use of knowledge in job-oriented listing of competences (Lindgren, Henfridsson, & Schultze, 2004), coded knowledge (Gröjer, 2001; Morrison, 2010; Popper, 1972; Zack, 1999) or

⁷ Annexes are placed at last and denominated with an “A” and the ID-number Annex A1, Definitions of Knowledge

measurements of complex digits from recurrent events are found to be representatives for this stream of ostensive research in IC. Especially tacit knowledge has constituted problems being defined as knowledge individually, but unwittingly owned (Nonaka, 1994; Polanyi, 1997; Saint-Onge, 1996). Consensus in research supports its importance in operations (K. Kreiner, 2002), but struggles to materialize it (Duguid, 2005).

However, research theorizing causal relations between knowledge, operations and their effects limited it-self in IC literature's wave 1-3, A1.1⁸. Research was often focused on the notions argued to represent an awareness of the existence of non-financial elements or interpreted results estimated to verify the IC view as being helpful to for instance annual reports. The perspective of IC disclosures as value adding for the financial markets has not been supported by the financial markets (merged).

So, when Peter Drucker in 1993 from an operative view suggested that the means of production was no longer capital, natural resources or labor, but knowledge, then the IC domain had been exploring knowledge as assets for some time. Changes were described as 'The central wealth-creating activities will be neither the allocation of capital to productive use nor "labor" –the two poles of nineteenth and twentieth-century economic theory . . . Value is created by "productivity" and "innovation", both applications of knowledge to work' (Drucker, 1993).

The question was how knowledge assets relate to productivity and innovation, but the instrumental relations between knowledge and productivity/innovation remained unillustrated. Knowledge was later seen as 'more valuable and more powerful than natural resources, big factories, or fat bankrolls' (Stewart, 1997).

In IC and knowledge theories, knowledge is connected to labor and employment (P. Brown, Hesketh, & Williams, 2003), but the notion of organizational knowledge is more pronounced than individual knowledge causing troubles to find and identify knowledge in IC (J. Mouritsen, Bukh, & Marr, 2004). In KM, knowledge is predominantly defined as subjective and tacit knowledge (Nonaka, Toyama, & Hirata, 2008). Research has focused on explications of tacit knowledge through models like SECI (Nonaka, Toyama, & Konno, 2002) and constructs like Communities of Practice (Gammelgaard, 2010; Wenger, 1998), but dynamics in operations problematize the outcome from the models (Duguid, 2005) and points out the unknown relations between knowledge decisions and ostensive representations of knowledge, but also the unsolved relationship between knowledge and operations.

The distinction between situated, organizational knowledge on the one hand and the notion of individual knowledge (K. Kreiner, 2002; Polanyi, 1974) in a generic context on the other, seems important when trying to identify design elements for technologies providing reliable, updated and accessible information about available individual knowledge. Twenty years ago the same context produced research that envisaged effects of new technological achievements for distribution of knowledge in and between companies (J. S. Brown & Duguid, 1998) pointing out an awaited loss of control over the distribution of knowledge in companies. Within the firms the effects also represented loss of money, because firms pay the salaries but do not harvest effects from coordination of knowledge. Technological connectivity may take the research focus to collaborating networks, by some researchers referred to as IC ecosystems when applying

⁸ A 1.1 IC Literature Review

sectorial, regional or country levels as research focus, thus surpassing firm boundaries (Borin & Donato, 2015). Between firms, the inexistence of bottom-lines reduces the problem of coordination of knowledge to the search for and match of the most satisfying knowledge in the asymmetric situation of task information, because tasks being owned within companies define the demand for knowledge, while the globally distributed individual supplier of knowledge own specific knowledge, but does not know the demand. As a starting point, no financial constraints rule the potential connection and relationship between supply and demand for individual knowledge.

It is assumed that whether the task is supply or demand for HC in or between firms, then the properties of information needed for reliable, updated and accessible information about available individual knowledge is identical, if an unbiased, reliable overview, choice and connection to the concrete intellectual capacities is to be technically provided, decisions made and knowledge managed at a distance. This is because the quality of the HC match is equally dependent of precision and reliability when searching for or offering individual IC capacity and because firms' legal/economic boundaries do not impeach exchange of knowledge. Management of knowledge, thus, not only matches between supply and demand of knowledge, is within companies assumed to create other implications, because financial bottom lines represent the summarized economic result of many decisions within co-cognitive, strategic, ordered organizational contexts with common long /short termed goals comprising not only matches between supply and demand, but also long termed maintenance and development of the HC. For management of innovation the theorizing of individual knowledge is indirectly assigned an important role, because innovative processes are described as dependent of individual knowledge (D. J. Teece, 2010; D. J. Teece, 2007; Tushman, Anderson, & O'Reilly, 1997; Tushman et al., 2010). The important role was not generally outlined in first waves of the IC literature (Andriessen, 2004b; Bounfour, 2003; Bukh et al., 2001; Bukh, Skovvang Christensen, & Mouritsen, 2005; Busco, Frigo, Riccaboni, & Quattrone, 2013; Edvinsson & Sullivan, 1996; J. Mouritsen, Larsen, & Bukh, 2001; J. Mouritsen et al., 2004) although individually defined knowledge resources were identified and found to be assets quite early (Allee, 2002; Nonaka, 1994; Saint-Onge, 1996; Sveiby & Lloyd, 1987). But this stream of research did not gain solid ground for the next 20 years, maybe due to contingency based theories in management accounting (Otley, 2003) and maybe because knowledge in KM ontologically is defined as subjective (Konno & Nonaka, 1998; Nonaka et al., 2008). David Otley exerted self-critique by identifying some elements as generic (Otley, 2003). The subjective notion of knowledge was criticized especially pointing out inconvenient consequences for remote sharing of knowledge and for innovation (Gourlay, 2006; Hong, 2012).

Having been based mainly on subjective knowledge and notions of knowledge intermingling knowledge and competences, IC literature therefore exposes flaws for the sharing of individual knowledge, which is not co-present (Nonaka et al., 2002), and documents difficulties for teamwork in cross-bordering teams (Behfar, 2008; Cordery, Morrison, Wright, & Wall, 2010; Hardless, 2007a; Harvard Business Review Press, 2011; Hong & Vai, 2008; Kirkman, Rosen, Tesluk, & Gibson, 2004; Maznevski & Chudoba, 2000; Wilson, Straus, & McEvily, 2006). How

objectify individual knowledge, when it is intermingled with the human competence to activate and use knowledge?

The concept for the IC review (Webster & Watson, 2002; Wee & Banister, 2016) will therefore focus on literature's approach to mechanisms of coordination and distribution of assets in and between firms.

2.2 Review of Coordinating Mechanisms in IC literature

In the table of concept-centric IC literature review in Annex 1.1 it is explored whether or how the IC literature approaches mechanisms of coordination and distribution to operate the capital. The phenomenon is studied in the 3 waves in the IC literature referred to in the Introduction. Attitudes to auditability in flows and stocks are studied as well. The waves are arranged in 4 foci:

1. Level of analyses: Organizational knowledge >< Individual knowledge
2. Coordinating devices
3. Contexts: Company specific context >< unstructured context
4. Auditability: Control of relations between managerial knowledge decisions and disclosures

The 3rd wave calls for performative perspectives on IC and for standards able to operate knowledge. IC statements are criticized for vaguely documented relations between the value of the chosen IC assets, their management and the disclosures which are perceived as hard to understand, compare and use by the financial paradigm of control. The demand for reliability and comparability in IC disclosures in global contexts introduce an IC accounting perspective able to identify the assets, document managerial decisions regarding the assets (flows) and document the result of the taken decisions (stocks).

“In regards to identifying the value of IC, contemporary literature shows the existence of two lines of thinking, known as the stock and the flow approaches (Guthrie et al., 1999; Guthrie and Ricceri, 2002). The first approach, the stock approach, is concerned with calculating a dollar value of intangibles (Guthrie and Ricceri, 2002, pp. 5-9). It provides a snapshot of stocks of IC that is suitable for comparisons between companies. “It represents an attempt to fill the gap between market and book value by finding ways of determining the market assessment of the value of an organization's stock of IC” (Guthrie and Ricceri, 2002, p. 8). The second approach, the flow approach (Guthrie and Ricceri, 2002, pp. 9-13) views IC as being concerned with identifying the knowledge resources that drive value creation, rather than assigning a specific \$-value to the resources. It is based on the notion that future financial performance is better predicted by non-financial than by financial indicators.”

Output from the literature review outlines IC statements and disclosures as important fields of interest and the use of mean figures, deductive indications and self-assessments in job-centered records as technological standards. Some consider some IC statements to provide accounts that are comparable to other firms at the business model level, but the situated technologies are unable to constitute global flows and stocks, which represent comparable values of individual knowledge and competence.

An analysis of the notion of knowledge is conducted and compared to requirements for operations (flows) in unstructured contexts which underlines the importance of objective, recognizable elements of design in the construction of operating devices.

However, IC literature demonstrates some views on flows and stocks applying various definitions. For Nonaka the managerial context is described as flows and seems not for him to represent specific notions of accounting flows: “All things flow in continuous interaction and relation to each other, and this applies to human beings, firms, and the larger environment. Knowledge also flows and is in continuous change. Hence, all firms face the inherent contradiction of needing both stability and change to survive in the flow. We believe that the firms in our case studies overcome this contradiction by managing flow.” Johnson, on the contrary, applies an accounting terminology and proposes “Stock indicators” without making causal connections between flows and stocks, although finishing the paper on this node; “... the real potential for value may be in the systemic interaction of the various elements of the framework. Thus, future work into the concept should take a systems approach where a system can be defined simply as a collection of parts which interact with each other to function as a whole”

“The second approach, the flow approach (Guthrie and Ricceri, 2002, pp. 9-13) views IC as being concerned with identifying the knowledge resources that drive value creation, rather than assigning a specific \$-value to the resources. It is based on the notion that future financial performance is better predicted by non-financial than by financial indicators.”

This thesis rather supports the efforts to identify the knowledge resources driving the value creation by focusing on individual knowledge and competence as objects and as input to processes of allocation. To manage the objects in operations the input side is made visible, valued, comparable over distances and accessible for management to enact their decisions. The direct and documented relationship between the decisions constituting IC flows through knowledge and competence input in operations and the output shown as inventory or stocks is assumed to configure auditable relations between stocks and flows at the individual level. The stock/flow perspective is present through the arguments in the thesis .

ad1: The predominant level of analyses is found to be organizational, albeit allocations of knowledge to tasks happens through individual assignments

ad2: The focus on coordination of HC and coordinating devices is found to be scarcely addressed in IC. Therefore, processes to secure the most satisfying knowledge at the right time to the right task between units ex ante did not happen through comparisons and coordination of individual knowledge. Within firms the coordination was found to be based on self- assessed local digits

ad3: IC research is predominantly found to be company specific, so there is a gap from the structured context inside the firm to unstructured contexts between the firms

ad4: IC disclosures vary, are not comparable and not auditable. Calls have been made for disclosures useful to the financial market. The gap can be described as a lack of control of the relations between managerial KM decisions, movements in value representations and auditability.

Summed up, the literature review demonstrates why IC research cannot answer the RQ and points out gaps and alleys to pursue in order find the answer(s).

2.3 Identified Gaps in the Literature Review

The result of the IC review shows that boundaries for IC research in the waves 1-3 mainly are found within companies and not between them, and that the subjective knowledge perception and therefore the entangled view of competence and knowledge seems to conserve these boundaries. The level of analysis is predominantly found to be organizational and the representations of knowledge are found in mean, situated figures. IC literature provides little foundations or data for management of HC represented in by individuals, although individuals get allocated and are objects of management. Mechanisms and tools to coordinate and distribute HC assets (globally) at the individual level are lacking (K. Kreiner & Mouritsen, 2003) and the IC research context is therefore mainly found to be within firm boundaries and represented in complex objects. Practices of accounting are self-referring and self-assessed and inter-firm comparisons are hardly to be found.

The concept for operationalization of the HC assets in IC across boundaries therefore requires confrontation of the ontology and epistemology in theories of IC and KM in order to make a theoretical adjustment to the changed focus from within to between companies.

By admitting reuse, knowledge is separated from the owner as an option, an object, which is describable and not identic to the owner of the knowledge, thus not dependent of the owner's inherent competences to use the knowledge object.

It is general knowledge that knowledge assets get managed in processes of allocations, a process where managers define the match between the task and the choice of individual owners of knowledge ex ante. The decision offers (remote) allocations as a legitimate level of analysis and separates knowledge from other assets. In managerial actions at a distance, decisions and quality/quantity of the asset is individually calculable, on the condition that assets exist as singular digital objects and traces indicate performances. Measurements of individual knowledge and competence, HC in IC, may be helpful, because they, being direct and simple, allow interventions as management to happen between managers and individuals.

Allocations require dimensions of values to manage and visible, digitally traced decisions to account for.

The concept-centric review documented flaws in the literature concerning mechanisms of coordination of IC assets as individual knowledge and competence, which to my knowledge have hardly been objects of interest. Knowledge is viewed as

- a) organizational, thus not objectified at individual managerial levels
- b) individual, then identic with the individual (1) and not separated as manageable objects in knowledge and competence (2)
- c) subjective and personal, as sentiments, thus context-dependent, locally interpretable, invisible and unwittingly internalized

d) not valuable, not measurable, not accountable, but viewed in mean figures or large classifications (scarce, strategic, competitive knowledge etc.).

The research context is mainly firm-centric, not including contexts between firms. Notions of accountability have predominantly stayed situated and local causing various models for disclosures impeding broad, pragmatic communication with the financial markets about the values of intangibles. The publication of the different disclosures has demonstrated lacks of systematic relations between managerial decisions in the capital and the results and lack of standards to measure the capital (Guthrie et al., 2012; Zambon, 2016).

To develop artefacts able to provide data on which to take knowledge-based decisions in generic contexts the theory of Design Science Research, DSR, has as previously referred, been consulted. These considerations are outlined in the next chapter.

Chapter 3

Considerations over Theoretical Anchors

3.0 Introduction

Having outlined the proposal in the Introduction, this chapter presents and discusses theoretical implications and explains some directions that may guide research toward the proposals.

In order to manage individual knowledge in dispersed units independently of contexts and time an array of preparing theoretical tasks are induced. Knowledge is immaterial and seems included in everything and definitions of knowledge vary in the different contexts.

Much of the previous research on knowledge/ HC/ IC has been exploratory in nature in contrast to this conceptualizing, interventional research. This chapter tends to narrow the field by identifying theoretical relevant avenues to follow.

The preferred IC control and accounting approach requires objects (Catasús, 2008; Hopwood, 1987; Hopwood, 1990; March, 1987; Robson, 1992). The task becomes then, at the first place, how to conduct an objectification of the immaterial phenomenon of knowledge.

In the thesis, knowledge is viewed as theoretical HC elements in IC theories, because individuals own knowledge and individuals can be managed (Oxford English Dictionary defines Management: “Organization, supervision, or direction; the application of skill or care in the manipulation, use, treatment, or control (of a thing or person), or in the conduct of something”).

The questions are then how individual knowledge can be visualized, which roles it plays in operations, and what conditions decisions of allocations? How is individual knowledge able to operate as an object?

IC literature tends to theorize knowledge in mean figures or codifies it in context dependent, complex representations (Andriessen, 2004b; Geisler, 2006; Gröjer, 2001). These versions of representation of knowledge are not helpful for decisions of allocations, because the IC capacity then is represented as unattached to individuals and in mean figures, which does not leave room for identification of allocable knowledge.

The IC literature review documents and précises literature’s current perspectives on management of HC. Knowledge plays a main role in neighboring disciplines like Resource Based View, RBV or Knowledge Management, KM, which for some issues also will be

consulted in order to understand the use of knowledge and individual knowledge. However, IC considers knowledge as assets, phenomena which potentially bring value to the company (Davenport & Prusak, 1998), which is not necessarily the case in RBV and KM. Especially ontological and epistemological questions seem important, because the research question takes the boundaries for management of knowledge from “within” to “between companies”, which brings existing boundaries and contextual properties at stake. As knowledge cannot become studied as objects, the strategy furthermore is to explore how objects are objectified, visualized, valued, made accountable and managed in the material world.

3.1 Knowledge as Assets in Operations and Design Science Research

Assets visualized in the economic paradigm cross boundaries i.e. in companies, in global supply chains or at stock markets. Assets are managed by the numbers, which visualize and value their representations in financial systems of control. The numbers are understandable in every link of the chains – they act geographically and culturally indifferent and they enter in local accounts, but are still able to become accrued in centralized accounts – more or less context-free numbers of accounting. The representations keep their numbers, but the use and interpretation of these numbers get interpreted into situated strategies (merged).

The financial numbers’ capability to circulate without changing their representation and their properties are interesting and worthy of imitations, because this conceptualization places individual knowledge in generic contexts. Representations of knowledge are therefore studied in literature for their capacity to transcend time and space.

Furthermore, in the material world it is possible to study how requirements, conditions and properties condition coordination and distribution of assets. They are carried out in the classical valuing paradigms like economy and financial accounting, because assets here are visible, valued and studied.

Economic devices like prices perform in unstructured contexts; They may be perceived as elements of design for operability informed by figure based value representations in monetary systems (Ernst & Young, 2012). So economy offers methods of translations of the world into digits, but only of the material world. Digits as design elements in objects (services and goods) enable the design of accounting systems and various kinds of systems of control.

The idea is to study how financial control systems manage to keep transboundary processes of control function in and between firms in order to discover, whether methods in this capital of materiality are replicable in the capital of immateriality, IC, because these methods are visible and they have been tested and proven to work.

It is therefore attractive to go back in time and study ways accounting becomes aware of it- self and its methods, not only as technical but as sociological instrumentation, too (Hopwood, 1983). As management requires accounting, accounting requires objects (Hopwood, 1987). In global contexts of shared control the objectification of knowledge is therefore to be submitted to generic requirements and conditions of design. Included in the initial theorizing tasks is thus to find ways to objectify knowledge in generic contexts. Global IC accountability is to be constructed in two perspectives; accounting of knowledge within structured units with legal/economic boundaries (situation 1) and accounting of knowledge between the structured

units (situation 2)⁹. “Structured units” are characterized as “(..) ..organizations and networks consisting of strong ties are constituted by shared cognitive categories” (Augier, Shariq, & Vendelø, 2001, p. 257) as contexts within firms, whereas the context between “structured units” is characterized as situations with no “shared cognitive categories”.

Research shows that organizational change requires changes in financial accounting systems (Hopwood, 1990; Miller, 2001; Robson, 1991).

“ (..) to consider another generator of accounting change. For not only can market forces, forms of organizational segmentation and new technologies influence accounting, but so also can the world of ideas and bodies of knowledge. Accounting can be and is being changed in the name of discursive developments. I particularly want to emphasize the role of economic discourse in this process.”

(Hopwood, 1990, p. 14)

In the quote Hopwood mentions market forces, organizational segmentation, new technologies, ideas and knowledge as origins for change in accounting. Individual knowledge is assumed to be the origin to these phenomena; somebody got these ideas and made new knowledge, took the decisions and acted upon the decisions to carry out technology, segmentation etc. The quote connects the immaterial and the material world and accentuates the stance that ideas and bodies of knowledge also may drive change implicating discursive developments. .

Therefore, accepting the global paradigmatic change of drivers of economic growth described as a shift from industry (materiality) to information/ knowledge (immateriality)(McGrath, 2013), the intention is, as previously written in the Introduction, to design and supplement to financial systems of control with IC accounting mechanisms representing the values of immaterial drivers/ knowledge. The underlying assumption is that an added managerial effort toward auditable accounting output from data-based management of HC will provide economic growth that the financially based managerial accounting output alone is not able to effect, because some individual knowledge is considered to be unexploited assets. Gaps in the IC literature review documented the lack of coordination and distribution of individual knowledge and competence.

In order, therefore, to enable management of knowledge as assets in operations, the conceptualization is directed toward mechanisms of coordination. Management happens when decisions impact mechanisms of coordination as explained in Mintzberg’s five groups of mechanisms of coordination (Mintzberg, 1980). Comparisons between the contexts of co-presence and locality at one side and distance and dispersion on the other will be carried out to identify conditions for the distribution of elements in both contexts, referred above as 1) and 2). The strategy is to explore these potential elements of design in Mintzberg’s theory of organizational design to understand their instrumentality and conceptualize alike, potential mechanisms of coordination in an ICA paradigm. Mintzberg considers accounting systems as design elements to generate output: Planning and control systems constitute the design elements required to generate output, often as forward looking (budgets) or backward looking accounts

⁹ Definition chapter 4.3

(Mintzberg, 1980), which in the dispersed digitalized context may allow for accounting systems in and between units to provide shared channels for mechanisms of coordination and distribution of HC assets.

Mintzberg's theory (Mintzberg, 1993) will be consulted and synthesized to identify calculating elements and devices in order to generate forward and backward looking ICA output for managers to distribute and coordinate the individual intellectual capacity.

To account for knowledge the thesis engages, as mentioned in the Introduction, in the theory of design science research, DSR, "to conceptualize knowledge that can be used in an instrumental way to design and implement actions, processes or systems to achieve desired outcomes in practice" (van Aken, Chandrasekaran, & Halman, 2016, p. 1). This approach implicates "testing and redesign of the innovative, generic designs dealing with authentic field problems and opportunities" p.1. The outcome of the design processes, the concepts, is consequently, after having been changed into artefacts, exposed to GCC. The validity of DSR is related to the strong evidence that the solution create the desired results.

The logic of justification in DSR is different from explanatory research, because the designed proposals cannot be explored. Logical deductions are dealing with what *is*, but the design-oriented research jump to what *can be* – in the future. The justification of generic design, therefore, is about effectiveness. Does it work? It includes an answer to the design problem, description of development and tests and shows how the design solves the problem or satisfies given specifications. "The validity of a generic design is, unlike an explanation, not justified on the basis of how it has been made but by proving that it works" (van Aken et al., 2016, p. 2).

When properties and requirements for design elements are identified to operate the capital in measurement units, "The Intangible Currency"TM is designed and applied as visualizing and valuing device in an accounting system. The financial guidelines for intangibles (Ernst & Young, 2012) will be studied in order to align to the guidelines in the non-financial paradigm in recognizable design elements for the measurement unit and its distribution system, which then becomes designed according to systems of control. The ICA system strives to be auditable and useful (Andon et al., 2015).

The two outputs from the design processes, The Intangible CurrencyTM, TIC, and the ICA system, will be exposed to the global case company, GCC, as interventional, co-developing research to examine, if it works. In the globally dispersed context the method using surveys makes sense in order to explore the measurement unit, TIC, per se, but for the processes of implementation the qualitative approach has been chosen as more helpful. The arguments for these verification plans are presented later. To follow these research alleys, the following step introduces my stance or philosophical attitude to the world.

3.2 Stocks and Flows - Ontologies, Epistemologies, Paradigms and Mixed Methods

Having mildly problematized the research question in the light of practice and theories, questions about knowledge ontology and epistemology, paradigms, methodologies and

terminologies is reflected on in this section to better order the theoretical positions in the RQ and argue for mixed methods.

The general logic in disclosures from systems of control, like accounting systems, often generates accounts visualizing and valuing plans and effects from decision making in operations in digitized data (Andon et al., 2015; Fløstrand, 2006). The thesis' global context implicates an unsituated approach to data about knowledge, because data as qualitative facts about input and output of knowledge to inform knowledge-based decisions are to be distributed in structured as well as unstructured contexts and like financial data will have to get approximately equally understood at the distributed locations. What gets measured, gets managed (Otley, 2003, p. 319), so knowledge is to be measured. The global context is characterized by a lack of strategic orientation and lack of shared cognitive patterns and therefore appears unstructured (Augier et al., 2001). Proximity and physical co-presence is not included in premises of the RQ. These conditions are in contrast to most literature about knowledge management (Nonaka et al., 2008), where the level of analysis is the firm and knowledge is perceived as subjective and situated (chapter2). Knowledge is predominantly defined as subjective in the KM domain and the IC research context is often firm-centered. This view is found to have a narrowing impact on the theorizing of generic HC in the IC domain, because individuals cannot be co-present and cannot learn from each other. Tacit knowledge, which is considered very important in operations (K. Kreiner, 2002), will consequently become lost (Konno & Nonaka, 1998).

Furthermore, the objects of explorations and methods of IC measurement are mainly found to be event-driven, selective, uncomplete, complex and located in time and space (Andriessen, 2004b) which are conditions contradicting the actual managerial problem.

This relation between the ontological view of knowledge in KM and the epistemology found in IC seems theoretically strait-jacketed and seems to hamper the theorizing of the notion of global knowledge.

“Ontology logically precedes epistemology ... we cannot know what we are capable of knowing (epistemology) until such time as we have settled on (a set of assumptions about) the nature of the context in which that knowledge must be acquired (ontology)”
(Hay, 2006, p. 8) (Bates & Jenkins, 2007)

However, the prevalent notion of knowledge in literature is not able to answer the research question, because this literature primary is based on co-presence, situatedness and studies within firms. A direction for this research is therefore to look for other notions of knowledge to pursue potential answers.

In the quote below, Stephen Bates discusses the relations between ontology and epistemology:

The dominant identification of knowledge in KM as being subjective seems to rest on “a foundation of indubitable beliefs from which further propositions can be inferred to produce a superstructure of known truths” (Jones, 1995, p. 289). Inclusion of epistemological terms when defining ontological positions can be viewed as part of a broader conflation of ontology/epistemology.. (...) ... there is the important, but unrecognized, issue of the relationship between ontology and epistemology. Marsh and Furlong argue, ‘Ontological and epistemological positions are related, but need to be separated. To put it crudely, one’s ontological position affects, but far from determines, one’s epistemological position’ (Marsh and Furlong, 2002, p. 18). (Bates & Jenkins, 2007)

The quote discusses the interrelatedness between a context producing truth and a context providing findings or propositions. The relation between ontology and epistemology is viewed as predetermining, where the ontology precedes epistemology. To answer the research question how qualitative data about individual knowledge becomes exchangeable and measurable at a distance, which at the same time frames “*a set of assumptions about the nature of the context in which ..()*”, describing the question’s epistemological context of knowledge, a notion of knowledge, where it has been enabled to travel, is required.

Explicit, academic knowledge being globally peer reviewed (socially constructed) is considered objective knowledge contrasting the ontological situated view of knowledge in most KM literature. Academic knowledge is described as “verified true beliefs” (Christensen, 2000). Academic knowledge describes realistic positions in verifiable set-ups and the body of knowledge is global. Potential stocks of objectified objects of explicit knowledge in an accounting paradigm may be regarded as *ostensive representations* resembling the description of ostensive themes in IC concepts: “IC consists of human (..) capital which has functional qualities and is thus value generating assets not visible in the firm’s balance sheet. IC has descriptive qualities and measurement is essence” (J. Mouritsen, 2006, p. 824).

As phenomenon, knowledge being immaterial, it cannot be touched or weighted, but still exists in global mental spaces between individuals (Quattrone & Hopper, 2005). Doctors and lay-men approximately know what doctors know, without knowing each other. This existence of knowledge expressed as a discipline may be denominated as “relatively universal” (circulating reference)(B. Latour, 1999, p. 71), because it through translations in globally shared social understanding reaches temporary stability, which in ostensive stocks can be displayed as objective representations of knowledge (Popper, 1972). These objects of knowledge can under special conditions in the artefact-based view of knowledge (merged) be shared, reused and travel (realism). But this knowledge is also, and at the same time, object for deconstruction, when human competences submit the knowledge object and its hitherto accepted boundaries to use and explorations in operations. Then knowledge becomes dynamic (relational) and situated. So the phenomenon knowledge acts in ostensive as well as performative forms. Therefore, the constructs of ostensivity/performativity (J. Mouritsen, 2006) may be relevant theorizing notions for an understanding of stock and flow when design of non-financial accounting is the focus. Flows of knowledge in an accounting paradigm may be regarded as *performative knowledge* resembling the description of performative themes in IC concepts: “IC is a representation of knowledge resources whose transformative qualities emerge in application. IC has classification qualities and measurement is convention” (J. Mouritsen, 2006, p. 824). The complexity in the oscillating interrelatedness in the interfaces between ostensive and performative situations of knowledge in operations influences and forms the strategy of verification of the designed concepts for the measurement units and the implementation of the accounting system addressing both realistic and relative contexts. To contain both properties of IC stocks and flows in the measurement unit, it tends to contain and represent an ostensive state of knowledge objects and at the same time the potential flow, which may be generated by its allocation. Mixed methods are planned to address the inherent properties in the measurement unit to verify its usability per

se and in a longitudinal aspect to verify if the ICA system, now customized and in some operational aspects situated, works.

The widespread situated knowledge ontology seems to influence main KM and IC technologies locking up epistemology in time and space dependent cages impeding the global level of analysis (Gourlay, 2006; Hong, 2012). The subjective knowledge view seems to hamper the design of generic stocks of knowledge, because knowledge representations as situated knowledge in the unstructured context are unrecognizable. This understanding of knowledge is therefore rejected and the arte-factual view of knowledge applied in the thesis.

In Design Science Research, DSR, the socio/technological interface displays a parallel asking for evidence of the conceptualized proposals to work, which seems to superpose realism/positivism to constructivism, because the designed elements to work in generic stocks has to be globally recognizable and at the same time able to be customizable into local projects. The thesis therefore will engage in opposing ontologies and epistemologies (realism and relativism/positivism and constructivism), because input to knowledge-based decisions in operations is attached to time and space in concrete situatedness (relativism, performative definition) and the representation of individual knowledge has to stay objective and static in its moment of registration (realism, ostensive definition) to create a credible and recognizable representation of the stock. So implications for the information about individual knowledge are that it in the context of stocks (disclosures), which have to be comparable across firm boundaries, the theorizing happens in a positivistic paradigm, while in operations, the theorizing of flow becomes situated, relative and constructivist. This has influenced the chosen methodologies for the empirical processes.

The thesis discusses opposing ontological positions, because the methods of translation of knowledge into data about the value of objects and the specificity of knowledge theoretically has to embrace both forms to represent stocks of knowledge (objective, static, context-free truth (realism, ostensivity)) in operations of allocation, recruitment, retention, talent management, etc. and flows, where dynamic knowledge in operations of development, innovation, productions in concrete situations becomes subjective and situated, have multiple meanings and is conceptual. The quantitative verification method is supposed to makes sense for the measurement unit, which is elements constructing the stocks, because the measurement unit regarded as a device - to act as global devices – may prove properties from the paradigm of realism like objectivity, comparisons, generic overviews and measurements – and if the method shows that it works, the design works and may be proposed as a finding. This result is independent of other results and only related to the measurement unit.

This finding seems not to be disqualified by qualitative methods exploring potential implementation of the ICA system applying the unit, because many other parameters are included in processes of implementation, which do not necessarily address the calculability and framing properties in data about knowledge. Failed implementations of financially founded systems do not, to my knowledge, question the authority of the financial measurement unit expressed in monetary digits.

Still, the qualitative method seems relevant in the longitudinal case study, where the context becomes situated and constructivist. The method studies how human (managers) and non-human actors (measurement units) act under the inductions. As the ICA system then becomes customized, concrete and complex involving many human and non-human actors and as the exogenous business context during the 24 months develops from stable to unstable through uncontrollable market events and risks independently but impacting the context of the longitudinal research process, it is possible to discover concrete details and describe the detailed phenomena using the qualitative method. The findings are co-created, but the measurement unit cannot be discarded in the process. The system can. The measurement unit and the system is not identical, the system is the vehicle, means to distribute and coordinate the calculating devices of knowledge.

The chapter explained by disentangling the research question that the DSR theory implicates parallel positivistic and constructivist considerations in the conceptualizing of ICA and in the construction of evidence. It argued for the use of mixed methods. The more detailed presentation of the use of theories and methods is outlined in chapter 7 and 8.

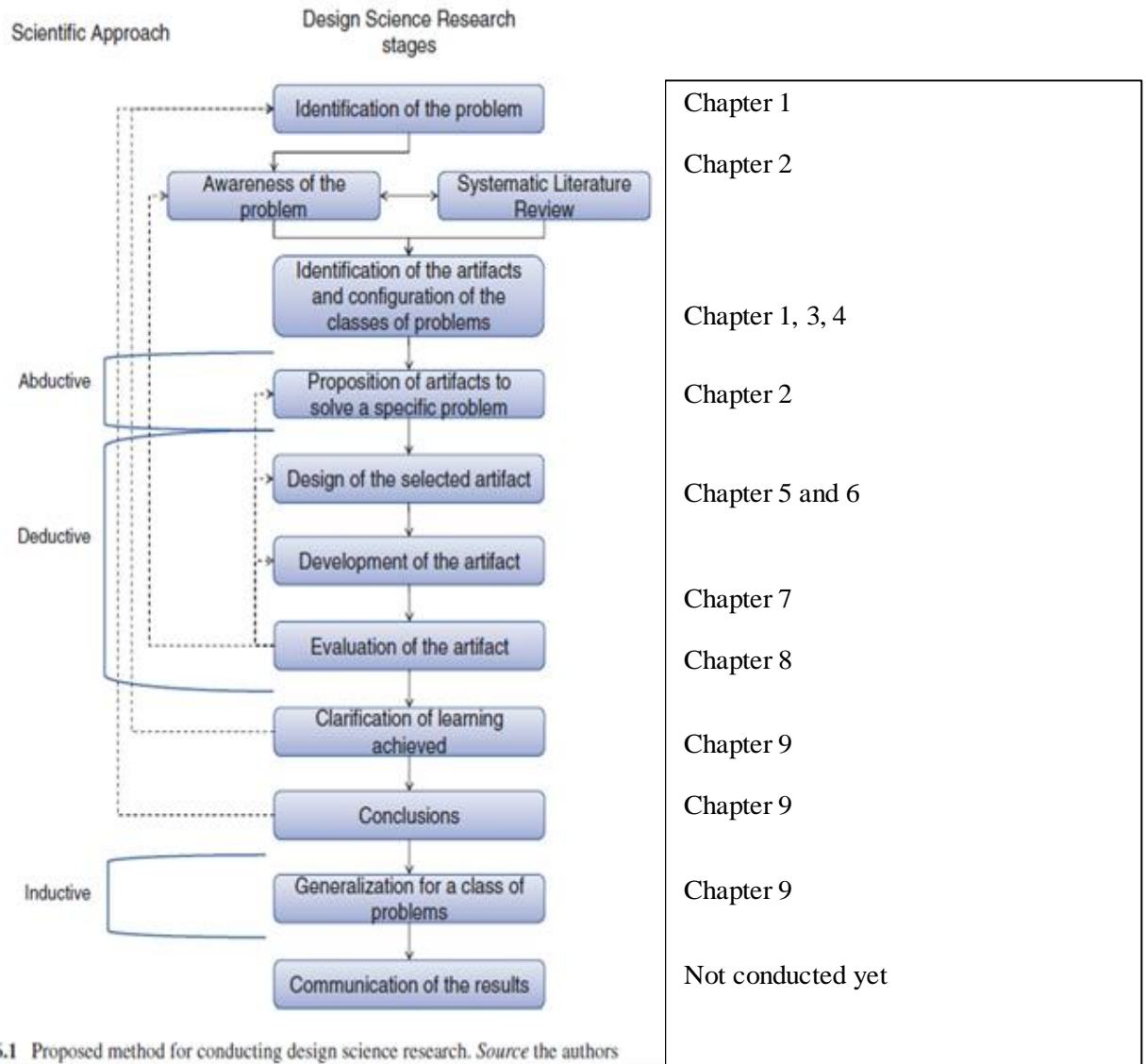
Chapter 4

The Class of Problems and Meta-Requirements

4.0 Introduction

This chapter explores in the DSR view IC technologies of control comparing them to guidelines of financial control, examines chosen financial role models, studies organizational coordination and distribution theory and identify logically possible organization theories of coordination and distribution applied to individual knowledge in and between companies in order to filter and identify the meta-requirements for the elements of design. This is because “The proposal should consist of evidence of the problem and characterization of the external environment and their points of interaction with the artifact to be developed by defining metrics and criteria for acceptance of the artifact, as well as clarification of the parties involved with the artifact to be developed and the classes of problems to which the artifact may be related (Manson 2006).” (Dresch et al., 2015, p. 83).

These efforts correspond with the below table’s framing of “Identification of the artifacts and configuration of the classes of problems”, “Identified artifacts (constructs, models, methods, instantiations or design propositions); structured and configured classes of problems”. “Design of the selected artifact” with the output “Design indicating the techniques and tools for artifact development and evaluation; detailed information on the artifact’s requirements” as outlined in the figure below is referred to the next chapters.

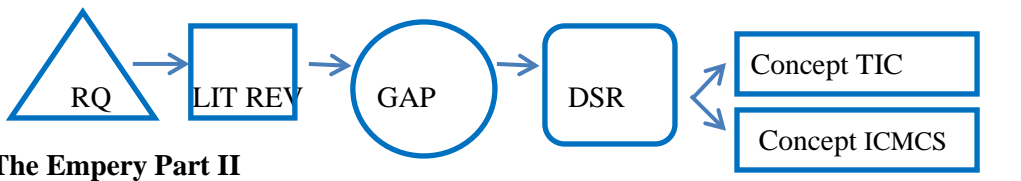


g. 6.1 Proposed method for conducting design science research. Source the authors

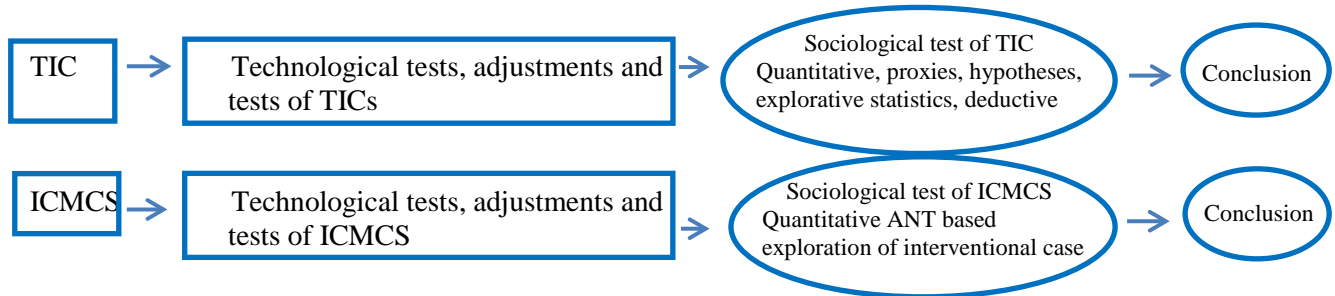
Figure 1 How the DSR stages correspond with the chapters in the thesis (Dresch et al., 2015, p. 119) and author

Graphically expressed an overview of the thesis is outlined like this clarifying how DSR organizes the roll out:

The conceptual Part I



The Empery Part II



The analytic and concluding Part III

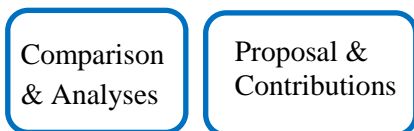


Figure 2 Graphic Representation of the Thesis, by author

The gap helps identifying the meta-requirements for the construction of solutions addressing the class of problems, Allocation of HC in operations, “meta-requirements describe the class of problems addressed in the research (Walls et al. 1992)” (Dresch et al., 2015).p 78

The following requirements for conceptualizing of the artefacts are deducted from the literature review as elements of design. Some of these elements are identified to be:

- a) Manageable objects, taking the IC research context to the individual level, because mean figures provide no interventional levels of management
- b) Apply of the notion of arte-fact based knowledge, which enables separations between the individual owner of knowledge and knowledge and allows for distinctions between knowledge and competence as manageable objects, because the processual, personal, situated notions does not provide options for knowledge to move or for the construction of devices of objective information about knowledge at a distance
- c) Objects, which are objective and independent of time and space, because the context has become unstructured and generic
- d) IC objects, which can be valued, measured and accounted for in logics of the financial accounting terminology to provide useful output

Having now an idea of which elements of design that may make sense in the conceptualizing efforts, an overview of how existing management technologies, MTs, solve the challenge, is outlined next.

4.1 Three Methods of Valuation of Knowledge in Intellectual Capital Management Technologies Compared to IASBs Guidelines for IC

The section explores why trust and usefulness does not get assigned to IC disclosures by financial markets (Andon et al., 2015; Fløstrand, 2006) in order to precise requirements to methods of valuation, accounting, and disclosures, when usefulness is the objective.

The financial paradigm and discourse constitute a global monopoly of the narrative of valuation (McCloskey, 1998), and the values in IC are currently predominantly embedded in and indirectly reported through financial control systems. The values of tangibles and intangibles are interrelated constructs in international guidelines for accounting, such as the IFRS. IC values are defined as “underlying intangible resources” in financial representations, as outlined in “International GAAP 2012: generally accepted accounting practice under international financial reporting standards,” which, in a global financial context, formulates guidelines about reporting (Ernst & Young, 2012) chapter 19. But the “underlying resources,” although labelled, are still invisible. Exploring knowledge as part of “the underlying resources” places this thesis as part of the problematization of the existing global value framing; that is, of financial accounting as unframed values, connecting it to the dominant valuing context and to the financial capital by considering the notion of underlying resources as part of the prerequisites for financial capital growth. If the optimal intellectual resources are allocated in daily operations in product development and innovation, then the assumption is that growth happens. The capitals being so narrowly connected in this view add arguments to the choice of IFRS as inspiration for the anticipated concept for the valuation of knowledge as an element of control supporting the broadly recognized view in knowledge economy (Stewart, 1997) and the conviction that knowledge is the most important resource for companies that is still unmanaged and consistently unreported as a value (Druckman, 2013).

Definitions in the guidelines (Ernst & Young, 2012) chapter 19:

- “Intangible asset” is defined as “an identifiable non-monetary asset without physical substance.”
- “An asset” is defined as “a resource controlled by an entity as a result of past events (a) and from which future economic benefits are expected to flow to the entity (b).”
- “Identifiable asset” is defined as “is separable, i.e. capable of being separated or divided from the entity and sold, transferred, licensed, rented or exchanged, either individually or together with a related contract, identifiable asset or liability, regardless of whether the entity intends to do so (a) or arises from contractual or other legal rights, regardless of

whether those rights are transferable or separable from the entity or from other rights and obligations (b).”

- “Control” is defined as “the power to obtain the future economic benefits flowing from the underlying resources and to restrict the asset the access of others to those benefits.” (ibid.)

Management can be defined as a craft that requires tools and skills according to pragmatic instrumental rationality. “Understanding management entails understanding the choice of things to be accomplished, as well as the tools and skills necessary to do so” (K. Kreiner & Mouritsen, 2003, p. 2). Knowledge is also defined as an intangible asset in the “underlying resources,” and KM as context, methods, and tools for “controlling” knowledge. Relations between the guidelines and existing MTs applying valuation of knowledge using the taxonomy above for N-F valuations are tabulated below in Figure 3 applying distinctions in N-F measurement methods (Andriessen, 2004b):

Three Methods of Valuation of Knowledge in IC MTs Compared to IASBs Guidelines for IC			
Methods (Andriessen, 2004b) IASB guidelines	N-F Method 1: “Value measurement method” Valuation criteria to observable phenomenon	N-F Method 2: “Value assessment method” Personal judgment by self- judgment and/or evaluator(s)	N-F Method 3: “Measurement method” No value criterion but metric scale related to observable phenomenon
Is it an asset? “A resource controlled by an entity as a result of past events (a) and from which future economic benefits are expected to flow to the entity”	No resources are valued and no control is exercised but interpretations of output from Q&A are analyzed	No resources are valued and no control is exercised but classifications and interpretations of output from surveys are analyzed	No financial figures are analyzed and interpreted in an intangible context to predict future conditions and possibilities
Relevance “Make a difference to the decisions of the user. Predictive value Confirmatory value”	Management is on the basis of the measurement able to enhance financial and inclusive value (MPherson, 2001)	The method enables the identification, audit, and benchmark of the key intellectual capital. (Marti, 2000)	The performance indicators are constructed to create predictive value (Edvinsson & Sullivan, 1996)
Faithful representation “- complete, neutral, free from error” - description of the nature of the asset - numerical depiction of the asset - description of what the numerical depiction represents”	No faithful representation. Translations based on a questionnaire to stakeholders, constructed depiction of multidimensional outputs	No faithful representation Elective method to the choice of “core.” Descriptions and numerical depictions are included in the method	Based on the choice of the analyzer completeness, neutrality is not assured. Descriptions and numerical depictions are incl. the method
Reliability “Information has the quality of reliability when it is free from (material) error and bias and can be depended upon by users to represent faithfully that which it either purports to represent or could reasonably be expected to	R depends on the choice of Q&As, the choice of population, the way of asking, and not repeatable uninformed processes	R seems weak based on no criteria and self-assessed interpretations	The reliability relies on the analyzer’s reliability and judgment

represent”			
<p>Comparability</p> <p>“- enables users to identify and understand similarities in, and differences among, items”</p>	<p>No comparability</p> <p>The multidimensional construction does not allow separation of items</p>	<p>Not for external reporting</p> <p>If the company uses similar items and classifications as situated, internal comparability in different periods of time could be obtained</p>	<p>The tendencies are difficult to compare varying the items and their compositions</p>
<p>Consistency</p> <p>“- use the same methods for the same items, either from period to period within a reporting entity or in a single period across entities”</p>	<p>No consistency</p> <p>As the collection of items measured differs over time and the stakeholders too, it weakens the possibility for consistency</p>	<p>Barely using self-assessments</p>	<p>No consistency as items changes</p>
<p>Verifiability</p> <p>“- different knowledgeable and independent observers could reach a consensus, not necessarily a complete agreement that a particular depiction is a faithful representation”</p>	<p>With situated information translated into figures the possibility for independent observers to agree turns weak</p>	<p>Verifiability cannot be established</p>	<p>Verifiability cannot be established</p>
<p>Timeliness</p> <p>“- information is available to decision makers in time to be capable of influencing their decisions”</p>	<p>With event-based processes not integrated in daily operations and needing analyzing and publishing with a frequency of 1–2 annual releases, timeliness is only met for special decisions</p>	<p>With event-based processes not integrated in daily operations and needing analyzing and publishing with a frequency of 1–2 annual releases, timeliness is only met for special decisions</p>	<p>Timeliness understood as an intuitive annual indication of the situated future</p>
<p>Understandability</p> <p>“- is classifying, characterizing, and presenting information clearly and concisely “</p>	<p>Information is clearly presented, but classifying items is not</p>	<p>Information is clearly presented, but classifying items is not</p>	<p>Easily understood, but no comparability</p>

Figure 3 Assessment of methods of non-financial valuation (Andriessen, 2004b) in light of the IASB guidelines, by the author.

The table, figure 3, demonstrates that valuation methods in existing Intellectual Capital Management Technologies, IC MTs, only meet few requirements in the GAAP framework. Aspects of control are barely taken into consideration; knowledge is not perceived as identifiable items, resources, or assets; knowledge is not an input as a detached measured object; the MTs do not control individual knowledge; and the output from KMTs does not provide managers with information that allows interventions independently of time and space.

In order to further explore “usefulness” the notion of “control” is examined below. To establish control over an intangible asset it is necessary to identify the asset, but how do various existing KMTs do that?

Control of Intangible Assets as Underlying Resources in Management Technologies				
<p>Underlying resources represented in various types of KMTs</p> <p>Characteristics</p> <p>Levels of managing knowledge</p>	<p>Control is defined in IASB as</p> <p>- “the power to obtain the future (interventions, prospectively) economic benefits flowing (dynamic, not static) from the underlying resource and to restrict the access of others to those benefits.”</p>	<p>The intangible asset, knowledge is defined in IASB as</p> <p>- “an identifiable non-monetary asset without physical substance”</p> <p>- “is separable, i.e. capable of being separated or divided from the entity and sold, transferred, licensed, rented or exchanged, either individually or together with a related contract, identifiable asset or liability, regardless of whether the entity intends to do so or arises from contractual or other legal rights, regardless of whether those rights are transferable or separable from the entity or from other rights and obligations”</p> <p>- “a resource controlled by an entity as a result of past events from which future economic benefits are expected to flow to the entity”</p>	<p>KMTs generating prevision</p>	<p>KMTs</p> <p>Dynamic process integration</p>
<p>Stocks</p> <p>Repositories</p> <p>Q&A</p> <p>Yellow pages</p>	<p>Listed unclassified, unvalued items with no power to create benefits</p> <p>Text based knowledge from underlying resources, effect from the</p>	<p>Stocks are not intangible assets because they cannot be identified as such and they are not valued</p>	<p>Few knowledge management technologies contain no forecasting features</p> <p>Mainly as indicators or tendencies (Edvinsson &</p>	<p>Pull functionalities, no automated integration to operations management</p>

	resources Not a system		Malone, 1997)	
Performance measurements Static retrospective accounts KPI's Indicators at individual, organizational and firm level	Retrospective, output from operations management Partial systems Translated into financial metrics Underlying resources are invisible, not manageable	Performance measurements are unidentified invisible intangible assets translated into economic metrics Performance managements as relative, partial, local, event-driven, aggregated metrics	Key performance indicators are often measured in financially constructed metrics or quantities	Sometimes integrated interfaces to operations management
MT example: BSc	A system providing business intelligence for management but underlying resources are black-boxed and not accessible	The intangible elements—learning and resources—in the BSc are not intangible assets, because they cannot be identified as such and they are not valued	Strategic BSc deals with the future and links operations management to strategy	Integrations to operations, but not for individual knowledge or intangible assets

Figure 4 KMTs and their application of knowledge as an individual asset, as an object of control and of prevision, by the author.

The table places different types of Knowledge Management Technologies, KMTs, in the financial framework of control and demonstrates their inability to visualize and control individual knowledge. None of the described methodologies uses a concept of knowledge in line with the guidelines in the IASB for intangible assets.

If a black-boxed knowledge construct as abundant resources (Penrose, 1995, pp. 66-86) is to be managed—identified, described, measured, developed, allocated, and controlled in operations—its elements have to be operated by individuals in coordinating processes. The “productive opportunities” (ibid.) can be described to require certain knowledge elements, certain underlying resources. Underlying resources can be matched to an identified demand for knowledge objects, and knowledge as an object may become predictable and distributed as an input, if measured and objectified. The example is given to concretize how operations ex ante may activate and manage the abundant resources. Therefore, the following section explores how a concept to measure knowledge objects enters into a paradigm of control, based on the IASB guidelines.

This subsection has evaluated KMTs against the guidelines concretizing weaknesses in existing KMTs as lack of auditability and external trust in IC information, clarifying both positive and negative consequences for operations and thereby also implicit potential elements of design for the further theorizing of ICA.

4.2 Knowledge as a Rationale of Control

In order to manage individual knowledge as valued objects and input, the underlying resources are perceived as a potential paradigm of control, which is “the power to obtain the future economic benefits flowing from the underlying resources and to restrict the access of others to those benefits”

“...This approach holds with the view that most knowledge tends to be tacit, context-specific and ever evolving as opposed to easily ‘codified’. The development, absorption, assimilation, (re-)combination, distribution, application and leveraging of knowledge to achieve the objectives of the organization are therefore seen here as predominantly people-based activities, requiring direct interaction between specialists. The management of such activities refers mainly to the ways in which organizations facilitate and guide or limit: (1) the development of certain kinds of knowledge and (2) the interactions between particular specialists enabling them to integrate knowledge for particular outcomes. These two elements, the knowledge itself and the mechanisms of interaction and integration, comprise the ‘knowledge base’ of the organization, which underpins the theoretical approach adopted here.”

(Collinson & Wilson, 2006, p. 1361)

The above quote identifies the knowledge base as knowledge (1) and individuals as media for knowledge (2) describing the phenomena constituting the objects of control. Measurement units may act as mediators between the qualitative properties in knowledge objects and the need for managerial decisions. When assets are individual knowledge, the need addresses what the person can do with the knowledge, he/she owns or searches for. Thus, the unit must—at the same time—be objective and personal, generic and local, and globally perceived in the same way. Therefore, knowledge and competence tend to be objectified and conceptually separated to enable separate translations into elements of control, inspired by the recommendations in the financial accounting discourse (Ernst & Young, 2012) and inspired by calls in IC research about how firms disclose IC in accordance with International Financial Reporting Standards Business Combinations (IFRS3) in financial statements (Brännström, Catasús, Giuliani, & Gröjer, 2009).

Knowledge objects and competence objects may appear as un-humanized value representations, but will be connected to individuals in operations. This understanding of knowledge reflects the rational, artifact-based view that makes distinctions between knowledge and competence possible and necessary, if knowledge—as an element of control (Brännström et al., 2009)—is to inform management about individual values in knowledge resources.

In order to precede, material role models for organizational coordination and distribution of assets are able to be examined to study, how they operate. These visible operations may frame non-financial epistemological elements and thereby identify and figure more requirements for relevant elements of design of models and artefacts for ICA. The next section therefore, studies Mintberg’s conceptualization and analyses of coordinating mechanisms in companies.

4.3 Organizational Role Models

In order to coordinate individual knowledge in HC methods of visualization and valuation are required. Theories have theorized the coordination of visible objects in order to build effective

organizations (Mintzberg, 1980; Mintzberg, 1993). Studies to identify design elements and possible operational conditions in materiality are conducted in this subsection to inspire the design of mechanisms to coordinate the still unframed, unstructured, invisible and unvalued individual knowledge in HC/IC. They tend to map the conditions and properties under which coordination happens in the material, economic framing of the world to identify possible theorizing of HC in intangibles.

It is the purpose of the chapter to identify conditions for operations in both capitals and formulate potential design elements able to conceptualize an instrumentalization of IC, so decisions can become knowledge-based in dispersed contexts.

The research context makes a distinction between “situation 1” to “situation 2”, from within (1) to between (2) firms, because situation 1 having strategic directions, an organization and situation variables, influencing the organizational configuration and its mechanisms of coordination; Situation 2, on the contrary, has none of the kind. Situation 2 represents the unstructured context between firms. Potential relations between two contexts are explored next in order to clarify the research focus.

The influential theorist Mintzberg (Mintzberg, 1980; Mintzberg, 1993) is reviewed for his conceptualization and analyses of coordinating mechanisms in companies. His five mechanisms of coordination are explored to explicate in both situations why some mechanisms work and some don't, underlining at the same time important conditioning differences in the 2 contexts. Literature about calculative devices is brought on, because it investigates coordination and distribution of values in un-structured contexts (Miller, 2001). The properties of calculative devices appear objective and independent of time and space between companies, but research shows that the devices as value representations in managerial contexts within companies become interpretable for instance in the sense that metrics denouncing investments may change to costs, not due to the devices, but to social elements in the techno/social interface. The design elements are distilled, not only for the conceptualization of IC devices, but also to pay regard to the design of properties of distribution mechanisms in future ICA systems.

For relations between system and device to be consistent design elements conditioning auditable accounting output in order to gain trust between firms and transporting the truth within the firms, literature about accounting in IFSR, IC guidelines and IC disclosures have been preliminarily studied (Ernst & Young, 2012; Fløstrand, 2006).

Finally, as an important element of design, “costs” in financial calculations, is considered an impossible notion in the non-financial paradigm, but it is at the same time conditioning calculability. So the connectivity in the socio/technical construction becomes critical: if managers do not operate the accounting system, then the system does not provide the output for HC/IC to be managed upon and it breaks down. Then there is no calculating selves (Miller, 2001) and no mechanisms of coordination to be distributed. The study of design elements therefore entails substitutional elements for “costs” (measurement units (Andriessen, 2004b)) and the effects of “costs” and the understanding of their connectivity is studied in social theory

about boundary objects¹⁰ and connectivity (M. Callon, 1991; Star & Griesemer, 1989). In the entrepreneurial lenses of DRS the coordinating device has to “work” in both stock and flow representations to keep the accounting network together and to be useful for decision making during allocation of IC resources and other knowledge based decisions.

Firstly, Mintzberg has ranged coordinating mechanisms as elements of design in 5 groups (Mintzberg, 1980) inside the firm (situation 1);

- 1 Direct supervision, nearest manager exerts control over the employee(s).*
- 2 Standardization of work processes, the work is coordinated by standards, work orders, rules and regulations*
- 3 Standardized outputs, coordination is imposed through standard performance measures and outputs of the work.*
- 4 Standardization of skills, coordination through individual standard skills and knowledge related to jobs*
- 5 Individual communications coordinates work* (Mintzberg, 1980, p. 324)

In these groups the following design parameters coordinate labor: Job specialization, specialized jobs in both horizontal and vertical senses, behavior formalization to standardize work processes, rules, procedures, policy manuals, job descriptions, work instructions, and finally training and indoctrination standardizing skills and knowledge through extensive educational programs.

On top of these basic design elements the design of the main structure is ranged in unit grouping as a design parameter serving direct supervision to be effective, clustering positions into units and units into bigger units aligning to the strategy. The various design variable for groupings - by skill, knowledge, work process, business function, product, service client, location - can be consolidated into two basic ones: by function and by the relevant markets, as put by Mintzberg.

Unit sizes, the span of control, comprise the number of positions grouped into a single unit.

Two design parameters are furthermore related to the lateral linkage of the main structure: planning and control systems constitute the design elements required to generate output, often as forward looking (budgets) or backward looking accounts (Mintzberg, 1980). Although the reference is almost 40 years old the take seems to be generic and Mintzberg is still taught in universities to day.

These mechanisms of coordination are presented as valid within companies. The majority, design mechanisms no. 2, 3 and 4 are only related to coordination within companies representing various groupings and standardizations of knowledge. However, constituting

¹⁰ The contingent character in representations like boundary objects has been problematized and concluded:” It may well be that a debate between STS and OMS about the meaning of an ‘effective’ boundary object would provide a useful starting point” underlining the contrary terms in OMS and STS. The similar theme is dealt with in the construction of The Intangible Currency and the ICA system as representations of flow and stock. Finally literature about knowledge and KM is explored to identify design elements that condition the transfer of individually based knowledge to devices able to work in both contexts.

elements for recognition of knowledge found within companies are not to be found between firms (Augier et al., 2001). The mechanisms of coordination no 2, 3, 4 are therefore not valid between firms. This difference is explored to identify potential implications for the coordination of knowledge between companies.

The contextual global approach (2) challenges design elements like - “Standardization of skills, coordination through individual standard skills and knowledge” – and “Specialized jobs in both horizontal and vertical senses”(Mintzberg, 1980, p. 324) - by asking which boundaries then define standardization and skills, because company specific notions are not part of this context. Jobs and positions are found within companies, not between them, but appropriate knowledge to fill vacancies is searched for between firms in processes of recruitment, in network collaboration and in many other processes. Standardization as design parameter makes sense in contexts of strategic orientation, but standards of skills related to job descriptions also produce constraints by preventing the company from developing a market driven agility needed to compete (Collinson & Wilson, 2006; Gourlay, 2006; Hong, 2012) or situational variables require recurrent adjustment and redesign of job descriptions and positions, briefly concurrent reconstructions of the organizational architecture (McGrath, 2013; Mintzberg, 1980). Design elements as jobs, positions, specialized jobs, horizontal and vertical orientations in organizations, standardizations etc. make sense within organizations, not between them. Furthermore, the advantages of the mechanism of job descriptions as coordinating factor adding value is questioned in contexts of volatile situation variables (Lindgren et al., 2004).

Between companies Mintzberg indirectly describes an exchange of intellectual capital as “liaison devices” in a continuum from liaison positions to joint units, from individuals to organizations as media of exchange – incorporated physically by sole individuals or in organized groups as business units (Mintzberg, 1980, p. 326). When co-presence and proximity conditions an impermeability that is lost in the distances of an unstructured context, then the boundaries between the units creates requirements for technology connecting them adding a demand for identically formed devices able to transcend the boundaries with unchanged information about knowledge. The medium for transport of knowledge changes from individuals to web-based structures of technology. Identical properties in the format of exchange are required for skills and knowledge to be distributed and coordinated in and between units due to the semi-permeability. Thereby mechanisms based on contextual conditions as co-presence, strategic orientation, rules, and standards, briefly group 2, 3 and 4 in Mintzberg’s coordination mechanisms are excluded, because generic concepts escape the time and space oriented elements found in strategic orientations and job descriptions. For the identification of design elements informing about knowledge the context of situation 1 is contained in situation 2. If the elements satisfy requirements in situation 2, they satisfy situation 1 – not the opposite. Situation 2 will therefore constitute the focus for the design of transcending devices.

Secondly, the coordination aspect of HC/IC requires visibility and calculability for IC assets to be efficiently managed, transcending boundaries as “liaison devices” in processes like recruitment, open innovation and alignments in and between units. Shared control and

accounting systems in dispersed companies in global spans condition the elements of design to visualize and frame knowledge in boundary transcending digital formats.

By problematizing the transaction costs in relation to transport and coordination of the specialized knowledge, which in theories of performance management is described as expensive to act upon (A. Hansen, 2009/2010; Lazear & Gibbs, 2014; Ryan & Deci, 2000), control of individual knowledge at a distance gains financial importance in global contexts – in addition to faults and failures as mentioned in the Introduction.

So, summed up, knowledge regarded as assets requires easy and fast accessibility, process speed, and flawless communication about the specific values of knowledge to be communicated unaffected by local cultural values and schemes of cognition from every point in the global context in order to serve as generic resources, as defined independently from corporate contexts. This describes some conditions for design of calculative devices in the unstructured context in situation 2.

In the theorizing of the company-centered perspective (1) knowledge and individuals constitute for Mintzberg one integrated object, which is an individual to be managed. Knowledge is contained within the individual as skills in the coordinating processes. Knowledge and individual are inseparable; they are the same in this theorizing.

Turning against knowledge management literature, the view aligns with the notion of knowledge in most literature about KM, where knowledge is personal and subjective (Konno & Nonaka, 1998; Nonaka, 1994; Nonaka et al., 2008).

However, in the global technology-based contexts (2), the notion of subjective knowledge in KM hardly makes sense, because knowledge being interpreted and local is unrecognizable separated from its media and location (Augier et al., 2001). Tacit knowledge being important to operations (J. S. Brown & Duguid, 1998; Duguid, 2005; K. Kreiner, 2002; K. Kreiner & Mouritsen, 2003; K. Kreiner & Mouritsen, 2003; Polanyi, 1974) cannot be shared due to time and space dependency and making sense of tacit knowledge require co-presence. Specialists are travelling the world, which is expensive and takes time. So the ontological take on the notion of knowledge in KM literature does not align with the contextual conditions for the design of calculative devices.

Thirdly, the notion of permeability between the two research contexts (1, 2) implicates identical design requirements for the flow of devices visualizing and valuing individual knowledge in and between companies, as it is the case for calculative devices about other resources. Financial currencies report the values of materiality between firms in unaffected measurement units, which output is interpreted and customized within firms (McCloskey, 1998). But the measurement unit it-self, the financial representation and the methodology of translations of the world into currencies constituted of calculative devices (Miller, 2001) seems so far to remain legitimate, though its way to function, its boundaries and rhetoric's are questioned (Lazear & Gibbs, 2014; McCloskey, 2005; Winston & Teichgraeber, 2005).

Conditions framing mechanisms of coordination in the financial paradigm are envisaged to create identical design requirements for the mechanisms of coordination in the intellectual paradigm when distributing the objects' qualities and quantities: valuing elements as prices represented in currencies function in and between firms, they function in unstructured contexts and they function in structured and unstructured contexts in and between firms as calculating devices (Miller, 2001), they transcend boundaries and represent the world in financial systems of control and accounting.

Fourthly, systems of control to connect units and provide managerial output have been listed as elements of coordination within firms (Mintzberg, 1980). The principles supporting control systems are understood here in financial accounting logics and explored for their elements of design in order to explore and potentially transfer conditions of accounting across boundaries into the non-financial paradigm.

Individual knowledge is owned by human actors, whereas knowledge as a phenomenon is embedded and co-created in the (social) world (Popper, 1972). Knowledge survives its owners. Separated from its owners in the company-centered view objects of knowledge are thus found stabilized for some time and place and are able to constitute stocks of objects of classified knowledge. In the unique moment in operations, where decisions of allocations are made concretizing the match between knowledge objects in stocks and individuals, the ostensive situation changes into performativity, because individuals use competences to activate their knowledge (the chosen, allocated knowledge) when working with tasks in companies. They create and use knowledge through their competences in flows when working. Competences are personal and activated by the owners. Competences do not survive the owners. The manager's decisions may match the tasks' demand for resources and the available supply of individual knowledge and competences. This match conditions the relations between stock and flow representations and between the managers' decisions and the effect and efficiency producing outcomes motivated by variables of knowledge and competences located in and between firms. The accounting system may document individual managers' allocative capabilities placing their responsibility in the automated reported transparency and control. Thereby tending systematically to link technologically traced HC decisions to the outcome the model tries to align to calls for accountancy consistency in disclosures (Andon et al., 2015; Fløstrand, 2006; K. Kreiner & Mouritsen, 2003; Miller, 2001; Zambon & Marzo, 2007)

The task is to identify design elements to map knowledge and competences in these variables independently of locations, cultures and other situated time and space dependent elements, establish connectivity and logics between the value representations in HC flows and HC stocks and in financial accounting logics make the concept useful not only internally but also to financial markets (Andon et al., 2015; Fløstrand, 2006).

These four entrances: Mintzberg's notion of "liaison devices"(1), technology-based visible and calculable objects (2), permeability between context 1(firms) and 2(markets) (3) and objective objects able to represent stocks and flows (situated) (4) reflecting on design conditions for devices to representing knowledge assets in operations influence the conceptualization of ICA.

4.4 Identification of Operative Conditions for Calculating Devices

As previously referred, the study of operations in the material world is conducted to serve as role model and inspiration in order to conceptualize elements to coordinate individual knowledge in IC. The outcome of this subsection is therefore inspirational elements of design for the concepts of an IC measurement unit and an ICA system.

The conceptualization of systems of IC control conditions the visualization and valuing of the assets and vice-versa, because its managerial support through output of accounting has to be relevant and reliable for the management of the assets.

The table “Logically Possible Organization Theories of Coordination and Distribution applied to Individual Knowledge in and between Companies”, Annex 1.2, is arranged in three groups synthesizing possible design elements for coordination and distribution of assets in the two contexts, 1 and 2.

Operability in IC is understood as relevant coordination and distribution mechanisms for management to add value to companies through management of HC in IC. Mechanisms of coordination are logically not applicable without objects and organizations. In spite of this, the constructs of “direct supervision”, “liaisons” and “control systems” between companies in Mintzberg’s theory are lined up, because the coordinating mechanisms may define design elements in research context 1 and between 1 and 2. These design elements will further serve as input to the objectification of knowledge.

The three groups are detailed as follows:

- 1) Mintzberg’s coordination mechanisms in operations; the boundaries between contexts 1-2 are semi-permeable in the “liaisons” processes conditioning the design of mechanisms to unaffected transcend the boundaries
- 2) The socio/technical transport of individual knowledge from humans (Human capital) to non-humans (Structural Capital) and back again inspire the design elements
- 3) The claim for accountability and auditability conditioning design elements in logics of accounting and connectivity- input/output- relations, stock/flow, and decisions/knowledge motivation (output from decisions of coordination and distribution connecting entities and enabling/ documenting causal effects between decisions and outcome).

The objective of the table, Annex 1.2, is to identify possible role elements and role conditions for the design of concepts for management of HC in IC in and between firms. Elements, which

a) are manageable, thus taking the organizationally based IC research context to the individual level

b) are objects of arte-fact based knowledge, which enables the separations between the individual owner of knowledge and knowledge and allows for distinctions between knowledge and competence

c) are objective and independent of time and space

d) are valuable, measurable and accountable in the non-financial paradigm, but still subject to logics of financial accounting

to enable processes of management, i.e. decisions about coordination and distribution of IC resources in remote operations.

In the table's group 1, the global context, the possible elements conditioning IC mechanisms of coordination and distribution in dispersed contexts was reduced to one mechanism of coordination, the "individual communication" (element no 5) (at a distance). The mechanism conditions and requires shared non-financial elements for comparisons across boundaries of supply and demand for HC in identical formats to be comparable. Furthermore coordination requires "systems of control" (Mintzberg's element no 7) distributing digital formats able to visualize and value individual knowledge in and between firms.

In group 1, moreover, reviewing possible elements conditioning IC mechanisms of coordination in the company context, for the coordinating mechanism "direct supervision" (element no1) to happen remotely in dispersed firms, comparable outputs from processes applying, matching, developing and using individual knowledge has to be accessible and therefore distributed. For the coordinating mechanism "Standardization of work" (element no2) to happen standardization is represented in non-financial terms. Mintzberg's coordination mechanism, "jobs" (element no6) is as a coordinating factor more doubtful, because the complex representation of knowledge and competence in packages in job descriptions restrains coordination and distribution of individual knowledge. Agility and innovation is thereby hampered, because individual knowledge is hidden in job descriptions and not accessible across structures and processes. Communication devices have in accessible digital formats explicitly to articulate the values required for the objects in an overview of knowledge objects.

Systems of accounting (element no7) are relevant as coordination and distribution mechanisms in the context when digital formats able to visualize and value objects of individual knowledge in and between firms have been designed and made accessible in a structure transferred to web technology enabling this distribution between units.

So, under the found conditions, organizational theory offers three possible elements of design for coordination of HC in IC, coordination mechanisms no1, no 5 and no 7 in the table, Annex 1.2.

In table's group 2 reviewing possible design elements to visualize and value IC objects in mechanisms of distribution in the global context (2) an open system approach is induced which means that knowledge variables outside the firm may influence the design of structure (J. S. Brown & Duguid, 1998; Donaldson, 1997).

The conditions for the mechanisms conditioning the elements of transfer of IC to technology for liaisons between entities to happen have global spans. Accounts of knowledge ex ante for the liaisons to be exchangeable between contexts 1 and 2 are ostensive without the existence of shared practices, communities and know how. Liaisons consist of individuals or groups of individuals determining the individual level of conceptualization. Both explicit and tacit knowledge resides in individuals. The global span conditions the elements of visualization of individual knowledge as objective objects. The ontological subjective view of knowledge (Nonaka et al., 2008) prevents knowledge from being recognized in unstructured contexts at a

distance (Augier et al., 2001). The subjective view of knowledge is inapplicable in conceptualized context, because patterns of recognition differ between the conditions of visualization and valuation of knowledge objects in the dispersed supply and demand situations. Therefore, knowledge to be recognized and shared in generic secure, precise processes of exchange may rather be represented in objective objects.

Relative measurements (A. Hansen, 2009/2010) for values of knowledge are as a principle of design impossible in context 2 having no comparative operative entities.

Absolute measurements understood as a format without situation variables is viewed as a viable element of design (A. Hansen, 2009/2010). For mechanisms of liaisons designed as IC devices to add value in operations they are required to transcend the boundaries between context 1 and 2 with the properties of boundary objects (Star & Griesemer, 1989). This identifies yet another element of design: The measurement method has to produce value representation including no criterion for values, only metrical scales that relate to observable phenomena.

The unstructured context has no business models, but offers technological spaces and accesses (The Internet) for supply and demand of individual knowledge which in the socio/technical interface between dispersed individuals (supply) and the demand entities (organizations) may inform about the type and the value of knowledge and competence in a market-like way. This happens in devices able to enter contexts 1 as calculative devices in systems of control.

Design elements therefore are conditioned by the coordination mechanism no 5 as well as technological formats in systems of control.

In context (1) the context is company-centered but the view is inapplicable, because situation variables from indispensable (recruitment, collaboration) individual knowledge objects permeate the context.

Devices of coordination connecting the contexts have to work in both contexts. Visualized knowledge devices flow from one context to the other denominating ex ante /ex post the values of the knowledge exchange which will or has happened.

Representations of knowledge designed for context 2 is applicable in context 1, because context 1 is part quantity of context 2. For coordination mechanisms as liaisons IC devices may add value in operations when transcending the boundaries between the contexts 1 and 2 as boundary objects.

“Boundary objects are objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual site use. These objects may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting social worlds.” (Star & Griesemer, 1989)

The measurement method therefore includes no criterion for values, but produces only metrical scales that relate to observable phenomena independently of time and space, i.e. location and use.

For systems to be operated and create output the elements conditioning calculative devices which represent the nature and the value of individual knowledge at a distance must bring more value to the decision making in operations than the effort to operate the devices represents (O'Grady, Morlidge, & Rouse, 2013).

In the table's group 3, in the global context (2), design elements in the coordinating mechanism no 7 "control systems" condition the design of objects as calculating devices in systems of accounting. In the unstructured contexts calculating selves may connect to visible IC devices in self-interest, if decisions and acting within the paradigm bring them benefits. Conditions for calculations to happen are individuals having access to:

1. a list of the possible states of the world
2. a possibility to rank these states of the world
3. a possibility to identify and describe actions that allow for the production of each of the possible states of the world
4. possibilities to compare costs

This list of requirements conditioning calculations from the economic paradigm is viewed through non-financial IC lenses understood as:

Ad1) Non-financial ostensive stocks providing overviews over classifications of explicit and tacit knowledge available in the context and relevant as comparable disclosures from individuals and companies documenting the capital (CV's and annual reports).

Ad2) Out-put comparability is ordered as an element in design of system of accounting.

Ad3) Consistency (Fløstrand, 2006) is required between the documented output of HC values in operations. Accounting as methods of value reporting of balances and decisions about the movements of individual knowledge and competence may construct the IC value representation of flows/stocks in companies.

Ad4) For the socio/technical interface in unstructured contexts managers/individuals act in self-interest when connecting to calculating devices. Design elements substituting "Costs" therefore are required, because the notions of pricing and costs are economic constructs not included in the research context.

These properties have to satisfy the requirements 1-4 above for the concept to work. In the company-centered context (1) devices connecting calculating selves in practices of management of IC like processes of allocation, accounting may have properties as calculating devices (Miller, 2001). Calculative devices may ex ante mediate distinguished processes as liaisons, recruitment and retention transcending the boundaries of contexts 1-2 coordinating the

capital. As possible elements of design operations' inputs and outputs configured by calculating IC devices will respect financial accounting logics designed to create rooms for mundane routines. Measured outcome from ICA is envisaged to motivate operational decisions and link managerial decisions and decision makers to traceable actions of (added) HC values in operations, which could be digitalized in comparable digits. Managers' talent to add value through coordination and distribution of IC may then become measurable. Traceable decisions in logics of accounting based on digital footprints may document operations as representation of IC values in flows and stocks.

Design elements for the socio/technical interface to connect to individuals will then rest on the individual drivers of self-interest, the properties in the calculating devices and the mundane routines and practices of IC management accounting.

Under the established premises the output from the above table proposes design elements that condition mechanisms able to visualize and value IC objects in order to take knowledge-based decisions in dispersed operations.

It shows why the widespread, prevailing knowledge ontology in the stream of KM literature is inapplicable for management of individually based knowledge in generic contexts. The subjective view of knowledge intermingled with competence (Nonaka et al., 2008) prevents knowledge from being recognized and trusted in unstructured contexts at a distance (Augier et al., 2001) which is conditioning control in the contexts. By submitting the conceptualization of knowledge to the properties of calculating devices its coordinating effect of mediations between the contexts (1-2) and between stocks and flows are furthermore assumed to happen. The output in this concept does not rest on subjectively chosen indicators or on the result of extrapolated backward looking surveys as in some scorecards' approach measuring important interpreted indicators of strategy (Johnson, 1999), but on happened, individually IC motivated actions (clicks) decided during operations in routines coordinating the represented HC values in capital.

By accepting the premise that values and denominations of knowledge should be represented in both ostensive stocks and performative flows to satisfy accounting conditions found in and between companies, this also entails the premise that knowledge is dynamic over time (Kianto, Ritala, Spender, & Vanhala, 2014). Leaning against the mechanisms of coordination and distribution found in the material paradigm and identifying the design elements consistent with the immaterial contexts, the founding theoretical premise of IC calculations is adapted by providing conditions for the calculating self in terms of choices and standards satisfying the economic guidelines, conditions and logics of accounting and auditing.

Following this logic, when designing methods to objectify and value individual knowledge, IFRS is consulted. The standardizing guidelines describe and define an asset as "A resource controlled by an entity as a result of past events (a) and from which future economic benefits are expected to flow to the entity". Applied into immateriality this guideline could say: "A resource controlled by an entity represented as valued objects of knowledge and competence chosen by a manager as a result of educational and experience-based decisions and from which

future economic benefits are expected to flow through its application to the work processes in the entity”.

This is considered as relevant, because the kind and value of knowledge and the kind and value of competence “Make a difference to the decisions of the user”. It has “predictive value “, “confirmatory value” and “faithful representation” as – “complete, neutral and free from error”, because the calculative devices will be designed as objects which are objective (not subjective) denominated in generic classifications and neutrally valued as results of levels of educations or length of employment/ length of positions at the labor market, chapter 5. Neither interpretations nor estimations based on values will be part of the process transferring the values of individual knowledge and competence from the human to the structural capital.

It includes “a description of the nature of the asset, a numerical depiction of the asset, a description of what the numerical depiction represents”. According to IFRS it is reliable when : “Information has the quality of reliability when it is free from (material) error and bias and can be depended upon by users to represent faithfully that which it either purports to represent or could reasonably be expected to represent”. “Comparability” is when the representation “enable users to identify and understand similarities in, and differences among, items”, “consistence” is when “use the same methods for the same items, either from period to period within a reporting entity or in a single period across entities”. The representation is “verifiable” when “different knowledgeable and independent observers could reach a consensus, not necessarily a complete agreement that a particular depiction is a faithful representation” and finally, according to IFRS it is “timely” when “information is available to decision makers in time to be capable of influencing their decisions”. Furthermore it is “understandable”, when “classifying, characterizing, and presenting information happens clearly and concisely “(Ernst & Young, 2012).

These conditioning elements from IFRS frame elements of design in the concept of IC, because strong critical voices claim that disclosures and statements in the IC domain lack understandability, reliability and auditability preventing the financial markets to act and collaborate on non-financial disclosures. Comparability in IC disclosures would be desirable. None or few calculating regimes with consistency between decisions in IC operations and value representations in accounting understood as stocks and balances showing movements in the underlying resources are provided (Fløstrand, 2006) within or between units, to my knowledge. The principles of consistency are requirements for causality between the managerial decisions and the value adding effects and they lack transparency and understandability (Andon et al., 2015).

On this node about comparability and auditability, the mechanisms of coordination and distribution in the material paradigm of operations is left in favor of a comparison between the two valuing paradigms, the existing economic paradigm and the conceptualizing thoughts about possible methods of valuing in the non-financial paradigm represented by IC.

4.5 Comparing valuing paradigms

The main characteristics in the development of the theorizing of IC have been briefly touched upon in the introduction of the thesis and the literature review. They are further explored next applying an operational view. The focus is on key variables, conditions and boundaries in the contexts. Existing key-concepts are grouped in the light of the RQ to logically approach an understanding of the state of the art. Next and finally the discrepancies between the provided understanding of the state of art and what managers need to know to be able to take remote knowledge-based decisions in allocative processes is clarified as opportunities for contributions. In order to identify the contextual cutting edges in existing IC literature, some examples of KM literature are included in the comparison, because the two streams of literature have issues of knowledge in common.

The focus of theorizing in IC has changed during the last 50 years as ordered in the previously mentioned three waves entailing interest for dynamic perspectives in the capital, but also problematizing boundaries and relations between the elements. From focusing on categorizing, classifying and labelling elements and gaining areas of shared understanding, the domain is developing from an ostensive contingency oriented understanding of stocks, statements and disclosures toward the addition of a performative view questioning how these statements came about. The context for this explorative research is mainly situated and company-based studying the past (Dumay & Garanina, 2013; Dumay, 2013; Guthrie et al., 2012; J. Mouritsen et al., 2002; J. Mouritsen, 2006).

The management accounting field is founded on the financial paradigm: “The contingency approach to management accounting is based on the premise that there is no universally appropriate accounting system which applies equally to all organizations in all circumstances” (Otley, 1980, p. 413). The applications of systems are customized and researched in their situatedness, but most systems use identical financial methods to translate the world into digits (Klamer & McCloskey, 1992; McCloskey, 1998). Economic thinking has over time developed measurement units in exchangeable currencies applied in financial systems of control and in accounting systems. The valuing method does not change, but the interpretation of what the value representations represent may change (Hopwood, 1973; Hopwood, 1983). Otley seems to reconsider this situated attitude to research in management accounting by admitting some features to be generalizable, and urge to use “inappropriate theories” and to encourage: “... need to concentrate more on understanding the dynamics of these processes, rather than hoping for a level of substantive knowledge that will remain valid over time”(Otley, 2003, p. 325).

To make sense in global contexts of HC decision making both the problems of recognition (Augier et al., 2001) and the problems of culture driven coloring of the interpretations and sense-makings (Hofstede, Hofstede, & Minkov, 2010) require methods translating the world into digits representing objective objects. Overviews, comparisons and choices of knowledge and competences preparing the decisions at a distance seem to require un-situated measurement units and objective value representations in stocks. An HC/IC accounting system is viewed as part of the mechanisms of coordination of assets and presumably subject to the same findings; that some elements are generalizable in the situatedness. Otley’s example was that “things have

to get measured to get done” (Otley, 2003). Jan Mouritsen problematizes management of IC assets in this way:

“Assets produce effects in action, but this is quite often unsatisfactory to managers because if everything is connected to everything, there are very few levers of intervention. Therefore, to gain oversight, measurement is needed which can help identify elements or objects around which intervention can happen. This procedure puts assets on hold; the measurement is therefore always un-realistic. The irony is that in order to understand interconnected, complementary activities, part of this complementarity has to be removed and substituted by separation. To gain oversight, the process to be made visible will die a little bit.” (J. Mouritsen, 2009, p. 157)

The paragraph outlines problems between overviews and operations when identifying design elements for visualization and valuing of knowledge, because classifications serve the creation of overviews and “put assets on hold” in the moment of registration, as the way financial methods of translation of values do, too. Relations between stock and flow are realistically drawn forward by freezing the stock in ostensivity and arguing that measurements always will be un-realistic. But when the flow is visualized and valued and operations applying these assets effect new updated representations of stocks, then the measures may not always be un-realistic, but performative until updates restoring the new picture of stocks happen. Intentions are to find ways to make it possible to audit the relations between the performative and ostensive form of accountable knowledge, when the lever of intervention is viewed as the coordination and distribution of individual HC/IC in processes of operations.

The elements of design visualizing and valuing the measurement unit address distances in operations between companies, time and processes, while the same design addresses the accounting issue of budgets and accounts and thus the relation between stock and flow within companies.

Meta-requirements in the two Contexts		
	Context 2 - Between Firms	Context 1 – Within Firms
	Un-situated Coordination and distribution	Situated in operations
IC Measurement unit	Classifications of objective measures of knowledge and competence in calculative devices	Calculative devices connect to concrete individuals and are managed
IC Accounting system	Accounts of Stocks represented in calculative devices	IC value output inform management of IC, influencing decisions of coordination of IC
ICA audits	Disclosures are expressed in digits as the output from operations and they are interfirm comparable	IFRS guidelines inform the design of ICA linking managerial efforts to the outcome in an auditable system

Figure 5 Contexts of Accounting by author

The table describes the relations between mechanisms of accounting in the two contexts 1 and 2 and shows the conceptualized shared presence of the calculative device in both contexts. But it is also shown how the devices change roles in the realistic discourse as stocks and in the constructive discourse as flows. This complexity has been outlined in the organizational coordinating mechanisms (Mintzberg, 1993).

Values in the material paradigm are represented in financial digits, which within companies are made visible in financial systems of accounting. In companies these visualized values form and frame the conditions on which management is exerted. They inform economically based decisions about coordination and distribution. Between companies the financial digits form markets. They are described as calculative devices (M. Callon & Muniesa, 2005; Miller, 2001) and they (managers) operate the visualized economic capital.

Supported by this general line-up of two paradigms of valuation the next subsection concretizes the detailed outcome from the concept-centered literature review.

4.6 Knowledge Outcome from Literature Review and Comparison of Mechanisms of Coordination

The IC review provided overview of the development of the field and identified for potential future contributions inadequate theoretical notions in existing literature. These notions and requirements will be collected in this section as well as the identified potential elements of design from the theory of organization design (Mintzberg, 1980; Mintzberg, 1993) in order to line up future potential elements in the theorizing of knowledge and the design of ICA artefacts. Archeology in IC literature unfolded logically developed stages by firstly describing invisible assumed values in operations, by secondly building an understanding through categorizing, classifying and coding of elements in different framings of operational processes and thirdly by creating consensus about the field's scientific importance and now approaching a stage, where concretization, standards and causality are explored (Dumay & Garanina, 2013; Dumay, 2013; Guthrie, 2001; Guthrie et al., 2012; Petty & Guthrie, 2000).

The concept-centric review focused on notions and constructs in IC literature which addresses IC elements of stocks and flows in order to operate the capital. The focus entailed an exploration of ontological and epistemological considerations in the field, which are outlined and concluded in the table below.

The following arguments made by Jan Mouritsen that

“...measurement requires assets to be on hold and in this capacity they do not perform their functions (1) and (...) that elements of intellectual capital do not each have one inherent logic that explains the entities that are captured by them (2)” (J. Mouritsen, 2009, p. 161)

seem indirectly to address the discussion of stocks and flows arguing that measurements will freeze assets in ostensivity (stocks) preventing them from performing in flows (1) and that the IC elements have no consistency 10F¹¹.

¹¹ “The consistency of measurement techniques: the quality of achieving a level of performance which does not vary greatly in quality over time”. Oxford Dictionary of English

This example is drawn forward as an exemplary argument with the intension of opposing it: It is generally recognized that some matches between individual knowledge and tasks are more satisfying than others, so the individual level of analysis seems to separate and point out HC/IC elements with “the inherent logic”; some matches will represent a more satisfying exploitation of HC than others. To take the analyses from the organizational level to the individual level seems to provide methodological sense; consequently the level of measurements and value representations will follow as well.

Conceptually, the development of IC measurements containing some inherent logics of individual knowledge and the development of representations of knowledge in an accounting logic that enables dynamic oscillations between ostensive and performative states of knowledge explaining and documenting the operational processes may then result in outcomes visible in both ostensive and performative expressions and situations.

If the debate is to be moved forward, another understanding of stocks and flows needs to be developed.

The theoretical attitude claiming that measurements will freeze assets in ostensivity (stocks) and prevent them from performing in flows (1) and that the IC elements have no consistency (2), is challenged by the above mentioned axiom, because some knowledge is better exploitable than other knowledge (2) and this knowledge, when owned and activated by individuals is researchable, allocable and therefore able to perform in flows (1).

The inherent logics of future, conceptualized sub elements of HC operated as elements in ICA through figure-based measurement units may then organize IC/HC effects in operations:

In 1) some “Assets on hold” represented in stocks designed to be comparable, eligible and available are more satisfyingly allocated to some tasks than others – it is possible to choose the best knowledge for the job

By the disentangling of Knowledge and Competence, both notions are objectified and represented in an accounting logic “on hold”. The competences may however represent how individuals are able to “perform their function”, i.e. activate the object of knowledge “on hold” relevantly in operations.

In 2) one of the elements in IC, HC, is listed as an entity in IC. The knowledge bank as represented by the total stock of individually owned knowledge and competence can be understood as having “one inherent logic” from period¹ to period², because the updated IC value representations in period² will represent movements of losses and growth, which explains management’s decided relations between the allocated objects of individual knowledge and competence and work process outcome in the period of time.

In the emerging ICA concept HC assets represented as individual knowledge and competence objects are represented in stocks and in flows declining the above claim.

The level of analysis is consequently changed from “organizations” to “individuals” and from superior main elements in the capital like “Structural/ Relational/ Innovative/ Human Capitals”

to sub elements in HC as “knowledge objects” represented as valued objects and technologically transferred to the distribution mechanism, the Structural Capital.

The outcome from the table showing “Logically Possible Organization Theories of Coordination and Distribution applied to Individual Knowledge in and between Companies” concluded that the economic valuing rationale may inspire the aspirations to conceptualize valuing mechanisms in the IC domain by exploring how assets in the financial capital get coordinated (Mintzberg, 1980). This is not new. In the end of the last century the IC focus on dynamics and measurements was alive and strong (Bontis, 2001; Epstein & Manzoni, 1997; Saint-Onge, 1999; Stewart, 1997; Sveiby, 1997), but it has vanished over the last decades to become again a recent call for a new focus on causal dynamics in the capital (Dumay & Garanina, 2013; Dumay, 2013). The conceptualizing focus was précised into requirements for:

- 1) Non-financial ostensive stocks providing overviews over classifications of explicit and tacit knowledge available in the context and relevant as comparable disclosures from individuals and companies documenting the capital (CV’s and annual reports).
- 2) Out-put comparability ordered as an element in the design of the distribution mechanism (system of accounting).
- 3) Consistency between HC decisions, the use and development of knowledge and competence in operations and stocks configured as the output of HC values in operations. Accounting as methods of non-financial value reporting of balances and allocative decisions documenting the movements of individual knowledge and competence may construct the IC value representation of flows/stocks in companies.
- 4) For the socio/technical interface in unstructured contexts managers/individuals act in self-interest when connecting to calculating devices. Design elements substituting “Costs” therefore are required, because the notions of pricing and costs are economic constructs not included in the research context

The table in Annex 1.3 summarizes and orders the ontology/epistemology of the phenomenon “knowledge” in and between companies from the literature review to clarify how it may affect the conceptualization of knowledge, the level of analysis and the framing of structures and coordination of assets. The table shows the dominating ontological view of knowledge as being subjective affecting an epistemology of knowledge representations unable to be audited (Andriessen, 2004b; Brännström et al., 2009; Ernst & Young, 2012).

The output from the literature review identified the ontology of knowledge as an important element of design entailing epistemological consequences for the boundaries, the mobility and the potential management of IC values, which opposes the framing in the RQ, because knowledge flows between firms.

As referred, the artefact based view of knowledge (R. E. Bohn, 1998; R. Bohn, 1994) was then chosen as the prevailing ontological view of knowledge in the thesis able to objectify knowledge, which is in contrast to important literature about knowledge, KM and IC.

The distinctions	Knowledge	Competence	Boundless infinite knowledge
Artifact-oriented knowledge perspective (A)	Knowledge as objective objects independent of time and space, developed as “elements of justified, true beliefs”, which are classified in the global body of knowledge body of disciplines	An effect of knowledge Employees can reuse knowledge objects activating their competencies	Knowledge exists without individuals in time and space Individuals are able to transport knowledge objects and combine and connect to competencies independently of time and location
Process oriented knowledge perspective (B)	Knowledge is subjective, situated, a private affair, not a related objective object	Knowledge and competence are intertwined and not separately identifiable	There are no knowledge objects, only persons with mixed knowledge and competence capacity, situated and subjective

Figure 6 Boundless infinite knowledge related to knowledge and competence in the processual and the artifact-based view, by author.

The table figure 6 sums up why the processual view of knowledge (B) is incompatible with concerns in the research question. It is situated and subjective and therefore impossible in operations to record and recombine in satisfying practices across multiple locations. The pragmatic, artefactual perspective (R. Bohn, 1994) does not exclude knowledge as linked to its location, because individuals as mediators embed and use knowledge, as illustrated in Plato’s quote of Socrates (Platon, 2007). Individuals develop knowledge in endless processes in institutions and new knowledge is endlessly refused, accepted, and recognized in institutionalized global processes (Popper, 1972) (B. Latour, 2005). Bohn examines knowledge in both mature and immature processes, and develops a notion of states of knowledge that are contingent upon how it is used: the owner’s degree of awareness of knowledge. Immature knowledge is defined as processes with low awareness, and mature knowledge is defined as having a high degree of experience and consensus. Bohn explicitly sets out the rationality behind the choice of resources, enabling room for the planning of knowledge resources containing both views of A and B to co-exist. The A view defines knowledge as stabilized, ostensive objects and allows it at a distance to be recognized, codified and accounted for, because it is considered a mature object, while the B view of knowledge is less accountable, as it is immature and under construction by the competencies of individuals. The artefact based view has disentangled individual knowledge and individual competence in organizations enabling the theorizing of individual knowledge and competence as objects.

Finally, the review produced the line-up of potential design elements, which are resumed next: In order to create IC stocks and flows in dispersed managerial processes of non-financial accounting the level of analysis is established at the individual level, because individuals can be managed and some knowledge is more relevant than other. Therefore, the decisions of some managers are of greater value than others. The notion of knowledge is understood in the

artefact-based view allowing for the separation of knowledge and competence. The elements of design are then to be synthesized into objects.

Requirements to the methodology of visualization and valuation of the objects are being identified in order to secure objectivity, recognition and content and prevent local interpretations of knowledge and competence. The visualized and valued objects are to be represented in distributed stocks by technology.

The objects, when allocated by managerial decisions to tasks in operations, are activated by the connection between knowledge and competence through working individuals making the objects flow into innovation, new products, patents and routines in operations. In flows new knowledge and competences may be produced requiring periodically/ real-time update of stocks. The requirements for auditable elements and processes have been identified in the financially based guidelines for intangibles to produce understandable outcomes, which makes sense as exchangeable mechanisms for intermediaries between the financial and intellectual capitals. The challenge now is to fabricate knowledge and competence objects that meet these requirements through an application of the identified elements of design.

4.7 Individual Knowledge *and* Competence

4.7.1 Cognitive Taxonomies for Competence

In the artefact based view competence is disentangled from knowledge objects. The phenomenon individual competence will in the following subsection be submitted to theorizing which aims to identify elements of design in literature. Literature about individual competences is found within the disciplines of pedagogy (Bloom, 1970) and education and organizational behavior (C. Argyris, 2004a).

The American professor, Benjamin Samuel Bloom, introduced in the middle of the 20th century a cognitive taxonomy to order and classify competencies (Bloom, 1970). Concerned with the conceptualization of HC/ IC control between units and companies generic ICA require objects of individual competence, which are disinclined to local interpretations. Hofstede argues that pre-understandings, attitudes, and feeling are to be included in categories (Hofstede & Hofstede, 2006). However, Bloom's taxonomy below, dealing with competences is chosen to be examined more closely (Anderson & Krathwohl, 2001; Bloom, 1970), because it establishes ranking steps of competence when activating knowledge.

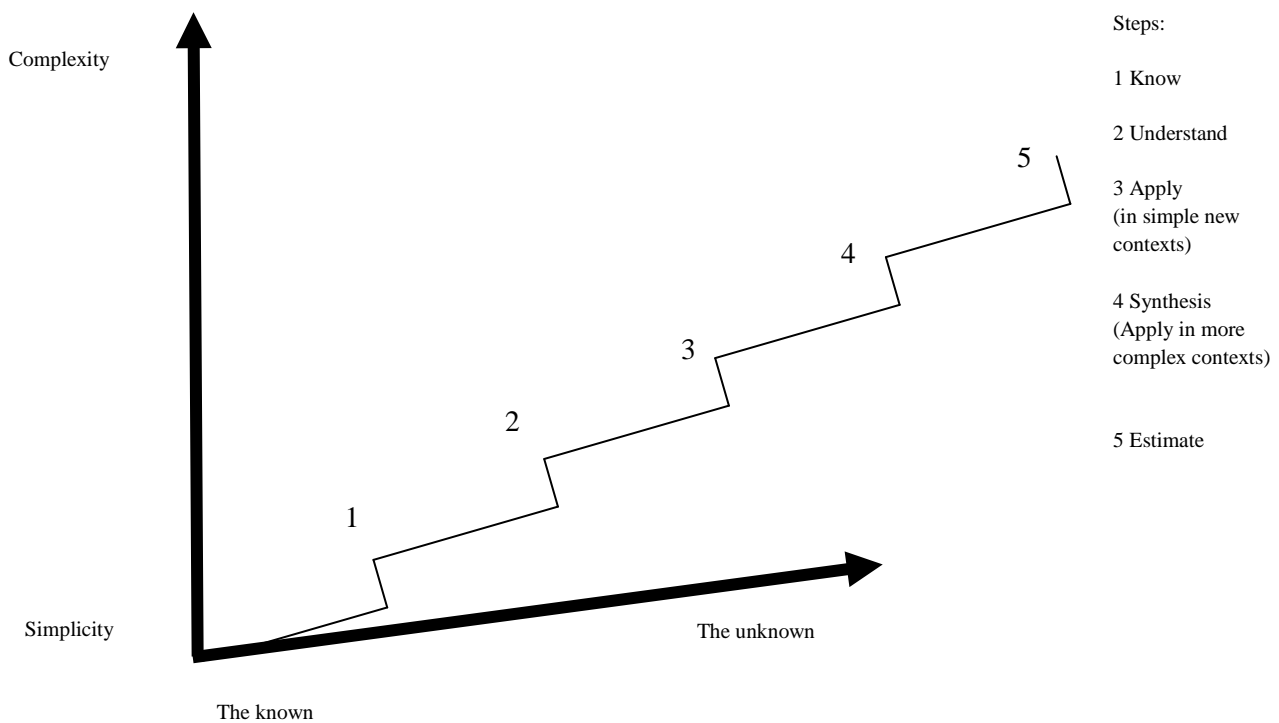


Figure 7 Bloom's cognitive taxonomy

Bloom operates in three dimensions establishing relations between the dichotomized notions of complexity–simplicity and known–unknown, which correspond to the research question's concerns for visualization of competence, because these notions are considered as organizational context variables and, therefore, contenders to enter into a visualization and valuation methodology (C. Argyris, 1996; C. Argyris, 2004a; C. Argyris, 2004b; C. Argyris, 1977). The x-axis represents a continuum from the known to the unknown, which, in operations, also may characterize processes from routines to development and innovation (ibid.). The y-axis represents the continuum from a simple to a complex context, so every dot defined by this area constitutes an organizational context to address actively in operations when allocating to teams and when planning and managing. The steps indicate the ability of individuals to mobilize relevant knowledge in relation to the defined context. Bloom denominates the Step 1 “Knowledge” on a scale, which increases the individual's capability to perform in a context of enhanced insecurity, because the context grows unknown and increasingly complex. The scale describes five steps of performance, which, in accordance with Argyris' thoughts from the mid-1970s about single and double loops, also define precise distinctions in creativity and performance in operations.

The Australian, J. Biggs, has also taken an interest in ordering the outcome of teaching (Biggs, Collins, & Edward, 1982). His taxonomy, reproduced below, “Structure of Observed Learning Outcome” also deals with five levels, but he elaborates more than Bloom on the competencies of every step:

1. Level	2. Level	3. Level	4. Level	5. Level
The person can: only deliver piecemeal information	The person can: identify, rewrite apply simple procedures	The person can: list, describe and combine	The person can: compare, contrast, explain causalities, analyze, relate, and apply	The person can: theorize, generalize, create hypotheses, and put into perspective
	but speak only single parts	speaks more perspectives	speak and integrate more aspects into a whole	and move from the specific to the abstract level
		but is not able to integrate these in a whole		

Figure 8 J. Biggs' competence taxonomy (Biggs et al., 1982).

The two taxonomies are rather similar, but Bloom includes the notion of known–unknown, which is interesting in dispersed unstructured organizational contexts, because the demand for intellectual capacity differs along processes of operations based on routines, rules, innovation and shared processes. Therefore, some processes like routines can be categorized as “known” and related knowledge as known. In unstructured processes projects requiring fast change and radical development can be categorized as “unknown.” Employees work more or less based on routines, with known processes, in known settings, and are often mediated by hierarchy, while processes in “development” and “projects” are often iterative in new settings and with new colleagues, and have another relation to hierarchy (Nonaka, 1994). Therefore, Bloom’s multi-dimensional taxonomy adds to its relevance. Due to similarities and relevant supplementary elements in the two taxonomies, this author has merged them into one, distinguishing human capacity to activate knowledge in organizational settings in two different types of competencies: “creative competencies” and “performance competencies”. The descriptive elements “known–unknown” and “simplicity–complexity” supply and clarify the two types of competencies using generic constructs to describe the outcome/input of competencies.

4.7.2 Dimensions in Competence

Studies of management technologies, MTs, show that an important feature for success in mobilization is simplicity (Busco, Quattrone, & Riccaboni, 2007; Qu & Cooper, 2011; Sarker, Sarker, & Sidorova, 2006). Even though concerns may be complex and the complexity is made calculable and standardized, MTs still have to stay simple in order to get distributed.

However, at least two reasons for the differentiation into creative/ performance competence seem to complicate this insight. The first is the possibility to manage quite different agendas of qualities of competencies at different levels of taxonomy, because the elements are then combinable in various ways; and second, because the choices offer ex ante tools to adjust and communicate quite complex combinability of the respective types of collaboration in operations. Therefore, the assumption is that it is relevant and still worth it to identify two simple, but important distinctions between the various individual competencies that activate knowledge in operations.

In the figure below, by merging the orders (Biggs et al., 1982; Bloom, 1970), the notions of “known/certainty” and “unknown/uncertainty” describe simple, general contextual prerequisites that are assumed to correspond with future organizational contexts and with the general notions of “structured”/“unstructured” as illustrated :

Organizational contexts for various requirements for competences		
Organizational context	Known	Unknown
Knowledge & Competence Management		
Structured: Routine based in known processes, known colleagues, certainty in processes, known outcome, known relations to other processes (within companies)	Competence is restricted to deliver piecemeal information, to identify, rewrite, apply simple procedures, and list, describe, and combine, but speak only single parts, and is not able to integrate these in a whole	Daily operations still frame uncertainty. Incremental change might require high performance, but not high creative competence
Unstructured: Development & projects Unknown, interventions (a project), or organizational development. Innovation: incremental/radical change (between companies)	With known targets, known new contexts for products, and predicted economy, known conditional framework competence can be planned and described in terms of requirement for creativity and performance	Independent of certainty and known conditions. Competence is able to compare, contrast, explain, and construct causalities; to analyze, relate, and apply; to theorize, generalize, create hypothesis, and put into perspective; to speak and integrate more aspects into a whole; and move from the specific to the abstract level and back again

Figure 9 The merged taxonomies of Biggs and Bloom (Biggs et al., 1982; Bloom, 1970) in relation to contexts of operations, by the author.

The table relates the framework of the merged taxonomies to the descriptions of operations, using the notion of structured–unstructured, because the distinction between routines/development is generally addressed in theory and practice (merged). The above table differs between the categories of “known–unknown,” so when booking, reserving or allocating resources across locations, the distinction between a single and a double loop perspective (C. Argyris, 1996; C. Argyris, 2004a) serves as an identifying notion for the ex ante choice of capability to create radical change in an unknown context, because the level 5 in both taxonomies as seen as corresponding to the double loop perspective. The potential combinations of competencies in are embedded in the table. The distinctions in the above model will serve as elements of design for the concretization of IC calculating devices.

For Argyris and Schoen (C. Argyris & Schoen, 1978) learning involves the detection and correction of errors so that given or chosen goals, values, plans, and rules are operationalized rather than questioned, which is known as *single-loop learning*. Single-loop learning is like a thermostat (Argyris’ example) that indicates when it is too cold or too hot and turns the heat up or down. The thermostat can perform this task, because it can receive information (the temperature of the room) and take corrective action. When the error, detected and corrected,

permits the organization to carry on its present policies or achieve its present objectives, then that error-and-correction process is *single-loop learning*. When something goes wrong, they suggest, a general port of call is to look for another strategy—a different perception of the nature of the problem—that will address the governing variables. An alternative response is then to question those variables themselves and subject them to critical scrutiny, described as *double-loop learning*, which requires different individual competence capacity. This may then lead to a change in the governing variables and, therefore, a shift in the way in which strategies and consequences are framed. *Double-loop learning* occurs when errors are detected and corrected in ways that involve the modification of an organization’s underlying norms, policies, or objectives. The thermostat is discarded and another world view is applied.

Single-loop actions are used when goals, values, frameworks, and, to a significant extent, strategies are taken for granted. Double-loop action, in contrast, involves questioning the role of both the framing and operations, which underlies actual goals and strategies. The former involves following routines and pre-set plans; the result is predictable and less risky for both the individual and the organization, thereby facilitating greater control. The latter is critical, creative, and reflexive, and the result is not predictable. Reflections here are more fundamental: the basic assumptions behind ideas or policies are confronted, hypotheses are tested, and thoughts are disrupted, like methods of critical research (M. Alvesson, 2000; C. Argyris, 1982). Finally, the latter may address the art of planning for innovation.

A focus in Chris Argyris’ research has been to explore how organizations may increase their capacity for double-loop learning. He argues that double-loop learning is necessary if practitioners and organizations are to make informed decisions in rapidly changing and often uncertain contexts (C. Argyris & Schoen, 1974; C. Argyris, 1982; C. Argyris, 1990). Newer literature even discards the sense of strategies, because the business contexts are seen to change faster than the production and deployment of strategies and thus arguing for the establishment of awareness and resources for unlimited disruptive organizational behavior (McGrath, 2013). For an organization to exert control over intellectual competencies across locations, it needs the ability to plan and predict disruptive development. IC control is a potential key, because organizational uncertainty assumingly can be reduced and handled within the shared framing of metrics denominating the allocation of relevant competencies at level 5, which is the human capacity to execute double loop processes. Thus, theoretically, it becomes possible *ex ante* to describe the application of knowledge objects in a *creative* and *performative* way to address defined organizational contexts.

By the merger of the rankings in the two taxonomies, design elements for objects of competences technically enable the construction of calculative devices of competence addressing an array of various combinations of competence for allocations in various organizational situations in and between companies.

The ranking of competences use dimensions of knowledge like “information” and “knowledge” and knowledge is described as the object of the competences: knowledge is identified, recognized, spoken about, listed, combined, detailed, compared, contrasted, argued, related,

applied, integrated, theorized, generalized, put into perspectives, moved from specific to abstract levels and estimated. The systematization expresses dimensions in the objects of knowledge, which will be examined and ordered in the next section.

4.7.3 Dimensions in Knowledge Objects

Biggs' and Bloom's (Biggs, 1982; Bloom, 1970) taxonomies rank and apply knowledge while ordering the competences in dimensions of superficial knowledge (information) to deep knowledge (estimations). The argument is that estimations, comparisons or abstractions cannot take place without the ownership of objects of deep knowledge. Implicit the rankings assume that knowledge objects which have properties able to establish estimations or comparisons are available and thus apply qualitative dimensions of knowledge in the model ranking competences. The ownership of knowledge objects may with one person be of many or few objects of knowledge. It is therefore relevant to insert a quantitative dimension for individual knowledge ownerships when documenting an individual stock of knowledge. This indicates requirements for dimensions of quality and quantity at the individual level when measuring knowledge and competence illustrated in the model below.

Qualitative Knowledge Dimensions

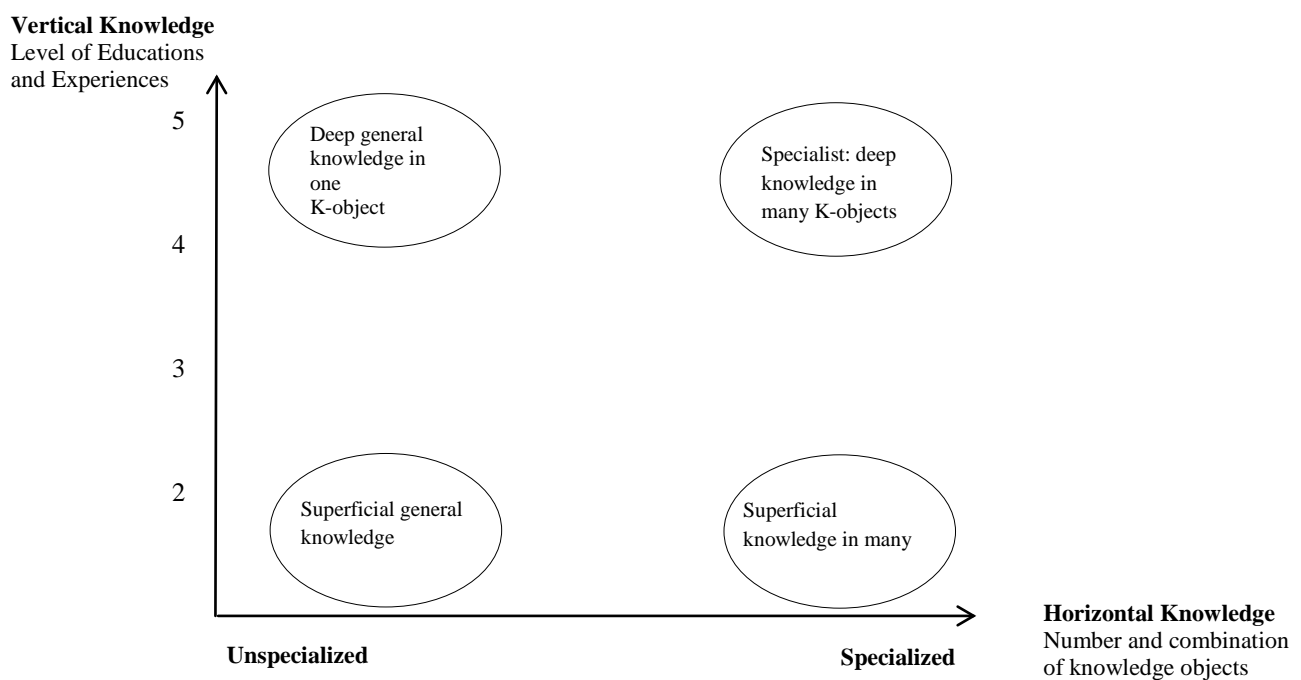


Figure 10 Proposal for qualitative knowledge dimensions, by the author.

The figure 10's dimensions in knowledge enable horizontal and vertical exchange of demand /supply for knowledge in the search and allocation processes to identify remote quality in the IC objects offered at a distance. Consequently, the structure for the explicit, academic knowledge classification is envisaged as an endless capacity to add new/ ascending levels of detailed knowledge objects along the two dimensions, because the global academic body of knowledge grows at an exponential rate (Bontis, 2001) and firms apply various subsets of academic

knowledge. Experience-based, tacit knowledge is classified in labor market categories¹² which evolve, so entities must constantly be able to register and allocate new knowledge that provides capacity to entities, whether it is public/private companies, borderless, scientific networks, or free agents.

Combinations are possible between the qualitative and quantitative dimensions of knowledge. The number of knowledge objects is countless and adding 2 types of competences to objects of knowledge multiply the combinations even more. These highly combinatory value representation principles frames the concrete construction of the further design of an IC measurement unit.

Having now explained why the main take in IC literature is moved from an organizational to an individual level of analysis and having furthermore theorized the objectification of knowledge by firstly disentangling knowledge from competence, by secondly theoretically explaining the objectification of knowledge and competence and its relation to the notions of IC stocks and flows in an accounting logic, constructs, bit and pieces for the conceptualization of HC/IC coordination have been prepared. This is studied next.

4.8 Conceptual Development of Management of HC Assets in Stocks and Flows

In ICA, the immaterial paradigm of accounting, the concept for valuing (price) of knowledge and competence objects by substituting the price information is the next step. Elements of design were identified as mechanisms of control found in the financial accounting paradigm to control and compare values (Ernst & Young, 2012) see table¹³.

Individual competences representing dynamic properties of knowledge are only activated, when humans are the media of knowledge – not by books or films, which have no competences. In this concept only humans have competences. By attaching the competences to the artefact based notion of knowledge and thereby represent individual knowledge in flows i.e. when knowledge is being chosen from stocks, one generic model for the representation of both knowledge and competence may represent both the performative (flows) and the ostensive (stocks) forms of knowledge and competence. The dynamic properties of competences are in this model separate values in the value representation of knowledge and competence objects.

In the accounting concept, decisions allocating individual knowledge and competence at a distance simultaneously include the assessments of the many dimensions in the value representation model: Ex ante in processes of allocation the task's demand for quality and quantity of knowledge is identified and the type of combinations of competences decided. To set a team the manager combines the objects of knowledge and competence visualized in stocks which are needed for the project and make the decision technologically accessible through choices of objects. The owners of such objects are automatically found by the technology connecting demand and supply of knowledge. The manager makes a final decision now informed about the potential owners' properties as positions, localities and individual knowledge accounts. The manager or self-manager has an overview over the relevant supply of

¹² Laborsta, <http://ilo.org/public/english/bureau/stat/isco/isco08/index.htm>

¹³ "Logically Possible Organization Theories of Coordination and Distribution applied to Individual Knowledge in and between Companies"

knowledge and competence, can compare, choose and set the team. When the team starts working, the objects of knowledge are activated by the owner's competences.

In practice, the knowledge identified as assets in IC, is activated as a consequence of the manager's decision. The objects, now linked to concrete individuals that work in the teams, connect flows and stocks in IC, because decisions allocating values of individual knowledge ex ante simultaneously also allocate values of competence in operations from overviews of and choices in stocks. In an ICA system the connecting processes are noted as decisions made by identified managers. Two things will happen: When the task is finished, knowledge and competences is added to the involved individual accounts of knowledge shuffling the outcome of the used IC from flow to stocks ex post. And the system of accounting "knows" and shows the consequences of the manager's decision.

The causal relation between decisions and outcome is sought reestablished in the accounting systems, which generally is considered to challenge control of IC disclosures and confuse the market (Andon et al., 2015; Fløstrand, 2006).

Between companies, the lacking co-presence and lacking strategic orientation hamper mechanisms of coordination (Mintzberg, 1980). In the open context the majority of these elements of design make no sense. Only objective, absolute value representations, which are time and space independent, but recognizable connected to shared global classifications and therefore identifiable, are supposed to be valid (Augier et al., 2001). The open context between companies requires objective and absolute (in contrast to relative (A. Hansen, 2009/2010)) measurements of individual quality and quantity of knowledge at a distance. Objective is the opposite of subjective and absolute is the opposite of relative in a context of performance measurement (A. Hansen, 2009/2010). Therefore, the model is designed to qualify mechanisms of liaisons, because companies ex ante between dispersed units and networks technologically are enabled to allocate the precise quality of knowledge and competence in mutual preceding processes clarifying local requirements for demand /supply of knowledge and competences in the liaisons and owned by the liaisons.

However, the IC literature examines ICA mainly in output contexts unlike this study that tend also to develop devices for the ex-ante management of HC/ IC and develop knowledge-based devices for processes of allocation in operations in input-based contexts to conceptualize the control of knowledge and competence based dynamics both before and after operational decisions.

For cooperation in the global context it is mandatory in order to be understood at a distance to identify globally shared notions of elements of design (Augier et al., 2001). Global classifications are therefore chosen as elements of design to identify IC objects for choice and decision-making in allocations. The stocks of individual knowledge and competence input and the accounts of the outcome are required to be globally recognizable and globally make sense in an accounting logic.

Accountability is understood as technologically traceable activities that based on managerial decisions documented by clicks moves knowledge assets in IC in dependencies which show as auditable digital traces, - referring to the guidelines (Ernst & Young, 2012). Then, not only the

invisible individual knowledge is visualized and measured, but individual managerial efficiency becomes measurable too. These activities represent the daily flow in ICA. This is understood as the flow/stock aspect of IC accountability, which is connected to decisions effecting movements in the capital altering the real-time value representations in flows and stocks.

How managers coordinate and distribute the capital is theoretically assumed to have an economic effect (Andriessen, 2004b; Bontis, 2001; Mura & Longo, 2013; Stewart, 1997), but the relation between input and output of individual knowledge and competence and financial results remains thoroughly to be empirically studied, as far as the author knows.

4.9 Conclusion

In the outlined organization theory (Mintzberg, 1980), it is shown that liaison devices and systems of control break the boundaries of companies in certain aspects (J. S. Brown & Duguid, 1998); The firms' legal/economic boundaries (ad 1 and ad 2) are semipermeable, when individual knowledge and competence is exchanged through liaison devices in and between firms leaving no structural traces, though still being the most valuable assets in the companies. Knowledge does not count as force of coordination, but knowledgeable individuals do. This lack of traceable coordination is addressed by the theoretical distinctions and disentanglement of knowledge and persons. Managers will by intentional selection and choice of knowledge and competence coordinate and distribute the values – not the persons – but the choice of adequate knowledge and competence for collaboration and liaisons in the emerging, envisaged concept of HC accounting.

In companies: Knowledge based coordination may take place by enabling control of stocks of individual knowledge and competence, by managers choice and digitalized transport of knowledge, by accounting-based updates of knowledge and management; individual knowledge and management is represented in absolute (individual) and relative (organizational) value representation of knowledge, and management of HC and the effects of the interplay between flow and stock is visualized by the movements in stocks.

Between companies: Objective knowledge and objective competence in measurement units may be chosen for recruitment and their values are independent of space and time. Explicit, tacit, general, specific, generic and local knowledge is documented in measurement units, which flow within and between companies visualized in technologies providing the access and control of knowledge through decisions informed by the properties in the measurement units.

This systematization assumes regulated connections between operations and output from ICA systems. Studying ICA entails reflection on what to account for when adding value to operations (J. Mouritsen et al., 2004; J. Mouritsen, 2004) and studying knowledge implies reflections on dynamic properties in knowledge and how to translate these dynamic knowledge representations of flow and stocks into an auditable paradigm. But, as argued, this concept assumes certain specific relations between individual knowledge, tasks, managerial decisions and effects – proposing an instrumentality through which these certain, specific effects may be examined. So, the concept concretizing an IC measurement unit and an accounting system will follow. This chapter represented the descriptive/explanatory part of this DSR project:

“While based on different research strategies, explanatory and DSR are not to be regarded as opposites, rather as complements. DSR projects, in fact, consist of two components, respectively descriptive/explanatory and design/testing. The first provides a solid foundation for the second by cultivating a deep understanding of the field problem for which the second component produces improvement-oriented knowledge” (van Aken et al., 2016)pp 1-8.

Elements for solutions of the class of problems, HC allocations, has in the this chapter been identified to the design of the measurement unit, because it may “create a solution for a specific and relevant class of problems using a strict process of artifact construction and evaluation and reflect on the research process to create new standards that ensure rigorous investigations (Alturki et al. 2011)” (Dresch et al., 2015, p. 90). The measurement unit has been theorized as a calculative device, which will be developed next elaborating on the identified elements of design in calculative logics of accounting.

Chapter 5

Design of the Non-financial Measurement Unit, “The Intangible Currency”

5.0 Introduction

This chapter concretizes the identified elements of design in units visualizing and valuing individual knowledge and competence. It applies the outcome from the theoretical approaches to combine generic methods and classifications to map and measure individual knowledge and competence as objects in order to represent them separately, but still interlinked. The concept provides individual knowledge and competence objects with numbers in The Intangible Currency™ (TIC), which tend to be designed as generic, accountable N-F measurement units. Accountable means revisable value representations in logics of (financial) accounting (Ernst & Young, 2012). The conception is designed to constitute operational and controllable logics of knowledge and rooms for management of individual knowledge and competence as assets in dispersed contexts through the use of calculative devices distributed in digitalized ICA systems¹⁴.

The dispersed contexts of accounting differ in geography, structure, purpose, organization and culture, which the design has to overcome. The valuing unit will be designed as a market device to enable calculations in unstructured settings in knowledge logics, at the same time performing an operational knowledge regime (Miller & Power, 2013).

To enable decision makers in operations in search for supply or demand for individual knowledge and competence generically to estimate, judge, and act in accordance with decisions informed by the calculating devices presupposes design which transfers the phenomenon of knowledge and competence from immateriality and invisibility to materiality and visibility. This is the purpose of this chapter.

¹⁴ In Annex 3, A3, descriptions of how to operate TIC's and manage IC in operations is found

5.1 Classifications of Knowledge

The context-centric literature reviews and the identification of elements preconditioning recognizability in unstructured settings directed the attention to two global, recognizable classifications: the global academic classification and the labor-market classifications. Explicit academic knowledge objects may be located, identified, and updated in academic classification of fields and disciplines, which are representable in one node (J. Law, 1986) as distributed, accepted objects of true beliefs, the classic definition of research-based knowledge (Christensen, 2000). Credibility is a key prerequisite for collaboration (Ford, 2004; Patokorpi, 2008), which is especially challenged in remote collaborations across locations as general, important organizational features in dispersed contexts (Harvard Business Review Press, 2011; Maznevski & Chudoba, 2000). Credibility is challenged, because the dominant perception of knowledge is an intangible phenomenon linked to time and space. KM deals with three major problems: the distribution, development, and application of knowledge (Hong & Vai, 2008; Hsu & Sabherwal, 2011; Siemsen, Roth, Balasubramanian, & Anand, 2009) – even more in displaced locations. The credibility is therefore central in the concretization efforts of the calculative devices. It is important to underline that knowledge objects stored and ordered in these classifications are identifiable and to be trusted, because they are peer-reviewed or by Academia and/or by Practice.

Tacit knowledge, however, is primarily considered to be acquired through experiences as functions of lived (work) life (Polanyi, 1974; Polanyi, 1997; Polanyi, 2005). The international classification, Laborsta/ Ilostat¹⁵, which classifies labor markets into sectors, positions, branches, and business lines, offers a generic, global model to map and order tacit knowledge obtained through work processes. Both the academic classification and the labor markets can be regarded as distributed networks, which are widely connected to and therefore, chosen as an element of design to identify, map and order generic knowledge objects in the concretization of the IC measurement unit. The classifications enable peripheral individuals to locate and identify knowledge objects (Augier et al., 2001) whether they are tacit or explicit - before and after operations addressing the *horizontal qualitative aspect* of knowledge (chapter 3). In classifications knowledge is visualized in texts allowing individuals to consider and compare whether one or another object is the optimal resource for a task, collecting and superposing the most relevant species of knowledge.

Remaining elements of concretizations in The Intangible Currency such as the quantitative aspect in the comparisons and choices of knowledge and the quantitative/qualitative aspects in the activating elements embedded in the competences are considered next.

5.2 Knowledge Calculability

In order to make the verticality of knowledge calculable the objects are provided with figures to indicate their embedded quality in operations as applied objects. When compiling taxonomical orders for accounting logics, distinctions between academic and tacit knowledge may be

¹⁵ <http://ilo.org/public/english/bureau/stat/isco/isco08/index.htm>

considered, because these knowledge objects are acquired to become individually owned in different ways.

In Figure 11 below, knowledge is assigned with numbers stratifying the *vertical value*, the depth of the owned knowledge:

Explicit and Tacit Knowledge in Numbers		
Possible distinctions at a distance	Explicit Knowledge Academic Knowledge	Tacit Knowledge Experience-based Knowledge
BA or an equivalent exam in a discipline from a public institution = Immature knowledge is not able of creating causality (R. Bohn, 1994)	1 = Knowledge acquired in a baccalaureate or equivalent 2 = Knowledge acquired in a disciplinary field as a BA or equivalent	The business function, the level (title) and sector can be defined and labelled as well as the time spent in the position. 1 = Knowledge acquired during 6–12 months full time 2 = Knowledge acquired during 13–24 months full time
MA in the discipline from a public institution or an equivalent exam = Mature knowledge is able to create causality (ibid.)	3 = Knowledge acquired in a disciplinary field as a MA or equivalent 4 = Knowledge acquired in a disciplinary field as a PhD or equivalent 5 = Knowledge acquired in a disciplinary field as a Doctor /Professor	3 = Knowledge acquired during 25–60 months full time 4= Knowledge acquired during 61-120 months full time 5 = Knowledge acquired during > 120 months full time Relevant for these context-based knowledge objects is “country,” where the experiences have been gained and “position,” which indicates at which organizational level knowledge has been gained/ applied

Figure 11 Transfer of vertical qualities in knowledge objects into figures, by the author.

Figure 11 fleshes out the valuation issue by applying an objective, absolute method to value knowledge objects; that is, adding an ascending sequence of numbers to clearly objective identified objects of knowledge to enable qualitative estimations at a distance based on the levels of education or the number of months in the same position. The use of absolute figures (A. Hansen, 2009/2010) of individual explicit, academic, and tacit, experience-based knowledge, relates it to the previously described states of knowledge using the distinction of immature/mature (R. Bohn, 1994) to label various states and qualities. It uses a simple scale assuming that experienced-based knowledge gained over a longer period of time, where everything is equal, deserves a higher number (1–5) indicating more profound knowledge than experience-based knowledge gained over a shorter period of time.

Summing up, the mapping of knowledge is (already) ordered in global, generic classifications of academic- and labor-market-based orders and these classifications will be reused as an element of identification for knowledge objects represented by the N-F measurement unit. Within these categories, individual knowledge objects are located and notable in figures according to the level of exams and the length of experiences. Knowledge objects then get positioned in categories and classifications with metrics valuing them according to the individual level of

study 5–1 (PhD, Master’s, BA, etc.) and according to number of months of experience 5–1 (months of experiences in a context defined by the labor-market classification). Access to the registered objects allows users to distinguish the quality of explicit (academic) and tacit (experience-based) knowledge across locations by comparing these classifications and figures. Comparisons and estimations of the assets are technologically enabled through the creation of transparency in the knowledge supply across locations. The demand for resources is thus specified by the manager’s horizontal and vertical choices of knowledge technically and real-time gathered and clicked in profiles of specific knowledge.

Supposed future implications are that technology circulates objects of knowledge by mutual forecasts of supply and demand in collaborations within or between companies and that coordination and distribution of the objects of knowledge happens in processes of allocation to teams and projects. Therefore, conflicts, delays, and the need to rework or scrap are supposed to decrease (Behfar, 2008; Cordery et al., 2010; Hong & Vai, 2008); this describe investigations that constitute future research, which is outside the scope of this thesis, but made possible by it.

In this paragraph generic design methods visualizing and valuing knowledge have been proposed; having separated knowledge from competences, principles for calculability for competences are to be conceptualized next.

5.3 Competence Calculability

In this subsection, methods to visualize individual competence in objects of creative competence and performance competences are developed in order to represent values in the phenomena and make them calculable.

The two types of competence have been defined as the human ability to activate knowledge in a social context: “referring to an organism’s capacity to interact effectively with its environment” (White, 1959, p. 297). The two types are complementary and supplement mutually the other element by addressing different operational tasks and working contexts. In the practices of allocation or recruitments at a distance, they are able to describe varieties, differences and combinations in the supply and demand for enacted knowledge on a detailed scale distinguishing between simple operational markers as routine-based/development-oriented, known/unknown contexts, and one-man/collaborative tasks (Chapter 3, (Biggs et al., 1982; Bloom, 1970)).

The view of knowledge is entrepreneurial and pragmatic: reusable objects mapped in the known geography of disciplines and labor markets. Knowledge has an objective and separate identity that will be reflected in the construction of the measurement unit, whereas competencies are personal capacities and abilities owned by individuals to activate the knowledge objects. In other words, without knowledge there is no competence, because there are no objects to activate. Simplifying the two tables of taxonomies¹⁶, borrowing from Argyris (C. Argyris, 2004a; C. Argyris, 2004b) and Biggs and Bloom (Biggs et al., 1982; Bloom, 1970) the following figure-

¹⁶ Chapter 5.3: Competence Calculability

based taxonomies are designed to label individual capacity to activate knowledge objects by use of creative and performative competencies.

5.3.1 Visualizing and Valuing Creative Competence

Conceptualizing a valuing logic for Creative Competence, CC, the below taxonomy is developed by the merger and synthesizing of theories developed by Argyris, Biggs and Bloom. The various contextual social dimensions in the theorizing of creativity and learning have been superposed and added in the two taxonomies for Performance Competence, PC, respectively Creative Competence, CC, described next:

Taxonomy for Creative Competence

The person is capable of activating a knowledge object in a creative way on one of the five different levels by:

1. Conducting a dialog, superficially, and scheduled, about the knowledge object (*Biggs' level 1*)
2. Reproducing the substance of the object, understanding and interpreting it (*Bloom's level 2*)
3. Exemplifying the object, putting substance into the relevant contexts, familiar with related disciplines and issues, and identifying it in relation to subjects and levels—single loop (*Bloom's level 3+ Argyris' notion of single loop*)
4. Applying different knowledge parts, assessing, analyzing, and relating them to new substance in given targets. Able to schedule planning, work on a meta-level, and get relevant associations, able to argue (*Biggs' and Bloom's level 4*)
5. Independently accessing other contexts, handling a number of levels of abstraction and complexities, combining objects in new ways, integrating disciplines, methods, and systems—double loop (*Bloom's and Biggs' level 5 and Argyris' notion of double loop*).

The above concept shows organizational notions from the previously cited frameworks: A single loop will accept the target and invent new ways of solving the problems (3), a double loop will contest the target claiming its irrelevance and argue for another arena to fight the problem (5). Figures from the above taxonomy for Creative Competences will in the concept be attached to the knowledge objects documenting one individual's capability to activate the owned knowledge object through creativity thereby describing its creative potential in operations.

5.3.2 Visualizing and Valuing Performance Competence

Conceptualizing a valuing logic for Performance Competence, PC, the below taxonomy is developed under similar conditions as the former for CC. The various contextual social dimensions in the theorizing of performance have been constructed for PC.

Taxonomy for Performance Competence

The person is capable of activating knowledge objects using his/her competence at one of the following five levels:

1. Is able to and prefers to work alone in known settings and in routines (*context is structured, Bloom's distinction between known/unknown and the distinction structured/unstructured (Augier et al., 2001)*)
2. Is able to and prefers to work in teams in known settings and in known processes (*as 1. but "alone" is exchanged with collaboration "in teams," the distinction "alone/team" being important at a distance*)
3. Is able to work both in teams and independently in unknown settings and unknown processes (*context unstructured, unknown and complicated: the notion of "unknowingness" (Bloom) is underlined*)
4. Is able to plan, dispose, engage, inspire others, and take responsibility (*elements of general leadership are underlined*)
5. Is able to move globally, to gain a foreign audience, to act naturally in other cultures using other languages, can create credibility also through digital media (*Biggs' and Bloom's level 5 independently of time and space*).

The two taxonomies are complementary and represent qualitative competence values. The quantitative–qualitative distinctions are disturbed in the performance taxonomy, because the ascending order does not necessarily indicate higher quality: collaborative work (level 2) is not always better than working alone (level 1). Contexts will define the relations, albeit in the creative taxonomy the relation between quantitative and qualitative is linear where 1 = less creative competence and 5 = more creative competence. The step from 4 to 5 distinguishes the capability to apply the knowledge objects in double loops offering disruptive, innovative solutions.

Scaling is a common tool in research ordering and prioritizing importance. The above taxonomies take after the Likert scale. A Likert scale is a psychometric scale commonly involved in research that employs questionnaires. This is not the case here, because the above taxonomy is the result of constructions of deduced knowledge. It is not a rating scale, but a Likert-type of scale. Likert's scale emerged from collective responses to a set of questions


where responses are scored along a range. Technically, a Likert-type scale aims to capture variation that points to underlying phenomena. Respondents specify their level of agreement or disagreement on a symmetric agree–disagree scale for a series of statements. Thus, the range captures the intensity of attitudes to a given item. A scale can be created as the simple sum of questionnaire responses over the full range of the scale, when assuming that distances on each item are equal. This is, as referred, not the case in the used taxonomy. Still, the Likert resemblance is to become more explicit in the organizational implementation processes, because to note the systemic input of knowledge and competence questionnaires have been constructed and written in code to transfer invisible, individual competencies to taxonomic levels¹⁷. However, the questionnaires do not explore attitudes or interpretations, but facts. In 26 questions the person will answer theory driven questions about how the person works with the concerned object of knowledge. Technologically, the 26 clicks are automatically concentrated into 2 figures between 1-5, one for CC and one for PC.

Having applied the design elements to concretize N-F measurement units by the identification of methods to visualize and measure explicit and tacit knowledge objects including two taxonomies for generic competence objects in figures, the result is ready to be conceptualized in the next section. This proposes materialized, but unlimited, combinations of objects of generic, global value representations of explicit academic, company-specific, and tacit knowledge objects, performance competence, and creative competence.

5.4 The Concept of The Intangible Currency, TIC

Finally, this sub-section conducts the conceptualization of the IC measurement unit, which is designed to be applied globally in and between business units.

To manage the knowledge element in HC in IC, the measurement unit is framed in logics of accounting. The measurement unit of TIC is configured next.

An icon, a pictogram (like €, £, ¥) -  - has been designed to identify the N-F currency. Partial conclusions have been drawn to keep measurements simple and timely (Busco et al., 2007; Kaplan & Norton, 2006; Sarker et al., 2006) and omit the use of context-dependent, multifunctional, complex backward looking measurements, because they are situated in time and space (Andriessen, 2004b) and therefore, not combinable and reusable.

TIC consists of objective, absolute metrics in three dimensions, X, Y, and Z. X represents the value of the knowledge object, Y represents the value of creative competence CC, and Z represents performative competence PC. One value of X, Y, or Z is useless, because the three figures define each other representing the qualitative value of one specific knowledge and competence object.

¹⁷ In Annex 2, Module I, three pages of screen dumps display the questionnaire.

Knowledge domain:	X	Y	Z	
[The name of the knowledge object in text]	[knowledge object, creative competence, performance competence]			$\frac{\text{I}}{\text{I}}$
	(figures from 1 to 5)	(figures from 1 to 5)	(figures from 1 to 5)	

Example

[Anatomy] [3, 1, 3]	$\frac{\text{I}}{\text{I}}$
---------------------	-----------------------------

Figure 12 Proposal of IC measurement unit, The Intangible Currency™, by author.

The above example shows value representations of one specific academic knowledge object, “Anatomy”, denominating supply or demand for this knowledge object with specific competencies, which may become distributed in any global context.

The example shows according to the taxonomies that the person owns an objective knowledge object in the academic discipline ANATOMY on a level 3. Level 3 indicates knowledge at master’s level. The person is capable of activating this knowledge object with his/her creative competence at level CC = 1 and performance competence at level PC = 3. According to the competence taxonomies the figures indicate capacity to work with the knowledge object ANATOMY both in teams and independently in unknown settings and in unknown processes in a superficial way by using dialogs and having had the chance to plan the dialog.

This objective information promises/requires a capacity relevant for new teams, because it is independent of routines and well-known surroundings. As the person can work equally in teams or alone at a Master’s level the capacity is flexible. The representation is conceptualized to serve allocation practices of precise combinations of knowledge and competence resources at a distance through calculative processes deciding on issues of diversified notions of knowledge, such as explicit, tacit, and company-specific knowledge in vertical or/and horizontal dimensions of knowledge armed with diversified degrees of creativity, self-management, and performance.

The TIC range is $5 \times 5 \times 5 = 125$ permutations of HC statements of the three constituent dimensions within unlimited superposed objects of knowledge in task-oriented demands for knowledge. Allocative quality becomes a figure-based, shared demand for context-dependent combined profiles of objects, searching centralized databases independently of the location of the potential IC supply. As the scores for each of the dimensions represent innumerable combinations based on objective, absolute figures, this yields a robust and reliable measurement of the organizational value of the objects. The reliability is designed to stem from the method of visualization/valuation, which tend to ensure objectivity by being an effect of the globally

dispersed processes of knowledge creation and by the use of absolute measurements when transferring knowledge and competence to figures. Still, while educations or stay-ons in jobs are similar and figures indicate equal values, the acts will perform differently and the remote choices have changing effects, because educational levels like BA and MA's or business practices geographically differ.

The concretizing method and the generic TIC represent the end of the processes of several stages of reversible transfers from immateriality into artefacts.

The table in Annex 1.4 illustrates applications of TICs in an example of N-F accountancy pretending that the individual has already answered the questionnaire¹⁸ about competencies presented in the next chapter.

The values listed in the right column in A1.4 show the personal knowledge account that demonstrates the applied TIC on the text-based CV. The representation in the right column illustrates in stock-like situations how knowledge accounts may look like when transferred to digital media¹⁹. Having access, individuals may activate knowledge with various competences and personal properties, but TICs can, as separate objective objects, be individually recorded, allocated, and activated in ways that then become situated (J. Law & Hassard, 1999).

Every single step of design of the objects has been outlined. TIC measures individual value or quality of knowledge and competence - as inputs or outputs, this has no importance, because the objects are context-independent and designed to be free from space and time. The generic metrics from 1 to 5 are globally to be understood the same way, but are assumed in practice to vary as varies masters attained from different universities.

5.5 Conclusion

In order to enable operations of HC the chapter proposes calculative devices, TICs, which have been materialized as tools to manage individual knowledge and competence objects in dispersed operations. Relevant knowledge for operations exists in and between the legal boundaries of business units. This context defines a set of new requirements for KM. Financial devices offer a comparison of prices and costs enabling decisions and actions, which cannot become replicated in the N-F paradigm of calculations. But mechanisms of comparisons can. Allocating solely objects of knowledge conserves the knowledge-based stocks inactive; Knowledge needs media to be activated in order to add value in operations, and employees are able to activate it in different ways through their different competencies. Competence properties have been identified and transferred to two numerical value regimes representing qualities in competences, because management of knowledge also includes management of employees as the owners or carriers of both knowledge and competences. Competencies have been structured in taxonomies that are relevant for operations and combined with knowledge objects in the measurement unit, TIC, in order to make human actors connect to the devices, to calculate, and to act, because only then will IC become operable. HC in IC is managed through the actions of managers' coordinating and distributing decisions. TICs may as calculating devices constitute N-F parallel situations to

¹⁸ Annex 2, Module I.

¹⁹ An example of a digitalized transferred CV is found as a screen dump from the ICA software in the Annex 2, Module I.

financial devices in the economic paradigm by visualizing knowledge and competence's immaterial values; and managers may copy their ways to act in self-interest.

The concept visualizes and values IC's HC in stocks of mapped knowledge, locating explicit knowledge in global, generic academic orders and tacit knowledge in global, generic experience-based labor-market orders, which are supposed to be recognizable classifications; Knowledge's quality, verticality and horizontality, and quantity appear in metrics in the attempt to transfer the financial properties of "costs" to potential spaces of calculations within IC.

The concept identifies and translates characteristics in human competencies of creativity and performance from merged taxonomies, and proposes a generic methodology to translate these phenomena to figures in TIC connecting the figures to every single object of knowledge. The TIC represents intellectual values of capacity, representing individual capability in absolute, objective value representations for explicit, tacit, and company-specific knowledge, as well as for creative and performative competencies.

The three ordinal value scales are considered to offer robust objective representations. The steps in the merged competence taxonomies reflect possible choices in operations. Distinctions between various capacities in routines, innovation, sales, and management are identifiable in the competence taxonomies when searching, allocating, teaming, or calculating knowledge values. The transfer of CVs into TICs tend to produce generic, figure-based value representation in ICA, made visible, reliable, exchangeable, and accessible in media, which here is a digital, web-based structure²⁰.

The design of TICs is the first step to answer the research question, because values are only manageable when visible and accounted for. The methodology differs from existing technologies by offering a calculating device to operations in and between firms. The device is designed to be digitalized as a core component in the programming of ICA software. The design differs from other KMTs' representations by the choice of the artefactual knowledge view, the object-orientation and their modes of operation, because existing representations are time- and space-dependent, event driven, and constructed in multifunctional outputs. Existing KMTs are mostly output-oriented. None of them visualizes individual knowledge or distinguishes knowledge from competence. They have few declared notions of accountancy, and no calculative devices representing the single input of values in operations, nor any generic measurement unit independent of time and location.

Please consult the Annex A3 and its subparagraphs for the description of how to operate HC in TICs and ICMCS.

To be mobilized, TIC is implemented in an accountancy model for the management of IC, which is developed in the next chapter.

²⁰ Outlined in chapter 5.

Chapter 6

Design of the Mechanism of Distribution - the Non-financial Accounting System

6.0 Introduction

TICs were designed as calculative devices and presented in the former chapter. This chapter applies TIC in the IC management model below applying TICs as core components in solutions for web-based technology in order to distribute the value representations in dispersed organizational processes and locations.

Managerial decisions founded on distributed system outputs of IC value representations are expected to coordinate and distribute individual knowledge and competence in HC by clicks, when choosing the most satisfying IC capacity in operations. Please find details outlined about how to operate ICMCS in the Annex 2 and 3²¹.

Model; Intellectual Capital Management Control System, ICMCS

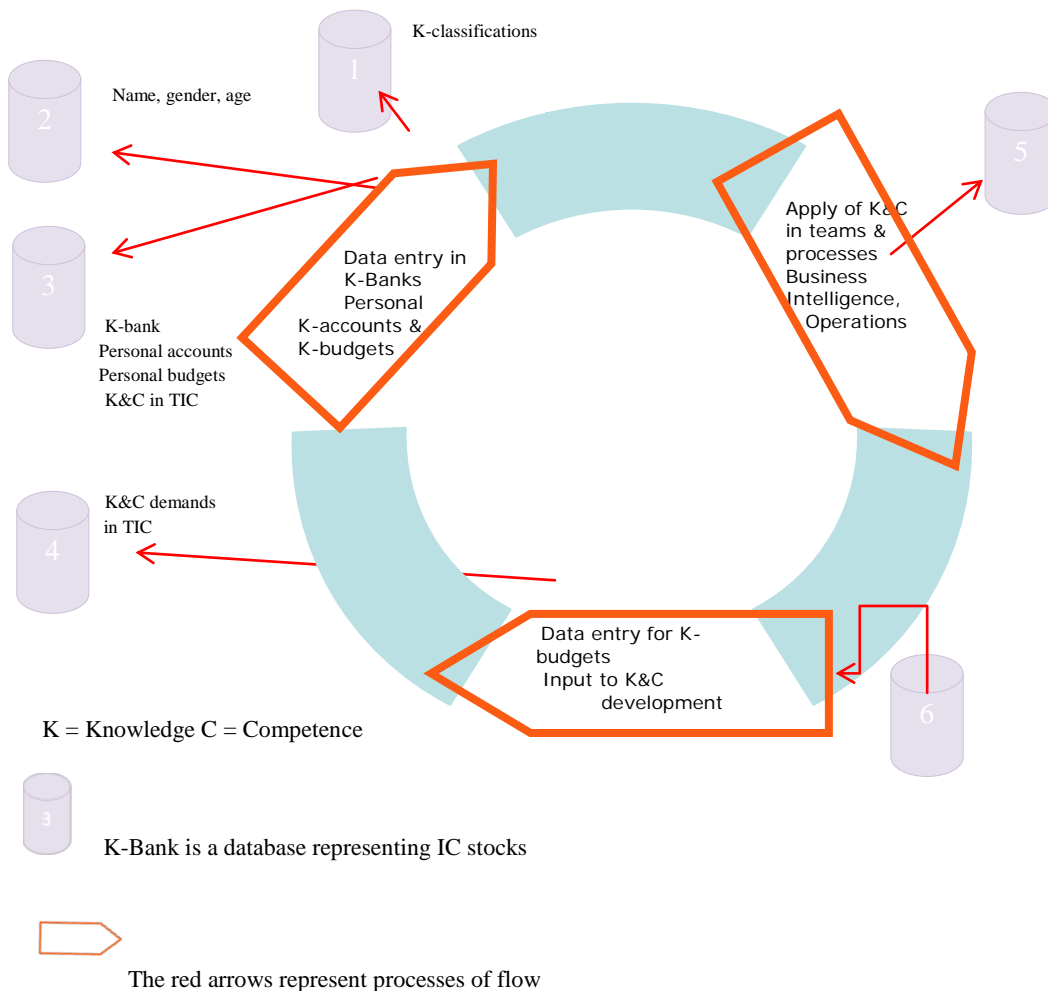


Figure 13 Model of the knowledge-based IC control system, by the author

²¹ In Annex 3, A3, descriptions of how to operate ICMCS and manage IC in operations

6.1 Short Description of the IC Management Control System, ICMCS

This chapter is structured as a short introduction to the system—the details of which can be found in Annex 2 and Annex 3, along with the further descriptions. Annex 2 presents the modules in screen dumps and Annex 3 describes processes of operations in the HC aspect using TICs and TIC value representations. The accounting *system* is part of this thesis, because logics of accounting, guidelines and technologies prerequisite elements in the design of the concept of TIC and because the artefact delivers the possibility of conducting the case study.

Firstly, the web technology is designed to distribute the objects across locations when managers calculate, allocating the values independently of time and space; and secondly, the technology is designed in order to produce timely output for IC management at a distance under requirements of accounting based rules of control. TIC is designed to mediate and account for dynamic relations between various knowledge objects, such as explicit and tacit knowledge and between knowledge and competence being generated in real time through operations, which is activated by clicks in the system (flow). The clicks represent managerial decisions made by managers based on TIC-born information.

The software program materializes the model of ICMCS representing the act from model to instrumentation (Hacking, 1986). Thirdly, the software constitutes an arte-factual materiality, which enables the conduction of case-based testing of the concept, because the practical tool is understandable, accessible and may be useful (Andon et al., 2015). Its further development can happen and can be shared across boundaries and distances²².

In an IC perspective the ICMCS concept expresses operations in TICs ex ante and ex post: how values of individual knowledge and competence are searched, decided, allocated, coordinated, exploited, distributed, developed, stored, trusted, accessed, and planned (March, 1991; D. J. Teece, 2007) in stocks and flows. The system addresses, how individual knowledge and competence is recognized as strategic, how the objects will add value, and where and through which knowledge and competence objects, work is carried out. The concept therefore also documents how managers' decisions influence results and thereby tend to establish auditable relations between operations and disclosures.

Excellent management of HC documents among other things

- current adjustments of the actual IC stock to the actual and future demand for IC capacity,
- balanced exploitation of the strategical capacity,
- balanced, distributed IC slack in the company,
- that the most satisfying individual HC is assigned the appropriate tasks,
- that menacing dysfunctionalities in projects and teams are discovered and solved in time,

²² Although this thesis through force of circumstance was empirically limited from the exploration of the distribution mechanism and its effects, it still refers to and is defined by ICMCSs sub-mechanisms of distribution during the processes of conceptualization and during the empirical work; hence, its inclusion in this thesis.

- that the number of defects, flaws and deficiencies are diminishing
- that run-through time is shortened
- that conflicts in wired collaborations are reduced
- that efficiency is enhanced while lowering head counts and ameliorating quality

While conducting operations the documentations are automatized by managers' clicks constructing IC value representations in TICs and by real time business intelligence based on TICs, i.e. percentages showing the type and values of existing strategic individual knowledge and competence applied in operations related to the same type of knowledge stored inactive in stocks, indicating slack in the capital. The figures are meant to provide knowledge based decision making about future investment in development of the capital, about capacity for change and innovative projects, about the timely management of the capital etc.

6.2 Visualizing ICA

This sub section outlines how the concept of the N-F accounting system is constructed and operated and gives examples of screen-dumps representing HC in flows and stocks.

The transfer of the IC management model to writing in code was undertaken in processes of collaboration between the researcher and the technological coders producing the web-based artifact and in prior processes, which are not included in the thesis.

The model visualizes individual knowledge and competence as input to operations, and orders the values in accessible databases for decentralized managers or self-managers to provide fast centralized, comparable overviews, with the possibility to estimate and choose optimal allocation values, and operates and finishes the task independently of locations. Furthermore, the IC control system contains a unit for shared planning and development of future knowledge informed by captured, decentralized, absorptive capacity²³ explicating processes for strategy, which generates future demand for knowledge and competence. In Figure 14 below the input/output model opens the black box of knowledge in operations:

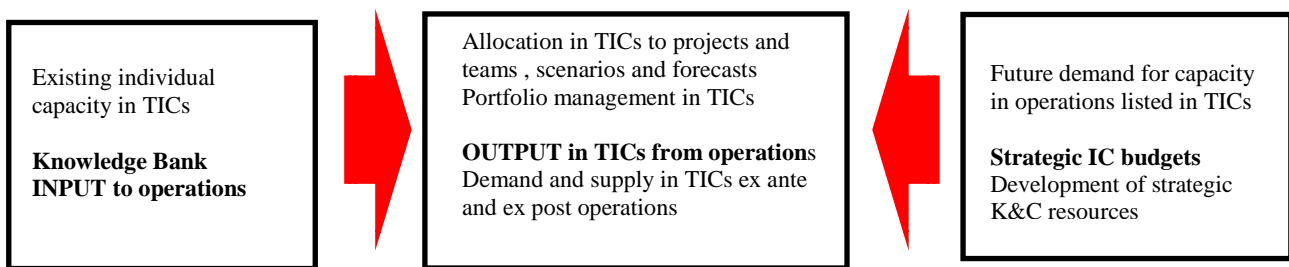


Figure 14 Input/output model of knowledge in operations, the model of accounting, by author.

The Figure 14 illustrates that the system operates generating accounting traces as inputs and outputs in TICs from operational processes involving movements in the capital. The movements, registered by clicks when searching, choosing, allocating, applying, and

²³ Absorptive capacity is in defined as the 'ability to recognize the value of new external information, assimilate it, and apply it to commercial ends.

developing, document how values in TICs through decision making move as assets in operations. Value representations are generated as search profiles for individual knowledge and competence, as allocations, as budgets and reports at the individual and accrued levels.

One system's site showing an individual stock is represented in Figure 15 below as a screen-dump from a "Personal Account".

It shows how individual capacity is represented and offered to operations in TICs. The figure-based IC data in TICs include, as explained, the name of the knowledge object. Aggregated representations, therefore, are to be constructed as value representations within the knowledge classifications and related to the individual, the group, the project, the department, or to the corporate level. Although TIC is designed as a generic value representation, accrued representations are situated representations of decisions, because the values are acted upon in concrete contexts of time and space.

If the firm is strategizing innovation in some departments or for some product lines, it may be of interest ex ante to allocate the most creative individuals, and by forecasting accounts for the total metrics of creative competences across silos in projects ex ante in order to establish corporate data about the potential consumption of knowledge, creative competence and performance competence for such processes.

If the firm plans to enter new markets, it may be of corporate interest to estimate the robustness of the task ex ante by estimating the IC planning and have the opportunity in time to fortify certain knowledge objects in the quantity and/or quality dimensions. These are examples of decisions, which, by the IC data, are able to be informed in sharable objective, absolute figures by automated outputs at distances. TIC provides fundamental data for the construction of such outputs and the accounting system circulates the TIC, but this thesis is delimited from the detailed disclosure of the algebra and the weighting of aggregated data in TIC of IC representations, which are referred to further research. Managerial IC accounting is referred to future research.

brainii.dev.netimage.dk/brainii-system_uk/index.php?side=persons&id=20

Brainii

Existing Knowledge

- ▶ Knowledge Bank
- ▶ Strategic Knowledge
- ▶ Persons
- ▶ Personal Account
- ▶ Personal Budget

Team Work

- ▶ Team Overview
- ▶ Create Team
- ▶ Current Teams
- ▶ Team Bank
- ▶ Strategic Teams

Future Knowledge

- ▶ Intern Knowledge Demand
- ▶ Customer Demand
- ▶ Stakeholder Demand
- ▶ Future Knowledge
- ▶ Knowledge Budget

▶ Key Figures

Intellectual Capital Statement

- ▶ Knowledge Accounts
- ▶ Competence Accounts

- ▶ Knowledge Budgets
- ▶ Competence Budgets

Admin

- ▶ Login List

Personal account

User: Anne

[Add knowledge] [Show] [Edit]

The site offers an account over the personal knowledge and its competences. The employee adds the account capability the capacity gets globally accessible.

[Click here if you want more information on The Intangible Currency, TIC #:](#)

	K	CC	PC	
Academic Knowledge				
Chemistry » Teaching in two fields » Basic inorganic and biological chemistry	3	5	5	≠
Engineering » Chemistry and Business Economy » Chemical Process Control	5	1	2	≠
Asian Studies » Chinese/English	2	4	1	≠
International Business » International Business » Corporate Finance	2	3	4	≠
Digital design: interactive design, IT, aesthetics, culture and production » Digital design: interactive design, IT, aesthetics, culture and production	3	5	3	≠
Biology » Ecosystem Functioning and Management » General Microbiology	3			≠
International Business and Politics » International Business and Politics » Global Political Economy	4	5	1	≠
Architect » Industrial Design	3	5	2	≠
Librarian (Library and Information Science) » Librarian	3	3	1	≠
» Linguistics	3	5	5	≠
Civil engineer » Physics and Nanotechnology	3	3	1	≠
Economics and Business Administration » Economics and Business Administration » Problem-oriented sociology	4	5	5	≠
Physics » Upper secondary school level course » Quantum Mechanics 2	1	5	2	≠
Architect » Residential architect	2	1	2	≠
Technical science: (civil engineer) Geotechnology » Technical science: (civil engineer) Geotechnology	2	4	3	≠
English and Organisational Communication » English and Organisational Communication » Text and text production	3	5	3	≠
American Indian Languages and Cultures » American Indian Languages and Cultures » The scientific basis for the study of American Indian Languages and Cultures A	4	1	2	≠
American Indian Languages and Cultures » American Indian Languages and Cultures » The scientific basis for the study of American Indian Languages and Cultures B	4	5	3	≠
Architect » Urban Planning	3	5	5	≠
Supplementary knowledge				
Experience Knowledge				
External Knowledge Private Sector » Construction » Construction of buildings	4	1	1	≠
External Knowledge Public Sector » Education » Education	2	5	5	≠
External Knowledge Private Sector » Mining and quarrying » Mining of coal and lignite	3	5	5	≠
External Knowledge Private Sector » Real estate activities » Real estate activities	1	5	5	≠
External Knowledge Public Sector » Professional, scientific and technical activities » Scientific research and development	3	5	2	≠
External Knowledge Private Sector » Water supply; sewerage, waste management and remediation activities » Water collection, treatment and supply	3	4	3	≠

Login info

Company:

Name: Anne

Type: Admin

Logout

Knowledge

Figure 15. Screen-dump ICMCS, Personal Account, Module I Existing Knowledge. Source: the author.

The above Figure 15 shows an example of the concept's representation of individual stocks. It is a screen-dump illustrating the digitalized account of one individual IC capacity using N-F figures representing values of knowledge and competence in TIC to the right. K = knowledge, CC = creative competence, and PC = performative competence. Questionnaires generated the input of competencies through algebra, which visualizes and values the competencies as an input ex ante, when the individual registers and offers IC capacity independently of time and space in the system. Annex 2 and 3 disclose more information about the modules and their way of functioning.

The example has been cut to fit-the-page format and shows no noted values for “Company-specific knowledge” or “Supplementary knowledge,” which is local knowledge, because this screen-dump is taken from the phase of technical testing.

In Module II²⁴ in ICMCS, managerial decisions coordinating and distributing the capital is hosted. Sites in Module II illustrate how managers and self-managers at the individual level in one action may create combined and complex capacity demands in TICs for tasks to be operated. On the same web-site, ICMCS ranks the existing, optimal supply in TICs and the owners' names and data. Comparisons, estimations, and choices are now facilitated as actions to be undertaken still at the same site. At higher management levels, individual calculative levels may be unsatisfying for corporate overviews. Calculative examples of simple aggregated value representations are mentioned below (using the concrete figures in TIC from the above Figure 15 screen-dump in the example below):

Comparable, objective, absolute, aggregated IC value representation for one person

1. Numbers of knowledge objects in total (T 25)/ academic($K^A = 19$)/experience-based ($K^E = 6$)/company-specific ($K^{CS} = 0$), supplementary knowledge (local knowledge) ($K^L = 0$)

The ratio between these numbers informs the unique individual profile between explicit/tacit knowledge and global/local knowledge. This profile may be communicated in diagrams as shown in Figure 16

$$\text{IC objects} \quad \frac{K^A 19, K^E 6, K^{CS} 0, K^L 0}{T25}$$

Academic knowledge $K^A = 19/25 \rightarrow 76\%$

Experience knowledge $K^E = 6/25 \rightarrow 24\%$

Company-specific knowledge $K^{CS} = 0$

Supplementary knowledge (local knowledge) $K^L = 0$

These percentages are related to the total number of individually owned knowledge objects and tell displaced managers and self-managers that the profile is academically founded. It is possible to produce various objective value expression percentages within each knowledge object or combinations of objects.

²⁴ Annex 2.

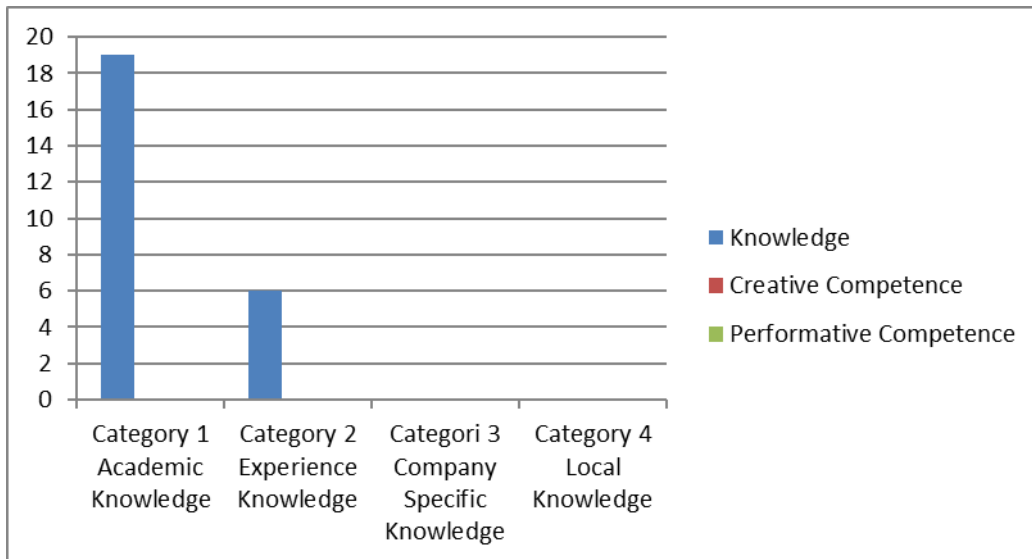
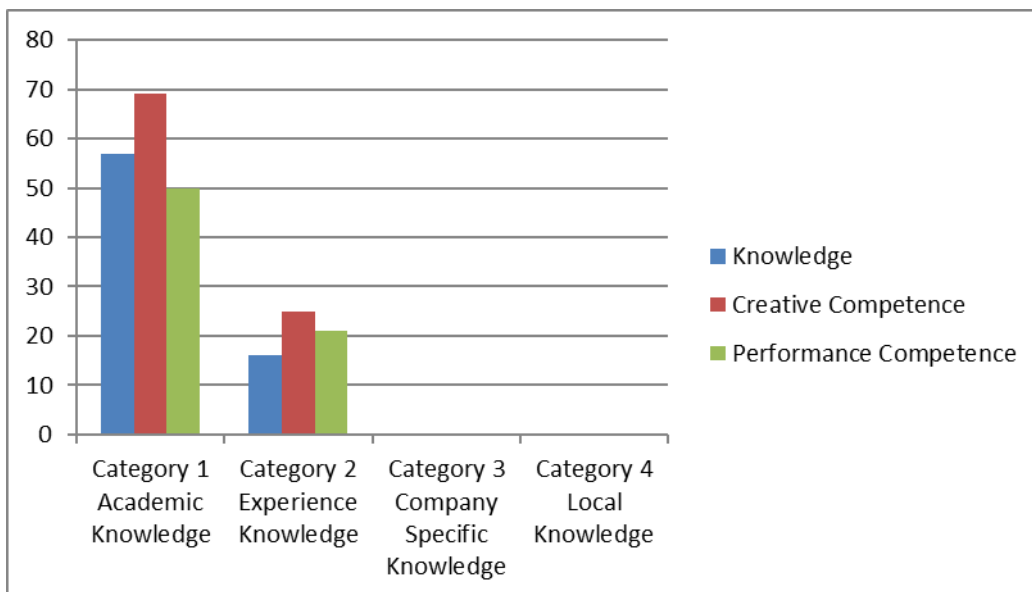


Figure 16. Graphic illustration of one person’s organizational knowledge supply, by author.

The Figure 16 informs about a stronger global knowledge (academic) profile, with some experience, but no local or company-specific knowledge²⁵. Levels of different knowledge categories are shown as a percentage of the total number of individually owned objects. It represents a person with very strong cross-disciplinary academic knowledge (K^A and 3) and long experience from private industry ($K^E = 3$). The percentages document academic strength at Bachelor and Master levels. K^E documents deep tacit knowledge in the objects’ sectors/business lines. Details in the IC capacity can be studied in the Personal Account Figure 15.

Including the competencies, the graphics look like this:



²⁵ The example has been cut to fit-the-page format and shows no noted values for “company-specific knowledge” or “supplementary knowledge,” which is local knowledge, because this screen-dump is taken from the phase of technical testing.

Figure 17. Graphic illustration of one person's organizational knowledge and competence supply, by author.

The Figure 17 shows graphically how the competencies, Creative/Performance Competence (CC, PC), are owned by the person, which Personal Account is illustrated by Figure 15, which provides more details about the competences. The person did not answer the questionnaire for 1 knowledge object, which weakens the managerial assessment. Performing in CC and PC level 5 in experience-based knowledge indicates that the person is able to combine knowledge domains and competencies at the top level in the mentioned industries.

The bar chart offers fast overviews, when several persons are at stake for choices or in situations of overviews combined with fast decision making.

Implications for the management of knowledge based on TICs, such as coordination, allocation, development of IC for innovation, diversity, product development, organizational development, globalization, etc. when using ICMCS are that the real-time N-F metrics provide management with shared, new fact-based information about HC ex ante and ex post. The information is about individual performance communicated – if wished - in shared managerial digital rooms, which allows for balanced optimization of exploitation (March, 1991), because a range of parameters are calculable and comparable as input at a distance: quality and quantity of the potential capacity in any chosen organizational unit, historic overviews, and forecasts. With concerns like diversity in teams, scarce resources, geographic content considerations, reflections on performance or innovation and capacity management, ICMCS provides output aiming to support complexity and heterogeneity in operations in an enabling system (Alder & Borys, 1996). The envisaging of these future processes, not being part of this thesis, may then rely on the structural K&C representations²⁶.

In dispersed companies, questions such as: “Is Northern Europe Region better equipped with level 4 in competencies than Asia?” are to be answered, and may be followed by decisions to design and activate local IC KPIs to motivate the development of competence level 4 in regions with reluctant innovation, or to keep an eye on scarce, strategic resources followed by a decision to open a premature staffing process globally within identified up-coming strategic knowledge objects to avoid global completion in this part of the IC.

Values for other accrued levels, such as regions/companies can be calculated.

Annex 2 shows how TICs are embedded in the software and annex 3 describes processes of operations based on TICs. Key processes mirroring financial value representations as knowledge budgets and knowledge accounts are designed to record and process data at the individual level from IC. The value representations needed on department or corporate levels are designed to be automatically aggregated-value representations of the noted individual values in TICs or in percentages. Information about the total stock of knowledge is centralized, searchable, and accessible in the Knowledge Bank, Module I. Stocks are accounted for in budgets and accounts, and Module II processes the use of individual knowledge and competence in flows of R&D and daily operations.

²⁶ Chapter 9.9.1 Limitations and Further Research 9.9.4

Module III is dedicated to the systematic and fact-based shared development of IC. Input to the module's output, which is strategic IC budgets for programmed periods, is collected from three categories: 1) internal demand for knowledge in future organizational development, 2) stakeholders' demand for future knowledge and finally 3) knowledge consequences for the firm in customers demand for future services, manufacturing, events and products. Please find further information in the Annexes.

One last screen dump from the produced artefact, ICMCS accounting system, is outlined in figure 18 below:

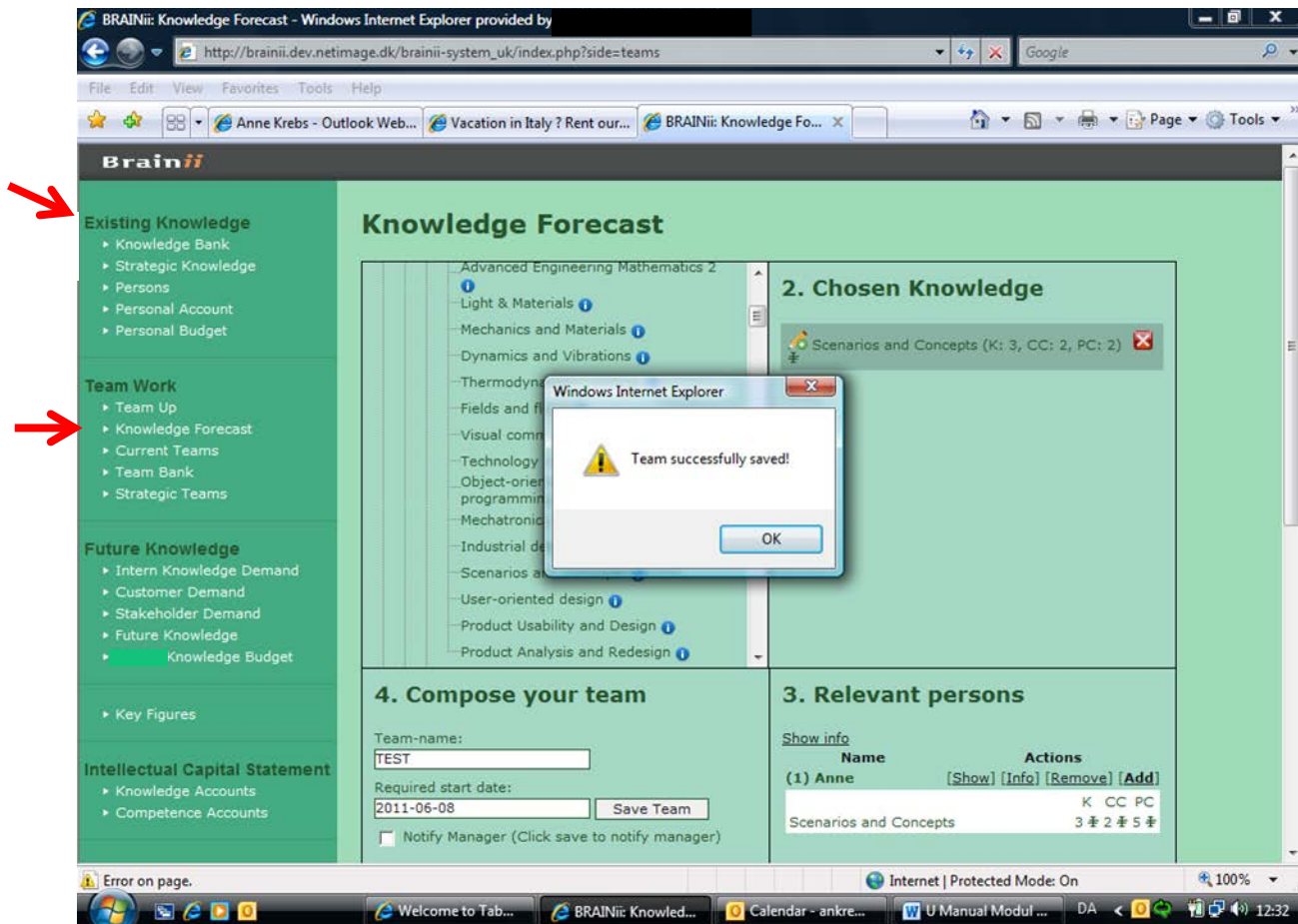


Figure 18. Screen-dump Module II, Team Work, Knowledge Forecast. Source: the author.

Figure 18 above shows how knowledge is selected in the Knowledge Bank and combined with demand for competences it represents future demands for IC capacity. It shows how the chosen knowledge search for and identifies relevant persons from the global database and outlines potential team members. The user explores horizontal and vertical values in the Personal Accounts of the identified candidates in order to calculate the most satisfying team composition, and then composes the relevant team. The team is approved or declined by the nearest manager, and saved in an organizational context of self-management. The potential team members are prioritized subtracting their IC supply in TICs from the demanding profile expressed in TICs to rank them according to their optimal closeness to the profile of demand. At a distance in time and space, it is thus possible to compose optimal teams having searched the stocks of IC.

Attended implications are that choices will delimit situations of inactivated strategic resources (IC slack) of IC or the lack of scarce resources— at the same time calculating optimal locations and backgrounds for successful cooperation. Moreover, that ICMCS may inform about the designed IC demand at the individual desk ex ante with no transaction cost/time, and at high speed. The information contains present and future intellectual preparedness of accessible capacity in IC stocks for the conduction of planned actions, informing *whether* a strategy makes sense in an IC perspective and *when* it is realistic to carry it out without running avoidable IC risks, if special knowledge and competence is acquired. IC forecasts may be useful for strategies-in-the-making (McGrath, 2013), because the real-time data service from ICMCS is flexible and dynamic, being able to reflect processes in-the-making.

Finally, ICMCS is assumed to be predictive. In processes of innovation, the system is expected to prove especially useful, because it manages ex ante often unmanaged knowledge-based processes that are considered very important to companies (Kao, 2009; Leitner, 2011; Majchrzak, Cooper, & Neece, 2004; Wu, Lin, & Hsu, 2007). Simultaneous management of individual knowledge and competence in innovation and daily operations, where paces and identities are considered different, is difficult {{572 Krebs, Anne 2012}}, but necessary (Tushman et al., 2010) and ICMCS's potential effects are considered future issues of research.

6.3 Conclusion

TICs have technically been implemented as the measuring elements of control in the digitalized IC management model constituting the ICA system. The model has been described and coded into software. Although the software has been relegated to a withdrawn role by higher priority business issues during the period of case research, the ICMCS software has, nevertheless, contributed to important elements of this thesis and contextually shown how non-financial calculating devices can be applied in the system of control. TIC is designed to represent values of individual HC in global operations and enable the allocation of these HC objects across locations. Simple and aggregated value representations and IC key performance indicators in real time have been developed to inform decisions of future comparing and planning HC processes as automatically generated system outputs supplementing the traditional financially based decisions. In the following chapters, the concepts of TIC and ICMCS are empirically tested. How the validations have been planned and will be carried out through apply of theories and methods initiates the following chapter.

Conclusion Part I

Part I firstly framed particular theoretical and methodological conditions for the conceptualization of operative HC/IC mechanisms in and between companies in order to understand the context for management of HC/IC assets. It defined the class of problems and secondly proposed two artefacts.

If patents and products, services and companies are the effects of applied knowledge, then less appropriate allocation of knowledge in operations will result in lower qualities in the output, which may be avoided in more satisfying processes of allocation.

Collaboration crossing borders is an increasing organizational necessary condition, which represents distances of geography, language, and contexts. Changes in business context outdate accounting practices, which consequently provokes accounting changes.

Precise practices of allocation imply systems of control, but financial tools only visualize and value some elements in IC. The problematization of economy as the global dominant paradigm of value control, ICA disclosures' uselessness and the lack of tools to manage individual knowledge as operational assets led to the research question;

How can individual knowledge become operable in dispersed, global contexts to support knowledge-based management decisions at a distance?

The IC literature review demonstrated weak focus on values of individual knowledge and problematized literature's notion of knowledge, because the processual, situated view hampers the release of the capital's assets. Theories are dominated by mixed notions of knowledge and competence, keeping it situated. KM does not consider individual knowledge as a strategic resource and many technologies require co-presence to share knowledge. Consequently, knowledge is often only shared locally.

Existing IC MTs were identified as unable to serve in dispersed, global settings, because the outputs are situated, partial, multifunctional, event-driven, and aggregated expressions that are often time and space dependent. Furthermore, self-assessed input is considered not to transport the truth. Implications for future knowledge representations were that they had to be objective, holistic, not partial, and represent one objective object in a continuum of unlimited time and space, and to be identifiable in unstructured contexts. They had to escape the dependency not only of time, but also of space.

The literature review identified gaps, which helped to look for contextual meta-requirements for the construction of solutions to the class of problems.

Comparing elements for coordination and control in the material paradigm, design elements for a N-F accounting concept aiming to make individual knowledge controlled and manageable were identified. Moreover, the financial guidelines for ICA from the International Accounting Association inspired the design of ICA. The guidelines propose a system of disseminated methods of value translations and value representations that globally aim to stabilize accounting practices.

Currently, IC values are sometimes interpreted as the financial difference between financial accounting books and the obtained sales price, only becoming visible when companies are sold (Druckman, 2013) although solid proofs for the assumptions are lacking. The thesis aims to find ways to operate visualized IC values *ex ante* as input to operations and manage operations based on the output from IC accountancy *before* companies are sold.

The IC literature review identified gaps, which created the conceptualizing phase, where proposals for IC value representations (1), TICs, were designed to visualize individual

knowledge and competence and a distribution system (2) generating accounts for TICs in dynamic operations represented in stocks and flows to produce N-F accounting outputs was conceptualized;

Part I is finalized by the construction of TICs, The Intangible Currency, positing generic methodologies to visualize and value individual knowledge and competence in measurement units and TIC's system of distribution, ICMCS, the Intellectual Capital Management Control System.

The accounting system includes technological mechanisms of distribution to exert IC accounting across distances. Part I assumes that TIC and its non-financial accounting system in collaboration with managers, becoming calculative selves, will coordinate and distribute individual IC in and between companies. By calculated IC allocations, the distribution of remote resources is attained, which probably ameliorate organizational competitive power and growth. Methods to test the instrumental artefacts designed to concretize the assumptions are outlined in mixed methods.

Values in operations are envisaged as being represented through two parallel paradigms of control, the financial and the N-F control, with the latter framing the underlying resources in the first. It is a logical consequence from the IC domain to maintain the economic vocabulary, because knowledge is considered operational assets. The N-F measurement units are designed like financial devices populating budgets and accounts. This finishes Part I.

The DSR approach requires the concepts to be tested in two dimensions, socio/technically, to verify, if it works. As the model was written in code using the TICs, they are, being materialized, able to be tested in a global company.

The global case company, GCC, is described in Part II as well as the methods used to validate the artefacts.

Part II - Validation

Part II comprises the validation of the proposed artefacts starting by describing the methods to test and validate the proposed artefacts of IC control. The validation consists of two chapters, "Testing of TICs in the Global Case Company" and "System Development Process."

Technical tests, which are required in processes of validation when applying DSR (van Aken et al., 2016) were conducted as contract-based activities between the IT supplier and the researcher. Along the processes of co-development within the GCC the output was adjustments which were carried out as technical changes in the concept of TICs and in the system of control, ICMCS. The conceptual changes were transmitted to the IT supplier as programmatic technical changes and tested before every hand-over and payment. Payments only were activated and confirmed after the final successful technical tests.

Chapter 7, "Testing of TICs in the Global Case Company" quantitatively explores by the help of proxies the sociological interface between the concept of TIC and managers to test, whether the chosen calculative elements of design will satisfy the qualitative and quantitative managerial requirements for data about individual knowledge and competence in logics of accounting. It is further tested whether TICs are able to address requirements of relevance, usefulness, and reliability satisfyingly for managers to decide and act upon the information at a distance. The answers are analyzed in descriptive statistics and collated with four hypotheses outlining assumptions about TIC's properties. If the hypotheses are not rejected, respondents are considered likely to use TICs as calculative devices.

Chapter 8, "System Development Process" presents and analyzes results from the longitudinal, qualitative case study, which adjusts and applies TICs and its mechanism of mobilization, ICMCS. The chapter is an anthropological description of events analyzed-in-the-making through ANT lenses. It documents how fighting agendas occurs, changing human and non-human actors' identities, thereby preventing the mobilization of ICMCS and processes of coordination and distribution of knowledge. The process is inaugurated through collaboration adapted in the longitudinal processes of change and testing, resulting in a customized version of the artefact fleshed out in ICA software, ICMCS. The case shows that financially based networks of MTs and routinized practices turn down the emerging N-F network, although the agenda is anchored in top management. During the period of testing the context has not remained equal. The chapter explains how exogenous variables and existing networks defend themselves in institutionalized practices impeding and preventing the deployment of N-F practices of calculation and the mobilization of the N-F accounting system, ICMCS. The testing of the technical interface between the GCC and ICMCS was completed and the social interface of ICMCS was partly tested in the phase of the co-developing collaboration accepting TIC and operations in the system, but the roll-out part of the test was terminated on the very day of the initiation.

Chapter 7

Case Context, Methods and Tests; TICs in the Global Case Company

7.0 Introduction

Chapter 5 proposed the concept of a generic measurement unit, TIC, distributable objects to represent dimensions of values of individual knowledge and competence online. The unit was applied and transferred to an accounting logic facilitated through software media described in Chapter 6, ICMCS²⁷. The accounting program was designed to make individual HC/IC capacity visible and accessible in global networks and individual knowledge and competence accountable in operations to instrument managerial control of HC at a distance. Written in code they became artefacts and can, therefore, be shared and exposed to case based testing.

²⁷ Annex 2 and 3 details the descriptions of the artefact and HC- based processes of operations

The vision of N-F accounting is that its instrumentality and logic may generate useful knowledge data from operations able to inform management ex ante and ex post about IC assets in operations. IC assets may then become managed, because the system output is driven by managers' need for appropriate qualitative/quantitative IC data in operations. Case-based methods are introduced to test whether the design of the N-F devices satisfies needs for calculations in the IC regime. If so, assets in IC may then be coordinated and distributed through knowledge-based decisions informed by the N-F accounting system.

The testing falls in 2x2 processes, first the technical and sociological tests of TIC and secondly the technical and sociological tests ICMCS. Mixed methods are used to respectively test TIC in quantitative methods and the co-development and implementation of ICMCS over 24 months using qualitative methods conducted in the case-based research.

The socio/technical interfaces between TIC and individuals when distributed by a digital structure has to be tested in both input and output situations. The devices only get coordinated and distributed if managers use the system and start calculating. The logic in the concept is that TICs - now mobilized as core components in a digital structure—represent intellectual values, which are relocated in the processes of selection and are accounted for, if managers start calculating. Management's movements and choices of allocations in the capital are processed and visualized as flows and stocks in budgets, accounts, reports, and dynamic performance measurements. These automated TIC outputs of IC are envisaged to be the future foundations for knowledge-based decisions about, first of all, the HC capacity, and then the owners of the capital.

Two surveys testing attitudes to the elements of design in TIC will be analyzed in descriptive statistics. The joint system development process in GCC is conducted to adjust and test the socio/technical interfaces in the IC management software. They are traced, discussed, and followed up by the registration of actions, documents, and tests.

Questions of validity and reliability issues in the chosen methodologies of value representation have been discussed. Proxies will be applied in the surveys to explore whether the elements of design addressing calculability in TIC effectively work, because knowledge as objects still is invisible before the system roll-out.

The two artefacts TIC and ICMCS have been designed and planned validated in line with the DSR guidelines. The next paragraph describes the organizational context for the case.

7.1 Description of Global Case Company

The following section contains a general description of the global case company, GCC. First, the company context is outlined and then strategies and existing MTs, related to management of HR (e.g. talent and knowledge) are explored and analyzed to find reasons why the structure is unable to answer questions like: Who knows what, where²⁸?

²⁸ Outcome from interview with president, January 2010

The GCC is a listed company, which initially had the perfect profile for providing case data: dispersed, global operations, development-driven, and ambitious. The company started as a local manufactory in the middle of the last century, ambitiously developing its processes of exportations to 50-60 countries in the next 20 years. It became a truly global player, manufacturing internationally, with more than 20,000 employees before 2010. The company story seems assimilated by the Danes as part of their identity, which explains some of the huge public effects of staff reductions some years ago²⁹. This event took place in the middle of this research and initiated a period of dramatic change for the company.

The research was formally commenced on June 30, 2008 when a president in the GCC signed the contract for this project. The same day the company's shares were traded above DKK 630. In the next two years, during this period of research, the shares were traded less than DKK 50. During this period the company's listed value changed from MDKK 11.275 to MDKK 6.253. The global market share dropped from 35% in 2004 to 12% in 2012³⁰. In 2010, however, the GCC increased its global market share to 16.3%. Today (2017) the GCC has reestablished more than 22% of the global capacity within their business area.

The financial crisis (2007- 2016) influenced the industry in many ways in terms of reduced general demand and more volatile public subsidies. Consequently, the GCC finally announced that it abandoned its present strategy of growth in Q3, 2011.

7.1.1 GCC's Business Context from 2008 to 2012

Dependent upon both private and public actors as well as local legislation, political environments, and agendas in the world, the GCC management capacity is highly specialized and complex. The company bridges every aspect of administration, production, transportation, security, maintenance, development, research, and business development in its sector. During this period, the GCC went from almost³¹ natural growth, expanding and building up capacity all over the world, into a forced, difficult consolidation/downsizing process, where the context was also colored by an increasing number of competitors.

A series of events occurred simultaneously and challenged the market position: increases in the internal costs and the costs of raw materials, less supportive political agendas due to the global financial crises, alignment difficulties in coordination and distribution of resources, a decrease in demand, and more competitors, to mention just a few. During this period of radical adjustment, the original culture of the company sometimes seemed to block the necessary decisions from being taken and/or executed (Boeker, 1989). In words from the GCC's website (2012), "expertise, willpower and passion" indicate a will to succeed, which is supported by repeatedly high employee satisfaction survey scores for intrinsic motivations as passion, commitment, and pride in working for the firm.

²⁹ On October 26, 2010.

³⁰ <http://www.bizjournals.com/>

³¹ 2004, a merger and acquisition process, M&A, was realized in the GCC merging 32% of the global market.

During 2009–2010, the production was not demand driven, nor was development³². The value chain was shared in a mandatory e-learning course for all newcomers, which taught that R&D and production were elements placed antecedent to customers in the value chain.

In September 2008, Lehman Brothers' collapsed, and the ensuing global financial crisis impacted the share value of the GCC. The sense-making and necessary managerial consequences of the financial crisis were only slowly realized, and for a period of time the company seemed to maintain two diametrically opposite world views: the official, communicated strategy and the non-articulated, a-centered, adjusting, local processes that dictated internal actions such as massive layoffs in the face of radical recruiting activities. In the following paragraphs, this development is noted as the expansionist Agenda I, and the consolidation Agenda II. Agenda I maintained the published strategy-linked actions directed at dramatic expansions in the short term within all departments, whereas Agenda II required opposite processes as downsizing within an even shorter term. Agenda I was public; Agenda II was not.

As a globalizing company, travel activity was high, both in terms of miles covered and hours spent, because management physically had to be present and engaged to ensure alignment in worldwide processes. Internally, a great deal of energy was devoted to structuring and leaning processes, and negotiating the integration and consolidation, which had become flawed and uncoordinated during the period of intense growth focus. The GCC had somewhat lost focus on costs and competition, which finally triggered new internal activities, because sales departments worldwide did not have the relevant IC capacity to handle competition. Sales plummeted, and throughput times were, at the same time, identified as pivotal metrics and were considered too long³³.

In an HC/IC-based view, the situation was a meltdown, because events internal and external to the organization forced management to act lightning fast, and often without knowledge of the actual state of the underlying resources. Global competition was a game changer, because it forced all processes to be reviewed and accelerated—in both an incremental and a radical perspective—processes that consumed thousands of internal man-hours. Innovation and new products were way ahead of customers, which is a telltale sign that development was not truly customer driven.

One of the first dialogues between the company and the researcher to identify a suitable research area instantiated the initial context. Top management was concerned about reducing time-to-production, length of time of new production sites, which was defined as the time span measured from the decision to enter a new country until the first product left the new plant. This was considered a key competitive parameter. The possible development of templates of modular knowledge processes was discussed, because the same types of knowledge were required for each new site: specialists on Geographic's, politics, economics, construction, logistics, and transport. Management estimated that the development of a suite of knowledge modules could

³² Intranet GCC

³³ Internal information

reduce time-to-production to 12 months, which might be attainable through the research project applying a HC/IC based view. The research project's business plan revealed that a time reduction of 1 month would yield a significant financial gain. However, the idea was left in favor of the project in this thesis. This little vignette illustrates the GCC's monocular strategic growth agenda at that time.

The HR preparedness of the GCC seemed designed primarily for administrative alignment purposes, and one effect was the focus on processes and general competencies in specific services or production processes. Change (and planning for change) seemed predominantly to be taken into account to consolidate the hierarchy of the organization. A key objective was the streamlining of the administration through a reduction of the number of administrative groups. Success factors did not measure whether HR preparedness included the capacity for radical change, because the organizational logic did not relate knowledge to work processes, but related it to competencies in job descriptions.

Knowledge was not on the agenda, it was embedded as competencies in jobs. An example: If a decision was taken to enter a new country, it was a no-brainer to design a group to explore the local sites, the political framing, etc., in order to prepare and plan the required actions. On a global scale, it was possible to search for employees native to the chosen country by manual request to HR headquarters, but combining a group with the relevant HC capacity was difficult, because people/job descriptions did not record knowledge in MT's data entry processes. The company was regarded as consisting of a number of jobs in which staff had to be capable of using a number of described competencies fitting the job position, rather than as a huge pool of human knowledge capacity, which, in suitable combinations, would be able to solve any task, all over the world.

The practices of the corporate HRM were thus aligned with the ontological and epistemological general status quo, as described in the IC literary review.

7.1.2 Fighting Agendas

In this sub-section, a situated organizational background is provided to understand the contexts for the case outlined later in the chapter, "System Development Process."

Located as a researcher in the corporate HR department, the view and the collected data derive from a department that is often labeled a "support function." In this company, however, the HR department was ranked (i.e. assigned status) as equal to departments like "production" or "finance," and the head of department, a president, was member of the board of directors. For this researcher it meant being close to powerful agendas in the executive layer of the organization without necessarily being directly informed about them. In the HR department, the noted gap between different organizational agendas for the first time turned into a wordless collapse in the days immediately prior to October 26, 2010, when nobody still seemed fully to realize the consequences. This date turned out to be important as it indirectly heralded the commencement of the cost-cutting downsizing process in the GCC without deployment of any word-born statements. Mirroring top management's gradual and hesitant acceptance of the need to downsize the HR department executed the lay-offs and continued to build up IC capacity

elsewhere. Other departments and regions were still increasing capacity according to the public growth strategy; for example, constructing and buying plants in the UK, but from then on plans were repeatedly announced within the HR department to cut staff, plants, and production in the years to come. The views and actions in Agenda I and II competed for some time, and the HR department acted out this dilemma by cutting a large percentage of staff in the Danish HR department using a competence argument (Agenda II), while at the same time building up executive capacity by establishing a new corporate HR department in Switzerland (Agenda I).

The delivered argument in the Danish corporate department for following the expansive agenda elsewhere was a geographical and qualitative one: Globalizing—the foreign location was more central to important global infrastructures and more attractive for the segment of recruiting new staff. The narrative was that it was not easy to get the right global competencies to move to a highly taxed northern Denmark.

The HR strategy up to Q3 2010 was shaped by the predicted fast growth, the forced speed of globalization, and no significant competition, as illustrated by Agenda I. During 2010–2011, the fight of agendas became increasingly visible identifying October 26, 2010 as the day where Agenda II manifested itself through a series of actions and events. Agenda I was challenged by misalignment and sub-optimization between organizational units, redundancies in staff training processes, new courses in the corporate academy, and massive time- and money-consuming alignment processes. But first of all it was challenged by declining markets. The aggressive plans for a global presence challenged the speed with which new plants could be acquired, because the myth was that “everything produced is sold”, because the GCC was used to customer waiting lists, and “We have no sales force here, only accounting employees engaged in taking orders from waiting-lists.”

Approaching October 2010, both the management and the organization changed. One tangible manifestation was that meeting rooms in corporate HR that had previously been available for scheduled meetings were suddenly occupied by internal and external staff required to— as it turned out— plan the forced organizational reductions. However, first of all they had to identify the names of the 3,000 employees that were to receive the piles of redundancy letters printed on the newly installed extra printers at the executive fourth floor of the HR department. The letters announcing the layoffs were printed in secrecy and distributed on October 26, 2010, producing instant employee and press uproar.

This was the first tangible sign of an invasive Agenda II. For more than a year, signs of the struggle of agendas could be noticed. High-ranking recruiters searched the world to staff the new HR department in Switzerland; they held meetings and allocated resources to execute the growth strategy while, at the same time, operational units were downsized or closed. In November 2009, many employees could autonomously decide when to travel, supported by a centralized corporate travel agency. This did not change until 2011 when mandatory processes of travel approval were introduced. Most travelling was cut out during 2012 and the Swiss HR location was closed down.

Staff disappeared from operations; one of the first visible global actions to reduce costs was to outsource the global Danish help-desk IT functions to Asia. The outsourced help desk service immediately turned into a nightmare of lost time and misunderstandings as a result of lack of knowledge and competence; waiting for answers generally slowed down processes worldwide during the first several months. Outside IT, whole departments and plants disappeared, were outsourced, or closed. The remaining staff was exploited to their limits, because of the two competing agendas, which also induced mistrust, dissatisfaction, and fear of redundancy. The hierarchy grew more prominent, and autonomy and decision power was forwarded towards the executive apex. No one seemed to have the courage or will to decide anymore, but used hierarchical reference to escalate every unresolved issue upwards. This unnecessarily multiplied transactions and slowed down business processes. As the markets diminished, global sales forces were established and new processes created to initiate an active interaction with the customers. This was new to the company. It continued to produce, but now to stock, which together with the enormous investments required in Agenda I, dangerously reduced liquidity.

In this changing business environment, the conditions for research changed too. Accessibility to the company for the researcher was lowered from 100 percent to virtually nil in a short time, and the consequences of Agenda II severely influenced operations. The unspoken, sliding transition from Agenda I to Agenda II significantly influenced this research, which is thoroughly outlined in the chapter about “System Development Process.”

7.1.3 Existing Context-relevant IC Technologies in the GCC

The IT department of the GCC had far-reaching structural power in terms of the IT architecture of the GCC, and had established formalized standard procedures requiring every structure-related decision to be approved by the department prior to its implementation or support. This added bureaucratic delays of applications and approvals to this research project’s timeline, which could not be met by the project’s own time-line. On top of this, the case was based on conjoint development, customization, and pilot testing before decisions of interfacing the system could be made. Therefore, the president, as company sponsor of this project, decided to run the research-related interventions without involving the IT department. An external supplier was engaged to execute the output from the system development process; that is, the writing in code of changes and the additional features of the system. This decision was taken to increase the probability of a timely conclusion of the research plan, but at the same time created potentially serious pitfalls, because new GCC participants were increasingly worried that the IT department was not involved. They felt that the project was clandestine and subversive. When subsequently discovering the project and its own non-involvement, the IT department did indeed turn into a hidden actor against the project and did not refrain from obstructing the project in various ways.

Figure 56 in Annex 1.5 proceeds with an exploration of the MTs—territorial stakes of the IT department—that are relevant to the IC management³⁴ of the GCC. The company has acquired a battery of technologies, which are loosely coupled in that they have few variables in common and are weak in terms of IC management (Dechow & Mouritsen, 2005):

“Glassman (1973) wrote that loose coupling is present when systems have either few variables in common or the variables they have in common are weak. Weick defined loose coupling as a situation

³⁴ Interfaces between the concept and existing technologies in GCC are sketched out in the Annex 4.1 to illustrate the differences and the theoretical potential for the integration to existing KMTs.

in which elements are responsive, but retain evidence of separateness and identity. Later, he wrote that loose coupling is evident when elements affect each other 'suddenly (rather than continuously), occasionally (rather than constantly), negligibly (rather than significantly), indirectly (rather than directly), and eventually (rather than immediately)'." (Orton & Weick, 1990, p. 203)

When systems are loosely coupled and none of them holds data relevant to generic IC management, then the total architecture is not able to interface occasionally to any system to provide support for the management of knowledge and IC. Thus, the characteristics and labels of loosely coupled systems can be applied to describe the GCC's coordination and distribution of HR. The figure 56 in Annex 1.5 provides an overview of existing HR MTs within the GCC, their data, and interrelatedness. As of September 2011, 15 different technologies were in use, all of them more or less embedded in structural capital. A few emerging technologies like "diversity"³⁵ and "from good to great" (no. 13 in the table) were not yet provided with any IT structure, but the actual diversity project was supported by fact-based analyses. Figure 56 shows existing HR MTs within the GCC, which are system-supported in loosely coupled systems as they have few or no variables in common and, therefore, are incapable of providing management information about individual knowledge capacity. None of them is capable of generating real-time business information, BI, for IC management across locations³⁶.

In this range of different technologies, which are loosely anchored in the structural capital, "financial accounts" is the only technology to be named a system in the sense that it comprises every aspect of an IT system: data storage, databases, data retrieval, data transmission, and data manipulation. Furthermore, it is the only accounting and control system mentioned, because it is concerned with providing data for management that work with:

"... the definition (1) of goals and the measurement of goal attainment (2), not just financially but also in terms of meeting all stakeholder aspirations ... evaluating organizational effectiveness (3). The second is closely connected with issues of strategy formation and deployment, and with very practical issues of business process and operations management. (4) It represents the codification (5) of the means by which objectives are intended to be attained. The third question is providing data to practices such as benchmarking (6). The question has tended to be neglected by those concerned with performance measurement as being in the purview of the human resource management function. However, the inter-connections between the two fields need to be better recognized to avoid the many counter-productive examples of short-termism driven by financial incentive schemes that are seen in practice. The final question has been considered in part by MIS and MCS specialists, but still needs to be better linked to issues such as the 'learning organization,' employee empowerment and emergent strategy." (Berry, Broadbent, & Otley, 2005; Otley, 1999)

The quote accounts for management control systems as comprised of definition of goals and the measurement of goal attainment, data to evaluate organizational effectiveness, overall support of business process and operations management, codification of the means, and benchmarking. The financial management accounts instill comparability to otherwise non-comparable activities across the company, both horizontally and vertically in time and locations, and maintain the financial narrative through frequent value representations ex post and ex ante of all processes

³⁵ GCC presentation and analysis.

³⁶ For further description see Annex A4

(Sarker et al., 2006). Financial accounts are integrated in most other activities, whether they are IT supported or not. It is noteworthy that this overview of existing technologies within the GCC contains no traces of data of individual knowledge and competence.

Consequently, there is no IC predictability in the IT architecture, and the systems are incapable of documenting individual IC in reports, or its application in operations. The survey-based, numerical, N-F information (e.g. employee satisfaction) is compiled in push modes, typically annually or biennial; thus, not in real time. The effects of any corrective action are collected and entered, determined by the scheduled surveys rather than by the current needs of the organization, and this obviously leads to a slow pace of adaption and repair. For the sake of completeness, other parts of the organizations may well employ or be in the process of developing more complex MTs; for example, “management cockpits” (Daum & Schou Nielsen, 2003).

The MT review indicates that there is the potential for measuring individual knowledge and competence encompassing the range of technologies, which deals with various corporate aspects of people management, because objects of individual knowledge and competence theoretically are hidden, invisible variables in most of these technologies. This result is further analyzed next.

7.1.4 Two GCC-Initiated Pilots

Returning to the description of the GCC, this paragraph outlines two local pilots that were conducted in 2010 in the HR headquarters in the above-described IT context. The worldview of knowledge in the GCC was job and competence based. The composition of teams most often relied on mutual relations built upon previous work experiences and personal preferences; that is, limited to a small number of usually co-located colleagues, and not anchored in IT structures nor systematically knowledge based³⁷. However, in November 2009, after the launch of this research project, another local GCC pilot study conducted by the local administration using a newly developed template for registration of more extended, job-related competencies was run in a small population in the local corporate HR department, becoming the first material sign of concerns for the registration of individual competence in the GCC. By studying this template in an ANT perspective, as a non-human actor, to reveal potential immutable mobiles able to impose order (B. Latour & Woolgar, 1986) in IC, they proved difficult to identify because no effort was exercised to translate substance “into a figure or diagram which is directly usable by one of the members of the office space” (B. Latour & Woolgar, 1986, p. 51). “Office space” anno 1986 should most likely be understood as “global office space” in and after 2009. The data stayed context-specific, result of self-assessed processes and local business context as information that will change interpretations in other regions of the world, even within the same company. The quality of the individually owned knowledge was blurred in the notion of complex job-oriented competences. Therefore, information in a sheet of competence mapping was unable to act as an immutable mobile, even if mobilized, which it was not.

The example reveals the job-and-competence driven organizational perspective linking IC registration to the firm’s values and functions. Self-assessed, the information ranks low in

³⁷ GCC examination.

reliability (Andriessen, 2004b), and is often negatively or positively biased by personal valuation (ibid.). The choice of media and individually typed-in data prevent automation and require a process of manual analysis to be transformed into BI. The intermixed notion of knowledge and competence can be searched, but cannot enter into aggregated representations. The searchable body of IC is restricted to certain processes and functions, thereby restraining mobility and agility of the data. For managers to relate to the representations of generic IC, they need to engage in a process demanding several actions in the existing IT architecture, because (1) the stored competence information is situated, local, intertwined and superficial, and is usually a spin-off of from technologies focusing on HRM processes, such as talent management and career management; (2) there is no vehicle or distribution device connecting the decision maker to the remote IC capacity; and (3) the process of analysis in the GCC delays IC BI by several months.

Similar conditions were found for another HR template used in another small pilot study in the GCC during 2010–2012, which was also initiated and conducted locally. The template did not get activated and put to general use in 2010 because information about knowledge was not considered important, at least by the managers³⁸ in charge. Later, during 2010, a manager in the HR department decided to investigate its suitability. In an Excel spreadsheet, a small population recorded typed-in information on educations and some work experiences, but the main effort was reserved for the recording of firm-dependent information to manage talent and careers. The template registers “education” as typed-in data in the format of “education levels.” The disciplinary content of the education was not entered. The template offered individual freedom to name different kinds of educations, but local names would only generate local understanding. There was no general classification to introduce a global order, and the typed-in data was present in datasheets, but could not take part in the construction of BI.

In both templates, the human and non-human actors are identical as objects and subjects, because knowledge and competence cannot be separated from their owners, they are mutually interwoven. Therefore, the values do not get objectified and the data are unable to deliver information about personal capacity in terms of knowledge and competence in such a way that would enable allocation processes and team formation at a distance. The organization’s expressed demand for knowledge about “who knows what, where” cannot be met, and the sheet cannot provide data for management across locations, because knowledge values are invisible, not objectified, unvalued and inaccessible.

For these small pilot populations, data was placed in spreadsheets deep down into the HRM technology of the staff. Individual knowledge and competence did not enjoy separate identities as objects for management in the IT structure, but as a spin-off from HRM activities like talent management and career ladders. As a consequence, access to the data sheets was restricted to the corporate HR administration department; it was not designed to be accessed by individual employees worldwide. A search to find out who knows what, where- had to be authorized by the administration process owner, but would have been futile. There were no functionalities linked

³⁸ Minutes from meeting with the manager in charge.

to the spreadsheet, and the information could only be updated by human actors typing in the revised or additional information. It did not consider IC as asset in operations across locations and did not make it accessible or transportable.

The story of the pilots adds, in an ANT perspective, some explanatory power to the above analysis of the IT architecture by pointing out that immutable mobiles for individual knowledge and competence, as well distribution devices, are lacking as devices of control. The conclusion here is that the actors cannot connect to the IC values and manage individual knowledge, because it stays black-boxed and undistributed in the existing MTs.

This analysis shows that the attempts of the two small corporate pilot studies to coordinate and distribute IC in the GCC did not provide the means to share knowledge beyond the limits of physical presence, which confirms the result of referred examination, and offers a causal explanation. So this question was unraveled from the actual research question:

How is coordination and distribution of individual knowledge instrumented?

The study of the interrelations between existing IT technologies detailed the context for change. In spite of a solid, global IT preparedness, human actors were not able to activate any devices to manage individual knowledge and competence at a distance, as shown, because they did not exist.

The paragraph described the business context in which the validations of the proposals of TIC and ICMCS are carried out as case-based research of engaged scholarship (Van de Ven, A. H., 2007).

7.2 Theories and Methods

7.2.0 Introduction

In the previous chapters concerning research strategy, literature reviews and the design of TICs and ICA, the elements in the thesis' progress was not only introduced but also argued. The research strategy chapter introduced concerns about validation of concepts developed within DSR by outlining the need to verify that the concepts actually work: the concept of TIC is as managerial devices socially tested whether the embedded elements of design will make TIC act as calculating devices. Technical tests are conducted as well addressing the concept of TIC and the concept of ICMCS. This paragraph details how the quantitative and qualitative methods will be used to test the concepts of respectively the non-financial measurement unit and the non-financial accounting system.

Although Design Science Research (Hevner, March, Park, & Ram, 2004; Simon, 1996) DSR, is considered an engineering, socio-technical approach, there are two main components in the process, a human social aspect and a technical aspect. When following the CIMO-logic: "For this problem-in-Context it is useful to use this Intervention, which will produce through these Mechanisms the Outcome" (van Aken et al., 2016) the social aspect in the thesis' problem is regarded as represented by future interfaces between managers/individuals and the digitalized knowledge representation distributed by web technology. The measurement unit, TIC,

representing the IC assets (the values of knowledge and competence objects residing in individuals) and the technical aspect is represented in structures designed to visualize, value, distribute and coordinate individual knowledge in accounting systems and at a distance. The design therefore comprises ways to translate individual knowledge to technological systems in global, generic contexts, which, when operated generates output in interfaces which are considered socio/technical interfaces and which have to work.

The CIMO logic transferred to this context places the RQ in the following rationale: the problem-in-Context (1), Intervention (2), Mechanisms (3) and Outcome (4).

There are two problems in the question: how to represent accountable (reliable and calculative) knowledge in dispersed organizational contexts in recognizable, objective and absolute expressions and how to structure accountable knowledge in an accounting system in order to control and manage the represented assets.

Ad 1 In HC/IC and KM theories knowledge does hardly appear as individually manageable, although presented in IC as assets in organizations. The assets cannot become activated and seem assumed to stay inactive and not get coordinated and distributed according to the demand for capacity. This is viewed as a problem causing inefficiencies that are assumed to hamper financial profitability (Andriessen, 2004b; Bontis, 2001; Jensen & Meckling, 1995; Stewart, 1997) .

Ad 2 An Intervention in the shape of the implementation of a non-financial accounting system is argued to be useful. Roles models are searched for in the material paradigm based on successful theories and practices and artefacts are, as results from the developed concepts of TIC and ICA, sought implemented in a global case company.

Ad 3 Mechanisms like calculative devices are shown in the neighboring financial capital to effect coordination and if applied in accounting systems, distribute the capital. Similar mechanisms designed for the IC are to be conceptualized.

Ad 4 The capital, being value represented in calculative devices, accessible and distributed by technology, calculated and made visible in outputs from the IC accounting system, decided upon and managed in an organizational context, is in TICs coordinated by managers' choices and distributed by ICA in order to produce an outcome with higher financial profitability with than without the system.

Firstly, the focus is on methods to clarify the sociological interface, concretized as the interface between individuals and TICs. It will be tested whether the properties in TICs are satisfyingly relevant and informative for individuals to calculate future outcomes at a distance. The social interface works in the conceptualized way when it is used to coordinate knowledge. But, managers at a distance have to choose to use it. The choice is dependent of the outcome, which is described as a trade- off: If the user profits more in lesser time this tool (accounting system) will be preferred to no tools or other tools (O'Grady et al., 2013). The character of profit is in the first place non-financial as speed, quality and fewer failures. The construction of social evidence

unfolds in the theoretic realism, where surveys run in the GCC. Quantitatively, they will provide data about the respondents' attitudes to TIC's properties. Proxies representing the properties are applied, because the accounting system has not been implemented yet and TICs cannot be referred to similar, distributed measurement units, because they do not exist.

Calculative devices in financial contexts are explained to "work", because they have features like "prices", which satisfy the self-optimizing properties for "the economic man" (M. Callon, 1997; M. Callon, 1998a) well enough to connect, compare the properties i.e. prices and thus keep these systems together. The social interface will thus probably be guaranteed, because actors are shown to possess an inherent urge to find the best "price". Callon explains, but in an Actor Network Theoretical perspective, this sociological interface between the financial device and the human actor as crucial for the connectivity and for the creation of markets and demonstrates it as an obligatory requirement for the generation of output. Calculative devices in non-financial contexts are as previously referred, challenged by having no price mechanisms.

It is therefore quantitatively tested, if the identified properties of the proposed design of a non-financial calculative device are satisfyingly attractive to keep the non-financial structure together to create output. If this can be trusted then it is probable that the N-F accounting system will work and generate output. The method thus addresses only the design of The Intangible Currency, TIC, representing values in objects of knowledge and competence. The responses will be analyzed in descriptive statistics demonstrating the respondents' attitudes to the proxies.

Secondly, the socio/ technological interface is concretized in the GCC as the interface between employees and the actions and choices connected to digitalized representations in the non-financial accounting system showing values of individual knowledge before and after operations. In the ex-ante processes of resource allocation in teams, management will make decisions based on TICs, if it trusts the calculative devices' ability and power to correctly represent the relevant properties of individual knowledge and competence. To test the use and outcome of ICMCS it has to be implemented. This process required a longitudinal study, which will be outlined shortly.

7.2.1 Proxies and sub-theories for Surveys

This paragraph presents a few sub-theories apt for the construction of proxies, which use was argued above and explains how they are relevant to the construction of questions in the surveys, to the construction of TICs, to the construction of hypotheses and evidence and to create viability for the tests in the GCC.

The sub-theories of "self-management" and "management at a distance" are introduced to socially test the concept of TICs, because they contain the relevant theoretical elements, and locate authority to decide and act at the individual level. As the construction of social evidence unfolds in the theoretic realism, pragmatism is exerted in the case when aligning to top-management's proclaimed local business purpose, which practically makes the case workable³⁹.

³⁹ Top-management introduces the tests to the populations by referring to the acknowledged need to improve "self-management", viewed in GCC as various problems in "remote management". The argument in practice was that enhanced self-management requires less remote management.

Using proxies is an often applied method in accounting research (Young, 2013). “Self-management” is about individuals making decisions (Alves et al., 2006; Manz & Sims, 1980; Neck & Houghton, 2006; Staples, Hulland, & Higgins, 1998) and “management at a distance”(Dechow, Mouritsen, & Granlund, 2006; Harvard Business Review Press, 2011; Malmi & Brown, 2008; Maznevski & Chudoba, 2000; Moser, Brenna, & Asdal, 2007) concerns managers making decisions without being present - both of which have an individual take-off. This sub-framework of theories informs the wording of the surveys and thereby inscribes relations or connectivity between design elements embedded in TICs in a managerial context of decisions and choices of knowledge and competence. The theories explicating the elements and thus enabling the construction of hypotheses to be tested in the surveys, and the causal model of hypotheses, are outlined next.

Secondly, the surveys of self-management and knowledge use proxies (ad1) which have been constructed based on the mentioned sub-theories. They reserve choices of collaboration to individuals. The proxies are constructed so the design elements in the sub theories correspond with the elements in TIC.

Theory of self-management was used to construct proxies, because TICs being not yet exposed to firms cannot be validated as implemented, existing tools and facts. TICs are designed to represent potential future managerial choices of individual knowledge and competences in processes of allocation in organizational contexts. The respondents have never practiced such choices and never been acquainted to the concept of TIC, and they have never made the like qualitative choices nor seen an ICA system.

The proxies contain and represent the characteristic elements in TICs designed to visualize and value individual knowledge and competence, which make ex ante decisions about allocation of HC/IC at a distance possible. The objectified HC in TICs is unfamiliar to respondents, so understandable questions familiar to the global population were developed in a theoretical context familiar to the population. Theoretically, the questions are explained and documented as elements of knowledge and competence in the theories of self-management.

The hypotheses are not being disconfirmed and they indicate that the calculative device, TIC, may be strong enough to be part of an accounting network and keep it together. If the respondents showed no interest in the choices and no will to act differently as a consequence to the new insight and taken decisions and choices, then the IC accounting system would not be able to keep together and the coordination and distribution of IC would not happen.

The surveys, provided as social evidence that TIC will work, shows a global population interested to choose other collaborators than the ones they have now. This implicates that they would allocate differently. The data demonstrates the respondents will to connect to the most relevant HC supply for their work activities, if they have access to overviews, reliable data and comparability, which the qualitative elements inherent in TICs provide. When the accounting system is kept together it is designed to coordinate and distribute IC in more satisfying ways

than the financial control paradigm and HR technologies by exploiting the relevant, undistributed HC through managerial efforts.

TIC's social validation is a prerequisite test of this artefact before the social testing of the artefact no two, the ICA system. The surveys show that TIC is valuable to the global respondents, because they will spend time choosing to obtain more satisfying work results. In this way TICs probably will be used and the IC accounting system probably may become valuable to the firm through the more conscientious, efficient exploitation of IC resources.

With help from the mentioned sub-theories about self-management (Manz, 1980; Neck, 2006; Staples et al., 1998) and remote management/teamwork (Behfar, 2008; Cordery et al., 2010; J. F. L. Hong, 2010) proxies are thus used to analyze the valuing elements' power to mobilize TICs in the potential processes of ICA. The answers furthermore indicate the respondent's (future users') attitudes toward a system providing IC transparency/calculability, not yet implemented. Proxies represent the calculative elements in TICs which theoretically connect the answers to the theories illustrating managerial decisions and behaviors addressed in the hypotheses. Proxies explicate in this way the interfaces between TICs and the decision makers illustrating the social dimension of the validation of the concept of TIC.

In Figure 19 and 20 below, the mentioned sub-theories are illustrated to visualize embedded elements of design in substituting set-ups. The surveys test whether these elements are attractive in social cognitive fields (Manz & Sims, 1980; Neck & Houghton, 2006; Shuck & Wollard, 2008; Staples et al., 1998). The theories identify relations between self-leadership strategies and individuals, teams, and organizational performances, which is helpful, because strategies are shown to frame expectations between individual knowledge and competence, behavior, and management/self-management:

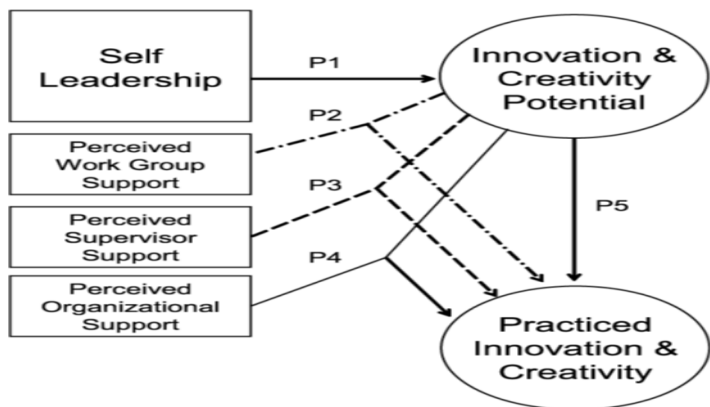


Figure 19. The importance of self- and shared leadership in team-based knowledge work. A meso-level model of leadership dynamics (DiLiello & Houghton, 2006).

The validation method includes the relations between the constructs in the model in Figure 19, because enhanced awareness of knowledge (Argote, McEvily, & Reagans, 2003) is supposed to influence self-management and to relate positively to individually based IC transparency (Cowling, Newman, & Leigh, 1999; Manz & Sims, 1980; Neck & Houghton, 2006; Rochlin,

1989; Shuck & Wollard, 2008; Staples et al., 1998), which TICs are designed to provide. The construct of self-management has been defined: “A person displays self-control when in the relative absence of immediate external constraints, (s)he engages in behavior whose previous probability has been less than that of alternatively available behaviors” (Manz & Sims, 1980, p. 362) and “an individual, who comes to act as a self-regulating calculating person” in the construct of the “calculating self” (Miller, 2001, p. 381).

The important issues to measure are whether the respondents choose differently and change collaborators if they identify and can allocate “better” knowledge and competence for their own tasks. This question addresses the quality of the design elements in the IC value representations and their power to influence the future decision maker at a distance. The implications are that if the measurement units acts as market devices by giving trust to remote knowledge through the users’ new behavior (choices and decisions of IC allocations) then the concept framing the underlying resources, HC in IC, represents and activates hidden values informing managers (self-managers) more perfectly about the extended, dispersed market of knowledge and competence (in and between companies), because the underlying resources through generic methods of visualizations and valuations are made calculable. The attitudes towards these kinds of considerations are to be uncovered in the surveys to indicate whether TICs, the conceptualized measurement unit, will act as a market device by the optimization of allocation practices, which are the concrete operations (allocations) of more satisfying matches between the offer and the supply of individual knowledge despite its location (M. Callon & Muniesa, 2005).

The sub-theories condition the questions in the surveys and entail four hypotheses. Recalling the relations between the project assumptions and the logic of the measurement model—as there is substantial evidence for a positive relation between the degree of self-management and successful remote management (merged), and relations between awareness of IC capacity and self-management (Neck & Houghton, 2006)—the model Figure 22 expresses the assumption that if self-management and awareness of knowledge is enhanced then the transparency. TICs are accessed in the concept of an ICMCS assumed to enhance the GCC’s competitive power, because the deliberate, intentional allocation and use of measured knowledge and competence objects is optimized through management’s coordination and distribution of HC across entities. It is assumed to happen without increasing costs noticeably, but this question is referred to future research.

Figure 20 below outlines the tacit knowledge element, experience, impacting self-leadership, behavior and performance.

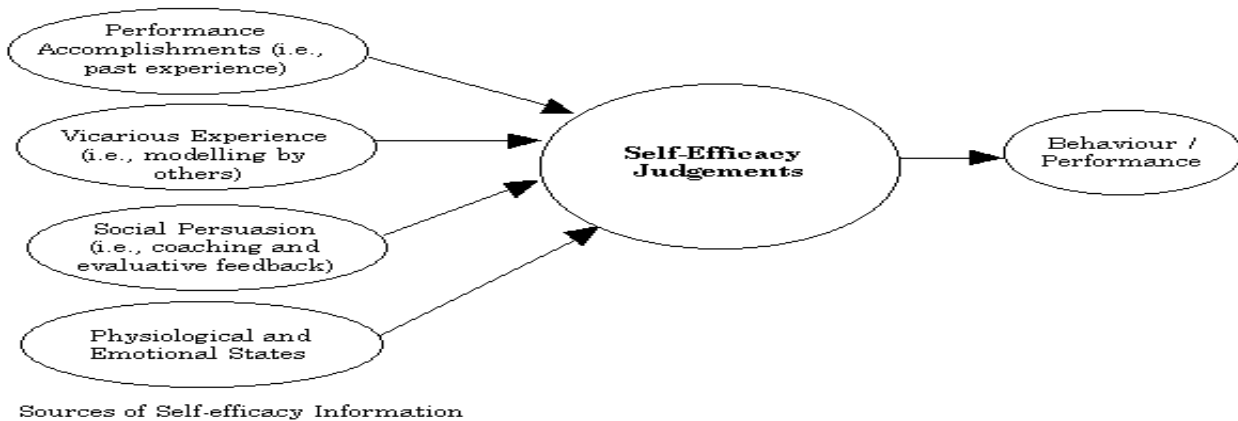


Figure 20. A self-efficacy theory; explanation for the management of remote workers in virtual organizations (Staples et al., 1998).

Figure 20 explicates relations between the different species of knowledge and competence pointing out the linkage between tacit knowledge and the capacity to act. These are also elements shown in Figure 21, where additional elements between self-leadership strategies and improved individual, team, and organizational performances are inserted in a model (Neck & Houghton, 2006); these relations are reformulated as questions in surveys:

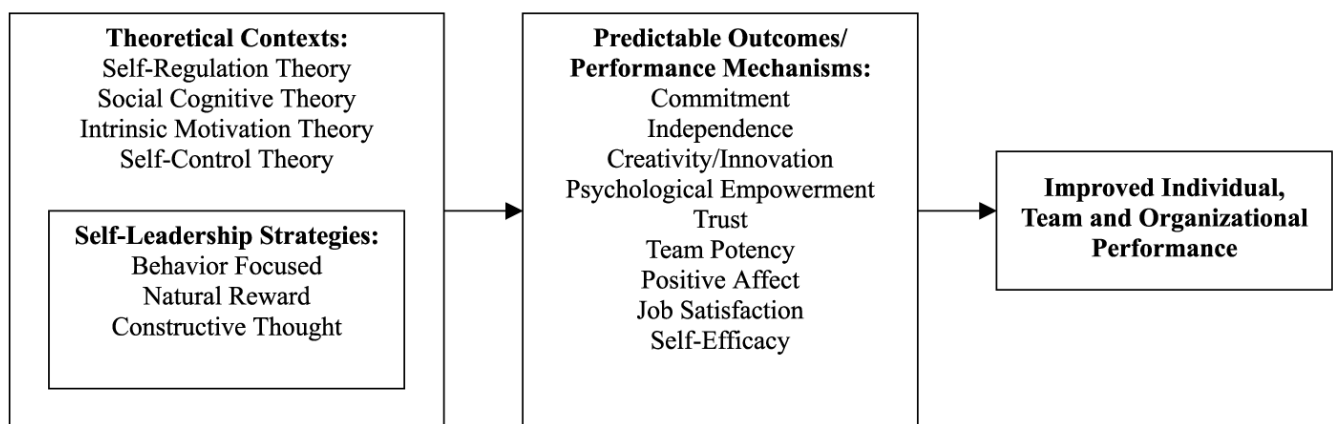


Figure 21. A model of self-leadership, theoretical contexts, and performance mechanisms (Neck & Houghton, 2006).

The elements of behavior informed by the theories of self-efficiency displayed in Staples’ model , Figure 20, are recognized as decomposed elements informing self-leadership strategies in Neck’s model, Figure 21. He adds the notion of performance mechanisms, which are helpful to the field of this work, because the two models connect and relate questions of individual knowledge and competence, transparency, and remote management.

Does the test population expect competitive advantages to be created through IC management? The question is important, because Staples discusses prerequisites for successful applications of IT tools; If IT-provided IC transparency does not offer attractive opportunities to optimize the individual employee’s own efforts then knowledge and competence will stay immobile and

local, because few accept spending time with a system that does not provide relevant value on their own desk (Lynn, 1999; Sarker et al., 2006). The following hypotheses: “If managers mobilize devices able to make IC assets travel due to the provided organizational transparency and access, then competitive advantages will occur” is therefore only provable, if a population, having no experience with IC devices and control programs, expects a positive outcome from the use of such a system. Under these premature circumstances of invisibility of knowledge and, therefore, no predictability and lack of expectations for the investment, the surveys are also designed to explore the demands and attitudes to individual knowledge and its use as well as to self-management/self-efficiency (prerequisites for remote power of decisions) in the population.

IC assets as objects of individual knowledge and competence are presupposed as integrated, black-boxed elements in the two theoretical models above, labeled as elements of “performance,” “experience,” “persuasion,” and “individuals, teams and organizational performance.” The purpose of two surveys is to explicate attitudes to the identified meta-requirements and design elements of visualization and calculation of individual knowledge and competence through the answers. The developed IC software using TICs has not been deployed in the population yet, so the questionnaires ask questions about invisible, tacit elements in order to identify current attitudes to the planned, future event: the deployment of practices of management of individual knowledge and competence structured by TICs in ICA.

7.2.2 The Quantitative Tests and Hypotheses

Through the use of proxies the analyses of the surveys thus explore the design elements in TIC and their assumed organizational capabilities as calculative devices. The proxies’ mutual relations and their capability to optimize remote management by means of enhanced elements of self-management through the access to insight (overview), decisions (choices), and actions (allocation), which is outlined in the future TIC regime, are studied.

As the surveys ask questions in a generally unknown field using words of many interpretations, the surveys are initiated by two open questions to identify whether the multinational, displaced population has a shared perception (Hofstede et al., 2010) of the key notions beings explored in the surveys: “knowledge” and “intellectual capital,” because conclusions on attitudes to the two concepts otherwise could be inconsistent.

The surveys explore the four hypotheses depicted in the Figure 22 below:

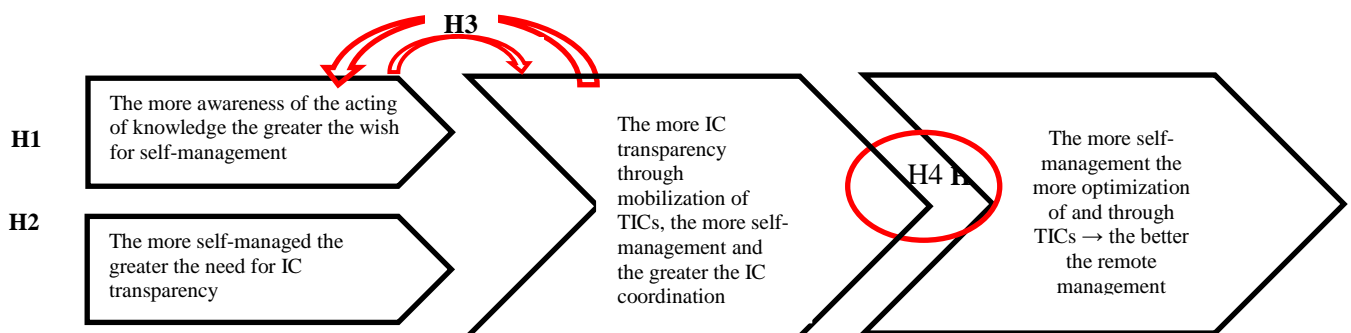


Figure 22. Research model: relations between self-management, awareness of individual knowledge and competitive advantages, by author.

The hypotheses are:

H1: The more individual awareness about knowledge and competence (TICs) acting as an underlying value (focused behavior), the greater the wish for self-management.

Practical implications: In dispersed companies, self-management is interesting due to its positive relation to management across locations, because co-presence in dispersed geography is often prohibitively costly and time consuming. Management from a distance represents avoidable costs, if self-management can be increased. Therefore, it is important to identify drivers to increase self-management. By introducing a focus on individual IC capacity, making it visible and updateable in an IT structure, the instrumentality may represent such driver. Self-management is validated to contain elements enhancing the quality of remote management and competitive advantage by management's explicit choices of IC objects (TICs) now visible and manageable (self-efficiency judgements).

H2: The more self-managed, the greater the need for IC transparency.

Practical implications: Self-management comprises processes of estimations, prioritizations, decision making, and acting, which are not necessarily shared, but do rely on the individual employee. When attending to a task, there may be a need to know whether the optimal resources are available and identify, locate, and choose ex ante the right knowledge and competence at the right time. The IC transparency in the conceptualized in TICs provides knowledge to make these kinds of decisions. To satisfy the urge of self-efficacy, instrumental IC transparency is required.

H3: The more IC transparency through mobilization of TICs, the more self-management and the greater the coordination and distribution of knowledge and competence objects.

Practical implications: When the individual access to choices of individual knowledge-accounts in TICs is provided, the more self-managed. When IC transparency enhances self-management, then processes to increase the quality of remote management can be designed and the coordination/distribution problems become instrumental and operable.

H4: The more self-management the more global optimization of and through IC devices → the better the remote management → Competitive advantages.

Increased transparency of and systemic access to IC qualifies remote management by the reduction of time to optimal collaboration and diminishing conflicts in digital teams by enhanced trust across dispersed units.

Practical implications: If these knowledge-based new uncertainties become operable in dispersed settings, then conflicts in digital teams become avoidable, which may positively impact the notion of trust in in these operations reducing costs.

Below, Figure 23 displays how the hypotheses are related to the methodological theories and TIC, the concept's elements of design. The elements of design are translated to questions in the surveys.

Hypothesis	TIC Valuing and identifying elements	Literature of self-management and self-efficacy	Literature of knowledge awareness	Literature of transparency/ competitive advantages
H1: The more individual IC awareness of how K&C act as an underlying value, the more wish for self-management	Individual knowledge disciplines, competencies, context, deep/superficial knowledge, specific knowledge managerial decisions about choice of collaborators, planning of work, planning of work hours, frames for collaboration	(Cowling et al., 1999; Manz & Sims, 1980; Neck & Houghton, 2006; Rochlin, 1989; Shuck & Wollard, 2008; Staples et al., 1998)	(Argote et al., 2003) (M. Callon, 1998a; B. Latour, 1986; B. Latour, 2005; J. Law, 1986; J. Law, 2008; Miller, 2001; Skærbæk & Tryggestad, 2010)	(merged) (Breu et al., 2002; Harvard Business Review Press, 2011; Jamrog & Overholt, 2005; McDonald, 2011; Shuck & Wollard, 2008; Siemsen et al., 2009) (Behfar, 2008; Cordery et al., 2010; Hardless, 2007b; Hong & Vai, 2008; Wilson et al., 2006)
H2: The more self-managed the more need for IC transparency	Decisions independent of nearest manager about collaborators, planning of work, planning of work hours, choices of collaborators, frames for collaboration Information about strategies and development of IC			
H3: The more individual access to individual IC accounts (stocks the concept) the more self-management	Choices between various qualities of knowledge and competence in and between companies	Literature of trust, knowledge contexts, and conflicts in digital teams		
H4: The more self-management, the more global coordination & distribution of through IC devices → the better the remote management → Competitive advantages	Match between underlying resources-knowledge and competence- tasks (speed, quality). New uncertainties, conflicts, risks and lack of trust		(Augier et al., 2001; Barrett et al., 2005; Behfar, 2008; Ford, 2004; Kirkman et al., 2004; Maznevski & Chudoba, 2000; Nebus & Hin, 2007; Wilson et al., 2006)	

Figure 23. Table showing how hypotheses are related to theories, by the author.

Conflicts and lack of trust in remote collaboration in and between companies are touched upon in the surveys as well, because these changes are identified as uncertainties that are important to operations in dispersed, global contexts (Behfar, 2008; Cordery et al., 2010; Hardless, 2007b; Hong & Vai, 2008; Wilson et al., 2006).

As the aim is to explore whether knowledge transparency provided by TICs may mobilize the will to act in new spaces of IC calculation, the elements from the two separate surveys are superposed in the analyses. The Knowledge Surveys, (Q) focuses on “knowledge,” and the Self-management Survey (QSM) focuses on “self-management”. The outlined theoretical constructs of “self-leadership strategies,” “predictable outcomes,” and the notions of “performance” are lenses through which to analyze the attitude to the listed mechanisms of coordination, because the notions represent liaisons between the proxies and the concept of TICs.

This paragraph described how the properties in TIC are socially tested for their ability to work by the use of proxies, because managers still have no access to the artefacts and a mechanism of distribution.

7.3 The Quantitative Social Validation of TIC

7.3.0 Introduction

The announced quantitative test is described next evaluating the conceptual design of the measurement unit. Firstly, two surveys are conducted in a small subset of 40 globally dispersed employees in GCC to test whether the identified elements of design to represent individual knowledge and competence in TICs at a distance, socially work. The former paragraph described how the testing is conducted by help of proxies. The concept of TIC has been refined and customized during 12 months of collaboration and co-development in GCC, but not yet presented or disseminated. Furthermore, the system development is studied in the following chapter.

Prompted by the hypotheses H1–H4, the results show how informants anticipate their future behavior having access to calculative HC/IC elements; that is, studying how informants believe they will adapt the calculative elements embedded in TIC, why they will, and to what extent these value representations make them calculate and let the calculations impact their behavior.

The completion of the quantitative analyses is outlined in this chapter. The data is presented and analyzed in descriptive statistics.

The case study took place during the period from November 2009 to September 2011, and was prematurely terminated due to business challenges in the GCC. Whilst it was possible to survey attitudes toward the future N-F calculability and conceptualized enhanced transparency in TICs, it became impossible to socially fulfill the application of the ICMCS, which luckily was technically tested before the exogenous events grew potentially lethal. In this chapter however, the focus stays on the testing of TICs.

ANT lenses are continuously applied for analyzes of validations incl. the longitudinal process of system development, because the method is able to follow and depict the concrete occurrence of events and in detail explicate how agencies were constructed and deconstructed between human and non-human actors in operations (M. Callon, 1986). The method is applied in-the-making, not only following the development, but also sometimes even predicting it. Latour's conflicting perspective of fighting agendas⁴⁰ adds an analytical opportunity to consider context, strategies, and operations as trials of technologies defending their paradigmatic foundation of control (B. Latour, 1996).

7.3.1 The Two Surveys of Knowledge and Self-management

The surveys were conducted in the GCC on July 25, 2011 in a dispersed, global population of 40 managers and employees who held various degrees of higher education within the legal knowledge body. This population was chosen, because the GCC allowed it, and because it complied with the case research criteria; that is, being global and dispersed, and collaborating across borders at a distance.

The research project was conducted in regard for the double considerations in industry and research, which were mediated in the construction of the questionnaires. On one hand, the questions were to be politically acceptable and approved by GCC and on the other, they were by the use of proxies to answer questions about the future and about immaterial, invisible issues. Theory connects the surveys' questions to the RQ by the construction of proxies as outlined in chapter 7.2.1. The project had per se, according to operational local routines in GCC developed a departmental business plan, although it avoided getting entered in the corporate IT structure, which operated in stage gate designed and controlled processes; this option was prevented by the project's industrial host due to time constraints. The business plan was produced by the operating case department's head of department estimating the effects of gains, cost savings, and business advantages in the department obtainable through the project⁴¹. Collaborating as engaged scholar the local industrial perspective had to be taken in account, so the surveys were designed to provide data for future interventions too:

1. To document the initial state of demand for and level of maturity towards more self-management and IC transparency in the test population
2. To inform a strategy of deployment of ICMCS about biases and open windows to plan the next steps of roll-out with GCC
3. To present the constructs of the surveys realizing the priming/performative effects of posing the questions about knowledge to the test population
4. To document users' attitudes to IC calculability and potential calculations before and after the implementation of ICMCS.

⁴⁰ Chapter 8.2 Global Case Company/Fighting Agendas.

⁴¹ May 2010, GCC Presentation: enhanced quality of work, savings app. 10%; 5-7 employees reduction = Dkr 10 mill.

The initial attitude in the pilot population to IC transparency impacts the abovementioned issues, because supportive attitudes are known to be helpful to successful implementations (Lynn, 1999).

The group of respondents consisted of individuals of both genders who were globally dispersed, but within the same academic discipline, Law, and they referred locally to different managers, but in the top hierarchy to the operating department's head of department. They were unknown to the researcher and remotely asked by the head of department to answer the surveys. This framing was an effect of 6 hours (3 × 2h) meetings between the researcher and the head of department to present the concept and create trust and agency enough to conduct the pilot project. The top manager's expectations of the outcome of this pilot were immediate cost reductions of > DKK 10 mill (2010) through cutbacks in the number of employees per year, through increased quality of operational output and lower run-through time. An agreement⁴² was signed between the top manager and the researcher as ways of managing mutual expectations of the unknown future collaboration and concretize the processes in time and the action plans. The manager negotiated and précised the research time-consumption, and the researcher produced the document of agreement, to visualize and document research in the department.

The surveys were to explore whether individuals had positive/negative attitudes to becoming calculating selves (Miller, 2001) when exposed to the chosen calculative elements in TIC's value representations. The precise framing of the questions is found in Annex A5. The surveys externalized whether and in which way the respondents believed that they would act in operations by connecting to the design elements within TIC, such as horizontal/ vertical values in and species of knowledge and competence. Informed by the responses, the data show how the respondents are willing to use the future instrumental IC transparency to allocate more appropriate, though remote resources to collaborations and team settings. It shows how they estimate and select individual HC/IC capacity. Such estimations cannot be conducted in the existing IT architecture in GCC. How results were found are outlined next.

7.3.2 The Conduction of the Surveys

Below, the surveys and its generated data will be presented and explored in descriptive statistics. Although it concerns a rather small population of respondents, it is noteworthy that the answering percentage was 80% in both surveys.

The Knowledge Survey⁴³ was initiated by two open questions about knowledge in general, because the dispersed semiotic interpretation of the word "knowledge" matters for the reliability and analyses of the results. The notion of individual capacity is contrasted to the notion of organizational capacity, because the focus of this thesis is on individual knowledge. To ensure consistent results, respondents' local interpretations of the applied notions have to be aligned in the same interpretation of the constructs; the perceptions of words in the international groups of respondents are often interpreted and biased (Hofstede et al., 2010; Nistrup Madsen & Erdman Thomsen, 2008). It is therefore important that the two open questions shown in Figure 24 and

⁴² Agreement, Annex A7.

⁴³ Annex A5.1.

Figure 25 in the Knowledge Survey disclose little heterogeneity in the perception of the notion of “IC” and “Knowledge”:

Q 1: What do the words “Intellectual Capital” mean to you? Please write a short definition.				
Number of respondents: 40				
A	Open responses ordered in	Open responses ordered in	Open responses ordered in	Open responses ordered in
B	“Individual Capacity	“Collective Capacity”	“Existing Company Value”	“Future Company Asset”
Words used in responses:				
1. Experience	mentioned times: 7	mentioned times: 2	mentioned times: 1	mentioned times:
2. Specific company knowledge	2	1		
3. Education	4	1		
4. Know how	1	2	1	
5. Knowledge	14	7	6	1
6. Focused capability	3	2		
7. Don’t know	1			
8. Expertise			1	
9. Leadership			1	
10. Innovation			1	
11. Patents	2		2	
12. Trademarks			1	
13. Skills	3	1	2	
14. Competencies	2	1		
15. Customer resource	1			
16. Strategic resource			1	
17. Talents		1		

18. Human resource		1		
Total	40	19	17	1

Figure 24. Knowledge Survey, open question: Perception of Vocabulary I, by the author.

Figure 24 lists in the very left column all the different denominations of “IC” used by respondents to answer the open questions. The answers are ordered according to the notions listed in the top row. The majority of answers associate “IC” with “individual knowledge” but have also used the words “experience,” “education,” “knowledge,” “skills”, “competencies,” “human resource,” and “talent” in the answers. The respondents’ perceptions of knowledge are connoted to individuals rather than organization- based. “IC” is understood as “individual knowledge” and the notion of individual knowledge is 2:1 in favor of individuality compared to organizational knowledge.

The next open question in Figure 25 is concerned with the notion of “Knowledge”:

Q 2: What does the word “Knowledge” mean to you? Please write a short definition.			
Words used in the responses:	Open responses ordered in “Individually based”	Open responses ordered in “Company Now—Future”	Answer divided by the Total number of answers
Information	13 times		13 (20.3%)
Platform for decisions	1 time		1 (1.6%)
Knowing & sharing	1		1 (1.6)
Experience	14		14 (21.9%)
Facts (hard)	4		4 (6.3%)
Expertise	1		1 (1.6%)
Qualifications	1		1 (1.6%)
Data & Ideas	3		3 (4.7%)
Competence	1		1 (1.6%)
Academics Education	5		5 (7.8%)
Personal skills	8		8 (12.5%)
Experience & learning	2	1	3 (4.7%)
Learning & understanding	2		2 (3.1%)
Ability	3		3 (4.7%)
Wisdom	1		1 (1.6%)

Know-how	2		2 (3.1%)
Awareness of facts & processes	2		2 (3.1%)
Total overview of times where the denominations are mentioned	64	1	65

Figure 25. Knowledge Survey, open question: Perception of Vocabulary II, by the author.

Figure 25 has been compiled in the same manner as the previous table and explores the connotations of the word “Knowledge” in the dispersed group of respondents. It shows that the word is understood as experience (21.9%), information (20.3%) and personal skills (12.5%) and in the main connoted to individuals.

TIC measures individual knowledge and competence, K&C, and, therefore, is designed to provide transparency at the individual level, which is important, because the argument of calculations is based on “Homo Economicus” (M. Callon, 1998a; Miller, 2001). Surveys explain transparency in knowledge as “individual knowledge” and not as “organizational knowledge.” Almost all respondents (97.9%) attribute “Knowledge” to individuals, but word it differently as shown in the table. This shared sense-making validates the results, because the respondents assign the same interpretation and sense to the notions of “Knowledge” and “IC” as reflected in the questionnaires: individual capacity that changes from person to person.

In Figure 26 below the results from the Knowledge Surveys’ questions are ordered and referred to Neck’s theoretical model of Self-management Strategies (Neck & Houghton, 2006) as previously outlined in Chapter 7.2.1 about the construction of proxies:

Relations between self-management, performance mechanisms and improved individual, team and organizational performance			
Self-management strategies	Questions ID	Answers	
Behavior Focused > 90% wish for a focused behavior	Q3, Q4, Q9, Q10, Q11, Q17, Q25, Q26	<ul style="list-style-type: none"> • 89% is often or always aware of K in tasks • 90% prefers the relevant collaborator to the nearest, the usual, the preferred • 96% prefers the cleverer and more creative colleague to same gender, same org level, same age, same national culture, younger/older • 96% prefers an unknown optimal capacity to a known less capable colleague • 86% will (sometimes (25%) always(61%)) strive for developing K&C to become more strategic • 100% wants more transparency for K&C 	
Natural Reward > 90% thinks a focused behavior is important for	Q20, Q21	<ul style="list-style-type: none"> • 100% think K&C is important for bottom line, short terms 7%, long terms 32% 	

bottom line		<ul style="list-style-type: none"> 86% thinks K&C is important for the competitive GCC power, 14% “to some degree”
Constructive thoughts > 75% wish for more K&C transparency	Q12, Q13, Q14, Q15, Q16, Q22, Q23, Q24	<ul style="list-style-type: none"> 93% collaborates with unknown colleagues using digital work space (64%), 29% establish physical meetings 47% act to establish trust in digital work space, 11% require a physical meeting, 43% are not concerned Mean time to optimal remote collaboration is considered 11days/person, although 43% prefers an initial physical meeting only 11% know colleagues K&C, 25% not enough 50% wish their colleagues to know their K&C 75% wish to know GCC’s need for future K&C 82% wish to know the relation between the future need and the strategy

Figure 26. Surveys result: Relations between self-management, performance mechanisms and improved individual, team and organizational performance (Neck & Houghton, 2006), adapted by author.

In Figure 26 above, the three “strategies for self-management” (Neck & Houghton, 2006) are related to the proxy questions in the surveys’ knowledge about how respondents act when relating to and using knowledge. The strategies are named “Behaviors Focused,” “Natural Reward,” and “Constructive Thoughts” (ibid.) found in the left column. More than 90% of the respondents wish for a “Focused behavior” (Neck & Houghton, 2006)⁴⁴.

The results show:

- 96% prefer an “unknown, but optimal capacity” to a “known less capable colleague”
- 86% (sometimes 25%, always 61%) will aspire to develop knowledge and competence to become more strategic
- 100% want more transparency in individual knowledge and competence

More than 90% think a “focused behavior” is important for the bottom line:

- 100% think knowledge and competence is important for the bottom line [short term 7%, long term 32%]

⁴⁴ Chapter 3.2 Mixed Methods/Quantitatively: Proxies and Hypotheses for Surveys.

- 86% think knowledge and competence is important for the competitive GCC power, 14% “to some degree”

More than 75% wish for more knowledge and competence transparency.

- 93% collaborate with unknown colleagues using digital work spaces (64%); 29% establish physical meetings
- 47% act to establish trust in digital work space; 11% require a physical meeting; 43% are not concerned
- Mean time to optimal remote collaboration is considered 11 days/person, although 43% prefer an initial physical meeting
- Only 11% knows colleagues’ knowledge and competence; 25% feel that they do not know enough
- 50% wish their colleagues to know their knowledge and competence
- 75% wish to know the GCC’s need for future knowledge and competence
- 82% wish to know the relation between the future need for knowledge and competence and the strategy.

IC transparency often refers to reports disclosing ostensive, organizational, complex IC values (Guthrie et al., 2012; Lev, 2001; J. Mouritsen et al., 2001; J. Mouritsen, 2004). When the surveys ask about individual knowledge and competence and self-management, an internal ex ante management focus is encouraged at the expense of this view. In the current concept, IC reports are anticipated as results of happened HC movements through knowledge-based decisions and consequently as managerial effects of individual decisions and HC activities like recruitment and allocation practices.

The paragraph documented acceptable identical perceptions in the dispersed group of respondents of the used wordings in the inquiry forms, thereby tempting to consolidate the outcome of the surveys. The results detailed anticipated, embedded relations between individual knowledge and competence and the specified theorizing of self-management demonstrating, how the questioning frame through the proxies is constructed to explicate the respondents’ attitudes to elements of design in TICs.

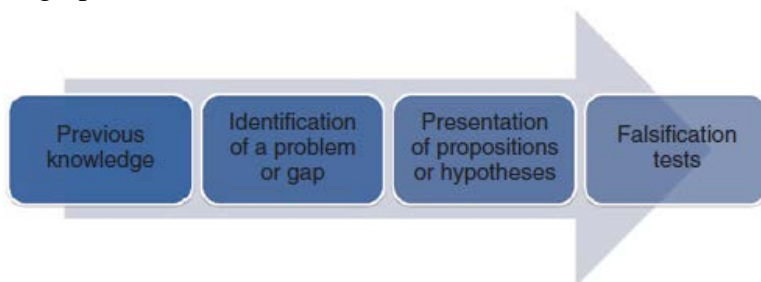
Future HC/IC overviews in stocks are designed to inform managers of choices of potential collaborators ex ante and at a distance on several parameters like the separated notions of knowledge and competence, horizontality and vertically in metrics of knowledge, creativity and performance in competences – so when informed by these elements of design in TIC – managers

are capable to act and chose differently. Above, the surveys document that among others that “96% prefer an “unknown, but optimal capacity” to a “known less capable colleague”, about which choice the elements of value representations in TICs can inform objectively and in absolute figures. The following sub-section details the results.

7.3.3 Analyses of Surveys in Descriptive Statistics

The separately run two surveys on “Knowledge” and “Self-management” distinguishes how answers from both questionnaires add importance to the elements of design. It is studied, whether an individual awareness of individual knowledge and competence made visible as identifiable capacities (as in TICs) for collaboration ex ante, will impact managers decision making. Furthermore, it is explored, whether more access to the HC objects - in short to HC/IC transparency as represented in TICs in personal knowledge accounts⁴⁵- is likely to influence the coordination and distribution of organizational knowledge, HC, (understood as the stock of individual knowledge and competence) and if so, how.

Previously, in this chapter, the hypothetical-deductive method was introduced in order to create evidence that the properties embedded in TICs and identified as elements of design are able to keep the system together, when the calculating element of prices has been replaced by N-F metrics. The method below shows a generic model of DSR (Dresch et al., 2015, p. 19) placing this paragraph in Falsification Tests:



Applying proxies as previously argued, the wording of the hypotheses reflects the use of these and their theories.

First, H1 and H3⁴⁶ about “awareness” are analyzed; the assumptions are constructions of responses from the two surveys when analyzing correlations between “awareness” and “IC transparency.” Constructs in both surveys contain the notion of “self-management” and “IC transparency” (Neck & Houghton, 2006; Staples et al., 1998).

H1: The more individual awareness of the acting of knowledge and competence (TICs) (focused behavior), the greater the wish for self-management

H3: The more IC transparency through mobilization of TICs, the more self-management and the greater the coordination and distribution of knowledge and competence objects

⁴⁵ Annex 2 Module I

⁴⁶ Chapter 7.2.1, 7.2.2 about proxies and hypotheses for surveys

“Q” = questions in the Knowledge Survey and “QSM” = questions in the Self-Management Survey⁴⁷.

H1 The Construction of the Hypothesis’ Theoretical Notions by Use of the Surveys Questions	
<p>H1: The more individual awareness of the acting of knowledge and competence (TICs) (focused behavior), the greater the wish for self-management</p>	<p>The notion of “Intellectual Capital awareness” is created by the questions Q: 3, 4, 6, 15, 16, 20, 21</p> <p>The notion of “Self-management” is created by the questions Q: 9, 12, 17, 22, 25 QSM: 1, 2, 3, 4, 5, 7, 8</p>

Figure 27. H1

When assembling the responses in assumptions, which inner construction is displayed in figure 27 above, “IC awareness”, Q 3–6, show positive awareness to “IC use, share, talk, search” - between 75% and 89%. The answers to Q 15 reveal that 25% of the respondents want to know more about colleagues knowledge and competence; and in Q 16 that 50% want their colleagues to know more about their own knowledge and competence. All respondents to Q 20 expect IC to impact the bottom line, 7% in the short term and 32% in the long term; and to Q 21, 86% believe in an important relation between IC and the competitive power of the GCC, and 14% “to some degree.”

The notion of “Self-management” is formed by QSM 1–8 about auto discipline in planning of work: QSM 1: 75% do their own planning; QSM 2: 97% take decisions about how to solve tasks; QSM 3: 78% feel their own impact on tasks; QSM 4: 78% work overtime; QSM 5: 60% want to enhance their own impact on work; QSM 7: 91% feel responsibility toward the development of the GCC; and QSM 8: 85% identify with the GCC.

Summing up H1: 90% of the respondents are aware of the knowledge they apply in tasks, but they do not know the relation between the strategy and the need for the development of knowledge, and 82% wishes to be informed about this relation, which, in the model is a prerequisite to be more self-managed. It also shows that > 90% of respondents would have chosen other collaborators if they had had the insight and the chance. There is a hidden dilemma that may become visible in the way some questions were answered: 56% have extended their working hours within the last 3 months very often, 22% often, and 16% sometimes, because they felt it necessary to do the work properly; but 69% answer at the same time that they have

⁴⁷ Annex 5: “Inquiry Forms in Surveys.”

taken no action to change the time-balance between work and life; 44% answer that they have no need to be more self-managed, but that they perceive obstacles to become more self-managed: 16% from management, 22% from company, 19% from colleagues. *This shows that there is an individual desire to become more self-managed, but organizational culture prevents such a potential from unfolding.* This organizational culture may have caused the contradictory answers, because the organization during the period of the case/ surveys fired employees for the first time in 8 years, and the company’s share value continued to fall. Therefore, nobody wanted to criticize the GCC.

Below, the construction of H3 and the results are displayed:

H3 The Construction of the Hypothesis’ Theoretical Notions of “IC transparency”, “digital teams” and “intellectual capital mobility” by Use of the Surveys Questions	
<p>H3</p> <p>The more IC transparency through mobilization of TICs, the more self-management and the greater the coordination and distribution of knowledge and competence objects</p>	<p>“IC transparency” formed by Q 4, 5, 15, 16, 20, 23, 24, 26, QSM 6, 7, 8</p> <p>“Digital teams” created by Q 13, 6, 12, 14</p> <p>“Intellectual capital mobility” created by Q 7,10, 13, 17, 21, 22, 25</p>

Figure 28. H3

Figure 28 shows how the three theoretical notions: “IC transparency,” “IC mobility,” and “Digital teams” are constructed. The responses forming the surveys’ attitudes to the assumptions inform the following descriptive analysis.

The notion of “IC transparency” is constructed by Q 4, 5, 15, 16, 20, 23, 24, 26, QSM 6, 7, 8. For Q4, 89% of the respondents were aware of the need for special knowledge for special tasks. IC transparency would allow them to detect and choose capacities that are geographically displaced from them and the motivation for the task owners to make knowledge travel through the digital system into shared collaborative virtual rooms is conceptually designed to derive from the overview and the accessibility to choose the optimal knowledge and competence in ICMCS. Q 5 (75%) reveals a practice where asking others to fill in lacking or incomplete knowledge may be limited when an IT system guides the search directly to the knowledgeable

person(s). The responses from Q 15 and Q 16 tell us about a mutual will to learn more about colleagues' knowledge and competence (25%) and let them know more about one's own capacities (50%). So a mutual transparency in personal capacities is supposedly not creating any problems, maybe because all the respondents believe in the positive correlations between IC and the financial result (Q 20), 7% in the short term and 32% in the long term. Therefore, they look to future resources (Q 23, 95%) and would like to know what type of HC is important in the future (18% "yes"; 45% "more or less") and 32% would like "more transparency" as well as 5% that would like to know "why the GCC needs future knowledge." Responding to Q 24, 46% would like more organizational IC transparency to be able to plan and calculate in work, and in Q 26 IC transparency makes sense both in work and for personal career planning. However, only 7% directly connote their career with IC transparency: "Yes intellectual capital transparency would make sense" (21%); "Yes it would make sense to my career planning" (7%); "Yes it would make sense to both work and career planning" (75%); and "Transparency is always nice" (11%). The results seem not to refuse the assumption that the population that may add another calculative space parallel to the economic calculating space and probably develop calculating selves within the IC accounting rationale. In QSM 6, 7, and 8, 80% answer positively on features of self- management concerning the corporate strategy level, the responsibility, and the equal brand identification.

The notion of "digital teams" is constructed by the questions Q 12, Q 14, Q 3, and Q 6. The response to Q 12 show that 93% collaborate with unknown colleagues through establishing a physical meeting (29%) or in digital spaces (64%) having multiple choice. Research (Cordery et al., 2010; Hong & Vai, 2008; Wilson et al., 2006) shows the emergence of new uncertainties related to digital collaboration, such as a lack of relevant information around work tasks and about collaborators; and less mutual trust and an elevation of the level of conflicts by misunderstandings. Others (Hardless, 2007a) consider co-presence as being mandatory for the transfer of tacit knowledge supporting the dominant thinking within organizational knowledge represented by Nonaka. (Nonaka, 1994). However, Hardless seems to consider IC digitalization as a relevant support for co-present knowledge sharing. Although TICs represent the tacit knowledge dimension, it is a question of how the trade-off between proposed devices and no devices will affect the bottom lines and the work quality.

Almost half of the answers to Q 14, 43%, indicated a physical meeting as a short-cut to optimized remote collaboration. The construct "time to optimal remote collaboration in digital spaces" is an interesting factor, because considerable remote collaboration is happening already, and is very likely to increase (Boh et al., 2007; Harvard Business Review Press, 2011; Kao, 2009). It is, therefore, of value to be able to reduce time to optimal collaboration, to reduce the need for physical meetings, and to improve trust and quality in remote collaboration. The responses to Q 14 indicate that 18% need only 1 day to adjust; 21% need 1 week; 11% need 1 month; and 7% need 3–6 months of intensive collaboration to acquire an optimal level of collaboration. In the company Scandia, this factor was reduced, which produced a huge positive impact on the bottom line (Edvinsson & Sullivan, 1996; Edvinsson & Malone, 1997). By representing the mutual values of individual HC in visible, accessible accounts measured in

TICs, IC transparency is assumed to fill in relevant gaps of missing information. Personal accounts can be drawn whenever and wherever a colleague feels the need for it, and as such, is supposed to mend trust and misunderstandings, and reduce the time to perform and ameliorate general quality in remote work.

Q 3 addresses the general “awareness” of knowledge and shows a high level of awareness (34% “often” and 55% “almost always”), and Q6 discloses quite a massive search for knowledge showing that 83% use several hours daily. Devices visualizing individual knowledge and competence across time and space are supposed to reduce search time and qualify the search result, thereby bringing a systematic horizontal and vertical search opportunity to the desks.

The third and last notion, “intellectual capital mobility”, i.e. HC distribution, is formed by seven questions: Q 7, Q 10_8, Q 13, Q 17, Q 21, Q 22, and Q 25. Q 7 discloses (as previously stated) a considerable daily search for knowledge and a tendency to choose team members for their creativity (48%). Establishment of trust is an issue where > 50% act on it (11% establish a physical meeting; 36% investigate network; 11% study previous work). More information creates trust, but as 96% (Q 17) would choose an unknown better team capacity to a known less capable colleague, trust, time, and IC mobility is affected. The respondents are supposed to start coordinating knowledge at distances, because 86% believe in a positive correlation between the GCC’s competitive power and knowledge (Q 21). As the population has a massive wish for more IC transparency concerning future IC capacity (> 75% in Q 22) and personally would strive for development of strategic knowledge (Q 25 65% “absolutely always”; 25% “Yes, sometimes”; and 14% “Yes if I had a reason”) then the IC mobility tend to be driven by both personal motives as well as organizational concerns.

The surveys indicate that IC Transparency may increase IC mobility, because both personal calculations and concerns about economic success in GCC influence respondents to calculate and make choices, which probably entails new colleagues and digital collaboration. Then the TICs, which represent the choices, probably will coordinate individual knowledge and competence across boundaries of time and space.

Summing up H3: The surveys showed that more than 90% of the respondents prefer and choose the most qualified employees for collaboration, even if they are unknown compared to the hitherto nearest or preferred colleagues. Results also showed that about 50% would prefer a cleverer, more creative colleague to colleagues of the same age, gender, level, and national culture. The result indicates that deployment of the proposed IC transparency system may have HC coordinating and distributing effects in operations, because more appropriate matches between individual knowledge and competence and tasks, independent of time and location, can occur. Respondents show willingness to connect to choices of more satisfying HC independent of former routines and remote locations, and diversity and positions. The data demonstrates a significant potential for collaboration across borders of disciplines, cultures, and locations, if individual knowledge and competence can be individually overviewed, accessed and estimated, including a potential for diversity in teams. This is relevant, because research shows that diversity entails innovation (Bounfour, 2009; Elsetouhi & Elbeltagi, 2011; Kao, 2009; Page,

2011; D. J. Teece, 2007) and because managerial interventions through ICMCS are designed to manage diversity-in-the-making in both co-located and dispersed or virtual teams. The hypothesis has not been rejected.

The “knowledge” survey showed high awareness of individual knowledge and competence viewed as resources and (1) an interest to optimize the personal use of IC for collaborative issues. It shows that the respondents would apply individual knowledge and competence differently (2), if IC transparency was provided, and that this difference would coordinate and distribute IC in a more satisfactory way, if choices and actions were possible. These choices enable the embedded properties in TIC. Therefore, within the limitations of a small sample and homogeneity in the disciplines, it is cautiously concluded that the surveys indicate that managers and self-managers will connect to the TICs to be informed about the quality and quantity of individual knowledge and competence in IC in order to optimize their own work. This also indicates that the identified elements of design used in the construction of TIC probably are effectively useful and may be adopted. The Knowledge Survey does not decline the assumption that TIC will be used as calculating devices in and between companies, among others, because 96% of the respondents prefer an unknown optimal capacity to a known, but less capable colleague.

H2 and H4 analyze whether elements in the construct of “self-management” are likely to require knowledge and competence estimations and whether the elements potentially may contain solutions to generic knowledge-based biases as “time to optimal collaboration” (cross-border collaboration in teams) and “conflicts in digital teams” (Behfar, 2008; Boh et al., 2007; Cordery et al., 2010; Hanouz & Samans, 2017; Harvard Business Review Press, 2011; Hong & Vai, 2008; Maznevski & Chudoba, 2000; Wilson et al., 2006). The assumptions about future behavior in situations of collaborations across borders of geography, culture, language, position, and disciplines in digital teams were explored in a knowledge perspective (H1 and H3) that tested whether the respondents were likely to connect to TICs. The assumptions did not get declined. TICs output therefore contain data assumed to change choices and make the calculating selves act differently, and thereby theoretically reducing biases.

Correlations between “self-management” and the demand for IC transparency are explored by help from the H2 in Figure 29 below. It shows how the decomposed elements from the theory of self-management influence the demand for IC transparency.

H2: The Construction of the Hypothesis’ Theoretical Notions of “self-management” and “Demand for IC Transparency” by Use of the Surveys Questions

<p>H2</p> <p>The more self-managed, the greater the need for IC transparency</p>	<p>“Self-management” is created by the questions QSM 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13</p> <p>“Demand for IC transparency” is constructed by Q 5, 9, 12, 17, 21, 22, 24, 26</p>
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Figure 29. H2 The construction of the notions of “self-management” and “demand for IC transparency”

The “degree of self-management” is in Figure 29 above determined by the answers to QSM 1–8 and QSM 10–13. More than 75% of the respondents prefer to be “often” or “almost always” self-managing as they feel a responsibility toward the GCC (85%). The organizational context on self-management shows a more tepid organizational attitude, where 33% of the respondents do not feel supported and 66% “often/almost always” feel that way. There is 44% that have no wish to become more self-managed, and 57% have experienced obstructions to establishing a higher degree of self-management (16% from management; 22% from the GCC; 19% from colleagues).

These results are mirrored in an incident during the research process of the system development in the GCC, where one of the respondents was prevented from answering the surveys, because the department had recently used time on another “similar” questionnaire from the financial department; it was “similar” because the questions also addressed HR, but did not investigate similar themes⁴⁸. In Q 19, 43% confirmed to having knowledge of other organizational, - in the financial department’s objective - similar processes. These features confirm the characteristics of the decentered company (Dechow & Mouritsen, 2005), because hierarchy in GCC, in which these surveys were anchored in the top HRM, has no total control.

Q 7 discloses spent search time in daily work and is not included as an element in the construct of self-management—to keep the framing for comparisons. Q 7 informs about a total of estimated investment of 49 hours of search for knowledge and competence in the population, which are estimations that correspond to other findings claiming that knowledge workers’

⁴⁸ The incident is mentioned in the next chapter

investment in individual search for knowledge ranges from 8 to 20 hours weekly (Maznevski & Chudoba, 2000).

The notion of “Demand for IC transparency” is formed by Q 5, 9, 12, 17, 21 22, 24, 26. Q 5 indicates that 75% ask colleagues for help “often/always almost,” and 21% “sometimes” to solve problems. The replies indicate a time consumption involving the time of colleagues.

Q 9 indicates that 90% of respondents would choose “the relevant specialist” rather than “the preferred specialist” (10%) for collaboration. This indicates a commitment to deliver the optimal result, even when choosing in the response categories between “the nearest,” “the usual,” “the preferred.” This indicates a will to revise routines when offered accessibility to “the relevant specialist”; that is, technological IC transparency.

Q 12 pursues a similar theme; namely, the individual will to collaborate with unknown colleagues. The answers reveal 64% of respondents using digital work space, and 29% “often establishing a physical meeting,” while 7% say “no.” This indicates a general willingness to collaborate with unknown persons through digital media. If IC transparency allowed colleagues an overview of available capacity and a possibility to enter the capacity into a digital team, this would probably become a used function.

Q 17 repeats the optimization concern asking approximately the same question as Q 9; 96% chose “an unknown, but optimal capacity” to a “known less capable colleague” (4%) and thus supports the answers in Q 9.

Q 21 investigates tendencies in the regime of beliefs asking whether there is an important relation between knowledge and the competitive power, which is answered convincingly with 86% saying “yes” and 14% answering “to some degree” and 0 answering “not really.”

Q 22 investigated respondents’ degree of orientation towards future knowledge and competence needs asking whether they know which kind of knowledge the GCC will need in the future. The answers disclose a lack of knowledge but a wish to know. No one responded “yes”; 25% “Yes, more or less”; 54% “I would like more transparency”; and 21% “No, but I would like to.” Thus, 75% of the respondents would like more IC transparency.

Q 24 investigated the same theme to explore whether the population knew for what use future knowledge should be acquired. Here, approximately half of the respondents replied “yes” and the other half would like more transparency.

Q 26 investigated the population’s total attitude to transparency in corporate future knowledge development and its personal relevance for work and career planning. The replies were: 21% “Yes, it would make sense to my work”; 7% “Yes, it would make sense to my career planning”; 75% “Yes, it would make sense to both my career planning and to my work”; and 11% responded “Transparency is always nice.” No one answered “I would study the relevancy for my work” or “No, I stick to my work.” These responses reveal a significant interest in IC transparency, the correlations of which are supported by the PLS calculations.

As 96% of respondents in Q 17 in the Knowledge Survey prefer an “unknown, but optimal capacity for collaboration” to a (4%) “known less capable colleague” and justify their choice “to obtain the best result” (Q 18), the surveys show a wish for transparency and accessibility that may mobilize IC and entail more satisfactory exploitation of IC. Q 15 and Q 16 investigate mutual insight in personal knowledge and competence and give a local picture in time and space. Approximately 25% wish for more transparency in order to know more about colleagues’ knowledge and competence, and 50% wish colleagues to have more insight into their own capacity, the concerns of which could mobilize actors to connect for more transparency.

The analysis shows in the many detailed situations that significant higher percentages of respondents to questions forming “self-management” wish for more accessible information about each design elements in “self-management” to attain the overview, choose, decide and enact the decisions. Respondents identify with the “Behavior Focused Strategy”⁴⁹ (Neck & Houghton, 2006). The expressed need for fact-based information about individual knowledge at a distance may be met in TIC representations providing detailed HC/IC transparency. The result documents an urge for knowledge information, HC/IC transparency, in order to enter in contexts of enhanced self-management. Therefore, the current study found that H2: “The more self-managed, the greater the need for IC transparency” did not get rejected, because the cohort, already practicing behavior focused strategy, expresses great need for more IC information.

Finally, H4, examines whether an increase of IC transparency is likely to reduce biases in distant, digital collaborations. The construction is displayed below in Figure 30. The following three constructs have been chosen to concretize the claim and explore the assumptions: “IC transparency”, “time to optimal collaboration” and “trust in digital teams”, because the more trust within and between units the greater the competitive power (BIRNBIRG, 1998; Collins, 2001; Ford, 2004; Wilson et al., 2006). Furthermore, literature shows that the mutual recognition of capacity is a crucial element in the construction of trust in teams (Barrett et al., 2005; Behfar, 2008; Ford, 2004; Kirkman et al., 2004; Maznevski & Chudoba, 2000; Wilson et al., 2006). When starting up a remote team, virtual team members want to know the capacity of the other team members (Behfar, 2008). By looking up personal TIC-based accounts and budgets, employees will be able to gain remote insights of both existing individual knowledge and competence and the future IC plans through individual accounts and budgets, which then inform the mutual digital communication, shedding a knowledge–contextual light and insight on the use of terms and wordings in collaborative processes creating biases. Finally, literature also shows that lack of knowledge, context, and missing information sometimes cause misunderstandings, time delays, and failures (Augier et al., 2001; Behfar, 2008; Nebus & Hin, 2007). The concept of TIC may address these issues.

⁴⁹ Introduction to this chapter.

H4: The Construction of the Hypothesis' Theoretical Notions of "IC transparency", "Time to optimal collaboration" and "Trust in digital teams" by Use of the Surveys Questions

<p>H4</p> <p>The more self-management the more global optimization of and through IC devices → the better the remote management → Competitive advantages</p>	<p>"Self-management" is created by the questions QSM 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13</p> <p>"Intellectual capital transparency" formed by Q 4, 5, 15, 16, 20, 23, 24, 26 QSM 6, 7, 8</p> <p>"Time to optimal collaboration" formed by Q 6, 7, 9, 14 QMS 2, 3, 11</p> <p>"Trust in digital teams" constructed by Q 10_8, 10_9, 12, 13 QSM 10_8, 10_9</p>
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Figure 30. The construction of H4's theoretical notions

The notion of "IC transparency" was outlined and studied in H3. Figure 30 above shows the notion of "Time to optimal collaboration" is formed by Q 6, 7, 9, 14 and QSM 2, 3, 11. The responses to Q 6 and Q 7 expose how massive the search for knowledge is and how much time is invested, Q 9 shows the preference for specialist knowledge and the will to remodel work routines in collaborations to obtain better results, Q 14 discloses a considerable time consumption and cost to optimize remote teams, and QSM 2, 3, 11 represent the level of self-management and the impact on choices of collaborators.

The notion of "Trust in digital teams" is formed by Q 12, Q 13, and QSM 10_8, 10_9.

The responses to Q 12 show that 64% collaborate with distant, unknown colleagues, Q 13 that there is a potential to increase trust, because 57% try to improve conditions for trust building in remote teams. The responses to QSM 10 denounce a willingness to work for diversity and new team constellations.

The surveys inform the mean time for optimal work in digital teams to be 11 days. More than 50% of respondents use in excess of 2 hours daily searching for knowledge and 41% ask colleagues for help. By eliminating the need to disturb others and by giving access with a few mouse clicks to persons who have the desired knowledge and competence, collaboration may become optimized by IC transparency. The investigation and establishment of global teams are in ICMCS designed to be carried out in one process by one person in few transactions of significant time saving, described in annex 3.3.

According to Question 13 in the survey, 47% act to establish trust in digital work space, 11% require a physical meeting, and 43% are not concerned.

When consulting an individual knowledge account in TICs, team members can get to “know” each other’s knowledge and competence before starting up the virtual team by remotely looking up proposed future members’ IC accounts. The detailed professional intellectual transparency may establish teams faster than now and conflicts may be avoidable through this transparency building insights and trust (Behfar, 2008; Cordery et al., 2010). These questions are referred to further research as well as studies of search time and quality of results and how time and results are impacted. In the surveys, 50% of the average search time is 10–14 h/week, which is more than a work day/employee/week.

H4 seems to be positively supported by the results, because the respondents express the willingness to search for individual knowledge and competence and to look up knowledge accounts for remote, unknown colleagues. Respondents tend to choose IC transparency for information, so conflicts as well as time to optimal collaboration may decrease, because trust is supposed to be established through relevant knowledge information about context and expected capacity ex ante; According to research on new insecurities in dispersed companies (Behfar, 2008; Cordery et al., 2010; Harvard Business Review Press, 2011; Hong & Vai, 2008; Maznevski & Chudoba, 2000; Wilson et al., 2006), some of these, such as “lack of trust” and “conflicts in digital teams” create biases, which, according to responses of the surveys, may be minimized by increased “IC transparency”.

Having detailed the constructs and the results of the two surveys, the chapter is concluded in the next paragraph.

7.4 Conclusion

The chapter describes the organizational context, theories and methods used to validate the proposal of TICs.

The analysis tend to use descriptive statistics on quite a scarce population of 40 respondent, but stepped back from the use of other methods of statistics in the face of the modest data collection. However, with an answering percentage of > 90 % and thoroughly explained processes and metrics, the result seems assigned with satisfying rigor (Dresch et al., 2015, p. 126).

The answers to the surveys studying the hypotheses H1–H4 were sorted and summarized in results showing how informants anticipate their future behavior if they had access to the choices,

which are enabled by the calculative design elements embedded in TICs. The result showed how respondents believe they will decide and act when exposed to the calculative elements, why they will, and to what extent such value representations will make them calculate and let the calculations impact their behavior.

The analyses show that H1, H2, H3, and H4 did not get declined and that respondents probably will use TICs, because the inherent elements meet the respondents' requirements for data about individual knowledge and competence to improve their work. TICs may provide overviews and access to data about HC/IC at the comparable, individual level and enable them to act on the choices of knowledge and competence objects for the better of their own performance. Then, individuals act rationally and choose the most appropriate individual HC/IC values for collaboration and for team allocations. As the questions are formulated as proxies for TIC's elements of design, data indicates that (self-) managers probably will connect to TICs and start to compare, choose, decide and act.

When individuals become HC/IC calculating, then the objects supposedly are systematically distributed by the system in dispersed contexts, because the chosen capacity may reside anywhere in the network. In an implemented ICMCS system the value representations in TICs will be accessible in centralized databases connecting the chosen, appropriate, satisfying combinations independently of time and space. Then ICMCS will generate corporate IC transparency, predictability, and operability in the hidden capital represented in TICs and probably become the coordinating mechanisms that the literature reviews revealed as missing in the non-financial paradigm.

If IC management is operated through the implementation of ICMCS, then the managers will be informed in real-time TIC data about N-F KPIs from, for instance, "teamwork-at-a-distance," or from "allocation-of-scarce resources." Management will be provided *ex ante* with accounts and figures about the adequacy or lack of capacity, diversity, and critical TIC figures, which can be shared and acted upon on-line across locations. Sharing values in TICs about knowledge may become important to remote management and digital teams, because this type of collaboration very often is biased and fails due to lack of relevant, legitimate information about individual knowledge and competence (Behfar, 2008; Cordery et al., 2010; Hong & Vai, 2008).

Requirements for its testing were modelled and the tests empirically conducted through hypotheses. The tests of the socio/technical interfaces of TICs are hereby terminated. It showed that the N-F measurement unit TIC, designed to represent N-F values of individual knowledge and competence, probably may connect to managers and self-managers and is able to keep networks together through calculating selves using calculating devices.

In the following chapter the proposed artefact ICMCS is tested applying qualitative methods.

Chapter 8

System Development Process

8.0 Introduction

For more than 24 months the system development process unfolded in the GCC, which first passed through various phases of exploration of the organization and its relevant MTs⁵⁰. Several attempts to anchor the case project were run at the same time, due to a restricted time schedule, and because the task to find and convince a business unit in the GCC to participate in the project was left to the researcher in a company that was increasingly becoming stressed by emerging, dynamic, dramatic exogenous variables declining the company's market value.

In this chapter, the processes of customization and implementation of ICMCS is described and qualitatively analyzed. The analytical frame (M. Callon, 1986) illustrates the phenomenological occurrences in order to understand processes-in-the-making, because this format is capable of handling both human and non-human, current and emerging actors. The co-developing process focus on the designed elements in the artefacts TICs and ICMCS, which are core issues in the system development process (M. Callon, 1991; Hevner et al., 2004; Malmi & Brown, 2008; Moser et al., 2007; Tatnall & Gilding, 2005). The process is initiated through interventions presenting the concept of TIC and ICMCS to different departments in GCC and is carried out in a long-term collaborative process of change and testing. The social testing of TICs is described in the former chapter, although TICs as an integrated part of ICMCS is noted in this test context as an actor. The case, then, includes the longitudinal test, which context is outlined next.

The GCC did not remain static during the case period of 24 months as previously referred in chapter 7 . The following introduces the framing conditions during the case. Interventions, unfolded in Part I, were planned and tried, but the research plans were influenced by uncontrollable risks in the research context as outlined in Figure 31 below:

⁵⁰ Outlined in the former chapter.

Changing Contexts 2009-2012 for GCC				
Framing contexts Concepts to be validated	Initiating macro-economic context 2009	Initiating micro-economic context	Development in context during research time	Emerging institutional research context 2012
1. Proposal of a N-F measurement unit TIC - exploration of potential calculating properties	Global crisis The company is a global leader Few competitors	Unrealized effects from the global crisis Weak focus on competition A stable context	Effects from the crisis are slowly emerging and acknowledged as decreasing share values Loss of global market leadership and reputation	Research as Industrial PhD student employed by the company Research plans were currently adapted to the changed context
2. Tool to access and circulate TICs in dispersed settings - exploration of potential control system, ICMCS, for knowledge-based management	8 uninterrupted years of increasing share values Considered the most attractive, influential global company in and beyond its sector in global rankings	Long through-put processes Accessibility for research 100%	Emerging awareness and identification of competitors Emergence of critical agendas problematizing stability Accessibility for research reduced to 0	The company cancels the research contract effecting a dismissal of the researcher The ICMCS software was customized and technically tested, but did not get fully mobilized

Figure 31. Radically changing case company contexts effecting research's conditions.

Figure 31 outlines constituting events during the conduct of the research project effecting changes in its case-based empirical process plans, especially for methodological elements in relation to the mechanism of distribution.

To uncover the status of KM in the GCC, IT structures were studied framing HRM and KM, as well as the attitudes toward KM in the research project's anchoring department. The status served to illuminate the background for the President's question: "Who knows what, where?" However, research conditions in the longitudinal, qualitative case quickly altered during the years, which developed as a dramatic epoch for the GCC, effecting a change in the accessibility for the long-termed research from 100 percent to virtually nil, which made interventions

impossible according to the original research plan. Therefore, methodologies, such as participant observation; non-participant observation; field notes as minutes, agreements, contracts, and presentations; unstructured interviews; and analyses of documents and reports became the feasible way to capture data (Brinkmann, 2014; Brinkmann & Kvale, 2015; K. Kreiner & Mouritsen, 2005; B. Latour & Woolgar, 1986; Miles & Huberman, 1994; Silverman, 2010; Tengblad, Solli, & Czarniawska, 2005; Van de Ven, A. H., 2007).

The articulated, common ground between this research project and the GCC was communicated to the company as the company's concern of enhancing "self-management and optimize management at a distance." The information was e-mailed from the head of the hosting department (who also held the position of president) to his global department explaining the agreed research activities, such as meeting participation, collection of historical data, analyses, etc. The concern was expressed as a broad goal, owned by nobody, and of interest to anybody, hopefully creating acceptance for any inconveniences with a satisfactory level of information about why the researcher asked questions about systems for competencies, communication media, and organizational relations. The labelling of "self-management" and "optimization of management at a distance" was kept as the explanation for all actions in the research project.

As an Industrial PhD fellow—and therefore employed by the GCC as a mandatory requirement in the government-based research set-up—this researcher experienced some tacit expectations to submit to the logic of the organization. The dynamic business logic created a changing context and new boundaries for the research, which were briefly described by the researcher's diminishing access to data during the 24 months of site-based research.

Data relevance was framed by the need to establish a status: how did individual knowledge and competence exist in the GCC? How did it get coordinated, exploited, distributed, developed, stored, trusted, accessed and planned? How were knowledge values recognized as strategic? Was it labelled, developed and exploited? Existing HRM/KMTs⁵¹ were identified as managerial technologies and Structural Capital, when noting how they were IT supported. Performance measurements were searched and explored. As a result, during the meetings it was stated that "competence" as a construct was preferred to "knowledge"; competencies were recorded, but knowledge was not. Competences were understood as being self-assessed related to jobs, but it was not really possible to make planned investigations due to general business conditions and to parallel processes of interessement⁵² (M. Callon, 1986), which were conducted at the same time by internal actors. Organizational openings and accessible opportunities had to be followed and exploited, wherever and whenever they occurred. One outcome of these investigations was that the notion of knowledge did not have an identity of its own and it did not get coordinated, exploited, distributed, developed, stored, trusted, accessed, and planned. Knowledge was not operated systematically as assets in a conscious way. This is outlined in the table about existing technologies⁵³.

⁵¹ Listed in Annex 4

⁵² Chapter 8.2.2

⁵³ Annex A4.

Indirectly, through meetings and documents, a business context of values and culture presented itself. It was in this context that the process of interventions began by the GCC signing the research contract. The interventions were composed of several elements; A process of customizing of the proposed, N-F measurement unit, TIC (1) and a co-developing process for the proposed control system ICMCS (2) and finally a process of deployment of the system (3). These were the decisive steps in the interventional case process. The planned third and final step of the intervention was the launch and implementation of ICMCS in the global pilot population. The surveys were carried out before, but parallel to the launch of the software.

Acceptance of the measurement concept and the distribution system formally took place when the anchoring department signed the “project agreement”⁵⁴. The customization processes of the measurement unit, which took place in a joint project group between the GCC and the researcher—a group enlarged in the making by several new employees specialized in the actual features of development—resulted in increased complexity in the concept. The process created a growing awareness in the pilot group, because demands to the unit and the system functionalities were formulated, adapted, and expanded on the run. The next step of intervention in the research plan was to investigate its instrumentality by implementing the system.

The measurement unit and the methodology with which to record individual knowledge and competence did not grow more situated during the process; on the contrary, the proposals were developed to include generic issues⁵⁵, because the GCC needed individual information about features as locations (the “where”, geography) for educations and places for the acquisition of experience-based knowledge and competence. It was important to the GCC to know the locations of the individual acquisitions of explicit, academic, and tacit, experience-based knowledge across locations when allocating staff to teams or positions, because tacit knowledge about local cultures and contexts then could be designed and linked to TIC and the objective method of entering data. Another internal descriptive feature was required, which did create the possibility for a more customized output: the project group wanted positions in the hierarchy represented as a voluntary choice when allocating resources. Therefore, the classification featuring the company positions was added as a scroll-down feature to the TIC in the system, which enabled a choice of hierarchical level when searching for individual knowledge and competence in scenarios or for teams in operations as priming actions for IC overviews and IC calculations.

This adjustment and development process lasted more than 12 months and was carried out at different locations; mostly in GCC offices in different towns in the northern part of Denmark and sometimes in Copenhagen or in remote collaborations online through digital media. Many challenges threatened the collaboration, which actually represented a common archetypal type of team in the GCC, because team members constantly crossed borders of diversity, such as location of work, age, education, experiences, gender, language, profession, cultures of business, disciplines, nationality, and charge and affiliations to the GCC. As our task was undertaken

⁵⁴ A7

⁵⁵ Chapter 8.2.7.

iteratively, and, therefore, freed from existing routines, we had to build up trust to collaborate (Ford, 2004; Harvard Business Review Press, 2011; Maznevski & Chudoba, 2000; Wilson et al., 2006). We had to construct a space with common objectives for a while.

The system was technically tested by the system provider and the researcher and accepted by the researcher. This was a legal process founded on programming, documents, agreements, and contracts. The outcome from the GCC case process in terms of digital consequences to be manufactured was translated by the researcher as mediator into technical requirements for system development during the process, which was produced by the external provider.

Having described the controlled and uncontrolled events during the conduction of the case, influencing planned methods and on-the-run adapting research to the context-based changes, the following text accounts for facts in the case processes.

For more than two years, the system development was an ongoing process, passing through phases of exploration of the organization and selected MT's. The attempts of anchoring the research project were run in parallel due to a constrained time schedule, because the task to find and convince a business unit to enter as a partner in the project did not take place through the organizational hierarchy; it was left to the researcher. The sequences in the concrete course are explicated in Figure 32 below:

Account of Attempts of Interest in GCC, Presence, Meetings, Documents, Surveys, Tests: November 2009–February 2012				
Presence 64 weeks whole/partly	Meetings face-to-face 98% Telco 2% Total number > 200	Documents HR Analyses KPI Tele & distance Analyses Feed back IT requirement specifications	Topics	Tests Beta tests
GCC supervisor, The president of the corporate hosting department	8–10 face-to-face meetings 4 Telcos	Mail to > 260 Mail from (via secretaries) > 100 Contracts 1 + allonge Agreements Minutes 10 Budgets 4 Accounts Presentations 5 Descriptions PowerPoints 5	Interface between the project and the company	
1. Attempt Phase of Problematization/ interestment Global service unit Period of time: 170210 to 290610 Duration: 4 months and 12 days	6 face-to-face meetings	Mail to 49 Mail from 44 Contract, not signed Agreements, not signed Presentation 1	Management at a distance Optimization of self-management	
2. Attempt Phase of Problematization/ interestment US Sales Period of time: 151109 to 100310 Duration: 3 months and 25 days	Mediated by company supervisor face-to-face meetings 2 Face-to-face US sales 1	Not separated in total Mail to 256 Mail from 2 Contract, not signed Agreement, not signed Presentation 1	Management at a distance Optimization of self-management	
2.5. Attempt Phase of Problematization/ interestment Hosting Dept. top management Period of time: 021010 to 210111 Duration: 3 months and 19	Face-to-face meetings with total group 2 Feedback meeting on system test 21/01/11 No managers registered	Integrated in general communications between the group and the researcher, no contract/agreement, minutes from meetings, and evaluation schemes	Management at a distance Optimization of self-management	Data lists of individual information from GCC IT structure prepared in GCC, exported to external IT provider, imported into beta testing system

days				
3. Attempt Phase of Problematization/ interessement Leadership-forum Top 300 Period of time: 180710 to 151210 Duration: 4 months and 28 days	Face-to-face meetings 5 with owner of the event Telcos 4 with owner & with head of "Analysis" to design GCC system output for import in ICMCS Face-to-face 4	Mail to 173 Mail from 40 Contract signed Agreements signed Presentation 1	The global 300 was planned to obtain access to the Forum register in ICMCS in establish an instant K&C bank to optimize collaboration and contacts during event and distribute system globally in top management	Data lists of individual information from GCC IT structure prepared in GCC, exported to external IT provider, imported into beta testing system
4th Attempt Four phases of translations Global legal Period of time: 091109 to 270711 Duration: 1 year, 9 months and 18 days	Face-to-face meetings with global top manager 7 Face-to-face meetings with project manager 27 Telcos 4	Mail to top manager 24 Mail from top manager 5 Mail to project manager 200 Mail from project manager 200 Contracts signed Agreement 1 Minutes/reviewed docs > 100 pages Presentations 5	The global population in Legal of 40 employees was planned as pilot to launch ICMCS in phases. Module I establishing an instant knowledge and competence bank to optimize collaboration and run-through time via knowledge sharing and search across departments and distribute system globally; phase 2 open for use of Module II and III.	Data lists of individual information from GCC IT prepared in GCC, exported to external IT provider, imported into beta testing system

Figure 32. Account of attempts of interessement and data documenting GCC: presence, meetings, documents, surveys, and tests. November 2009 to February 2012, by author.

Figure 32 accounts for research activities documenting the various ways of inductions and collections of data. It details the many attempts to establish the tests and shows the difficulties for research to engage the company in time consuming work not anticipated as being part of the production and unreflected in bonuses or patterns of incentives.

8.1 The Qualitative Social Test

To test of the socio/ technical interfaces of the artefact, ICMCS in the GCC, the Actor Network Theoretical Methodology, ANT, approach is chosen to analyze the longitudinal inductive processes, because this part of the evidence actually can be observed and described anthropologically having access to involved objects as human and non-human actors. Coordination and distribution processes are visualized in TICs and this enables non-financial

calculations based on TICs. Operations represented as forecasts, budgets and accounts in TICs displayed by the ICMCS are concretized in the artefacts connecting TIC input to processes in the dispersed context.

The complexity in processes of co-development and implementation of radically different paradigms of accounting and calculations got increased in the concrete case, which in the first place theoretically fulfilled the requirements for the creation of evidence and the applied methods, but organizationally happened to become challenged by the dramatically changing market conditions over the 24 months of co-development and testing.

The CIMO logic explains with the DSR guidelines (Hevner et al., 2004) applied to information systems science, the plan below:

Guideline 1: Design as an Artifact: Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.

Ad 1 One generic model to visualize and value individual knowledge and competence in TICs and one non-financial accounting system, ICMCS, represents the artefacts, which tend to satisfy the guideline. The case-based co-development and process of implementation represent an instantiation.

Guideline 2: Problem Relevance: The objective of design-science research is to develop technology-based solutions to important and relevant business problems.

Ad 2 The relevance of technology-based artefacts is argued in the Introduction chapter to be relevant and important.

Guideline 3: Design Evaluation: The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.

Ad 3 The utility, quality and efficacy of the measurement unit, The Intangible Currency, is studied through case-based quantitative methods as outlined in the former paragraph. The utility, quality and efficacy of the system, ICMCS, is sought demonstrated through the longitudinal, qualitative study.

Guideline 4: Research Contributions: Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.

Ad 4 The artifacts, TIC and ICMCS are expected contributions as referred in the Introduction. The visualization and valuing of individual knowledge and competence as manageable objects, TICs and the coordination and distribution of HC/IC in the system tend to be presented as proposals. The first artefact, TIC, is social/technically verified in the evidence creating quantitative processes and the second artefact, the mechanism of distribution and control, ICMCS, is sociologically declined/verified through the qualitative methodology.

Guideline 5: Research Rigor: Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.

Ad 5 The methods applied in the construction and evaluation of the artifacts are previously applied methods in neighboring fields and disciplines.

Guideline 6: Design as a Search Process: The search for effective solutions requires utilizing available means to reach the desired ends while satisfying laws in the problem environment.

Ad 6 Firstly, the IC literature review IC identifies gaps, the problem environment and describes the laws of the conceptualization. Secondly, while exposing the design result to the case company, the concept is adjusted and customized in co-developing processes

Guideline 7: Communication of Research: Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

Ad 7 The design result is presented in this thesis. Furthermore, case-based tests of the software distributing the non-financial accounting system are conducted simultaneously in industry.

The above summary demonstrates coherence between the two models for design research (Dresch et al., 2015; Hevner et al., 2004; van Aken et al., 2016) and is mentioned in an effort to improve the rigor in the use of theories and methods.

Next, this part of the case context is a little more detailed; formally, the research project was, as referred in 7.1, anchored in the corporate HR department, which was globally responsible for > 20,000 employees and a wide range of HR operations in seven regions⁵⁶. The project seemed well located in the GCC, because the processes in this department acted as early warnings and as developers of awareness of the organizational future. It was here that the upcoming dilemmas were caught and spelled out in operations: although the official corporate strategy for operational processes (recruitment, talent management) anticipated the need to increase the capacity to handle a dramatic global intake of new employees (expanding the headcount from 20,000 to 70,000 persons), the department executed mass terminations at the same time. The dilemma between external communication as a listed company and internal acting was visualized in acting: the decision to cut costs was executed here first. Thousands of letters of termination were printed in secrecy in the weeks before the redundancies were announced. The articulated strategy was maintained both inside and outside the GCC by parts of the dominant network⁵⁷, while a parallel network opposed the corporate public strategy by enacting short-term adjustments to the Danish market. The occurrences initiated an acceleration of dramatic decline in the organization's share values.

⁵⁶ Chapter 7.1: General Description of Global Case Company.

⁵⁷ Chapter 7.1: General Description of Global Case Company/Fighting Agendas, chapter 7.1.2



Figure 33. Figure showing a graph of a traced record of the GCC's market value during the time line of the project.

Source: <http://www.euroinvestor.dk/boerser/nasdaq-omx-copenhagen/>. Download 23102012

The case study shows that relations with the GCC actors proposed by the top management as allies in the interestment phase (M. Callon, 1986) became weak during a series of events. Mobilization, represented by the roll-out of the customized control system ICMCS, was stopped prior to the completion of the project: “the water was removed for the Kayak to sail”; (J. Law, 1986) and a human actor, not defined as an actor in the case study, (Sarker et al., 2006) decided to eliminate the emerging N-F network. The GCC share value was below 100, although the top-management's world view did not change in terms of its communicated financial expectations.

The radical demand for change of capacity was met by general and special resistances; global companies own IC 24/7, which is not systematically accounted for, and is invisible and inaccessible⁵⁸. In the GCC, the changing parts of the IC repeatedly left the company and came back at dawn. A percentage of the total capital would always be sleeping or non-present. This reduces change capacity. More specifically, as a market leader, the GCC saw a dramatic increase in the numbers of competitors challenging its position through all means: new technologies and new public frames; such as changes in public subsidies, the buying and selling of products, alliances, and suppliers, the changing prices of different means of transport, the development of new products, and the local financial advantages of funding. To address these many challenges, a constant need for an innovative approach to work emerged.

To face, act, or react to the multifaceted threats, change was not business as usual. If elements in routinized “operations” and the notion of hierarchy prevail over innovative flexibility, innovation is locked (Thompson, 1965). As a consequence, the case study began with a focus not only on processes and actors “in the making,” but also before “the making” (e.g. in the planning of interventions). The following represents the world view on the day, where words in documents and a web-based software program transported the researcher's knowledge vision to

⁵⁸ A4, A4.1 Existing IT architecture

a top manager in the GCC, and on June 30, 2008, at the headquarters of the GCC in Denmark, a meeting was established. On this day, the share value of the GCC opened at > 600 DKK after a constant increase through 8 years. During the meeting, which was initiated by the researcher seeking to create funding, a transfer took place, possibly because the words used to depict the vision of how the GCC could access and manage IC 24/7, providing the company with a global innovation capacity that corresponded with the identified future staff requirements of top management. The meeting was the first event in this story and was part of the problematization (M. Callon, 1986) and it framed the first attempt of domestication (ibid.), which was converted into a 3-year planning frame when the top management signed a funding contract on July 28, 2008. On this day, the share value was < 600 Dkk.

Four attempts of interessement (ibid.) were carried out that coincided with the development of knowledge classifications in the software. Finally, allies passed the obligatory passage point (ibid.) and a focused, concentrated, iterative phase of development was conducted, until the mobilization of the developed software was technically tested and ready to launch. Surveys and ICMCS were launched simultaneously.

The chapter is outlined by following the case study's moments of translations (1–4) (M. Callon, 1986). The following section contains a detailed analytic description. The occurring "trials of technologies" (B. Latour, 1996) leading up to the rupture are outlined and they support the notion of a mental space contributing to changes of identities if they were not maintained through representations anchored in the valuing paradigm (Busco et al., 2007; M. Callon, 1986; Sarker et al., 2006).

8.2 System Development Process and Trials of Technologies

Managers agreed⁵⁹ that the control and management of individual knowledge and competence potentially might impact innovation, self-management, and remote management, and might create competitive advantages (K. Kreiner & Mouritsen, 2003; Leitner, 2011; Q. Liu & Wong, 2011; London & Siva, 2011; Wu et al., 2007). The plan for the project, therefore, was to link these assumptions to the concepts in an ICM perspective. To become able to manage knowledge, the interventional project wanted to develop a "pragmatic instrumental reality" for individual knowledge and competence in order to develop "tools and skills" to enable managerial choices that actually were not visible or accessible, and, therefore, were not eligible. The objective of the geographically dispersed GCC was a project aiming to make "elusive parts of the organization manageable" and by mobilization "turn ambition to strategy" (March, 1987). The agenda implied iterative processes between the GCC and the researcher, with the GCC having accepted TIC and ICMCS as a framing model for development up front. The first step, therefore, was to find a suitable unit in the organization and adjust the relevant logics of knowledge and processes for valuing IC. According to the analyzing frame, the first part of this anchoring process enacted the "first moment of translation: problematization."

⁵⁹ In interventions, minutes, presentations, and contracts.

First, the developing steps are the examinations of interactions between the concepts and the allies exploring the methods of translations and focusing, in particular, on TIC as a calculating device. Second, the emerging trials of existing and new technologies are explored.

The GCC’s series of reactions to the interventions are here represented by actors engaged in developing controversies. The chosen methodological approach—the sociology of translations—explicates reactions, which are immaterial, and traces them in their translations into substance. Substance can be subject to traditional scientific demands and no interpretations.

“... for me translation is necessary precisely because of the irreducibility of a singularity. ... I am interested in a binary weapon ... if substance is excluded as the way to experience existence, then how many ways are there to subsist?...” (B. Latour, Harman, & Erdélyi, 2011, p. 49)

Three principles of translation: A, symmetry (explaining conflicts in the same terms); B, impartiality (between actors in controversies); and C, free associations (refraining from the use of prior distinctions between the natural and the social) are utilized to describe how the interventions in the GCC were met and later refused.

The constituent four moments of translation (M. Callon, 1986) describe the interventional case process of 24 months: (1) problematization, transporting research objectives to the head of the GCC creating funding and formal agency in the GCC, (2) intersement, planned processes “selling” (GCC terminology) research objectives to the GCC actors and creating obligatory passage points; (3) enrolment, where sets of strategies are displayed; and (4) mobilization distributing the customized TIC in ICMCS.

The competing networks, representing “trials of technologies” were identified in Figure 34 below:

Networks	Strategies	Goals	Representations	Perspectives
Financially Managed Network, FMN (1)	Economic narrative able to manage all corporate values	Manage company and support strategic corporate options	Structurally based financial calculative practices in routines across company on all levels of management, budgets/quarterly accounts, KPIs, CFO, financial department	Financial perspectives
Financial networks	Translating every action into figures, embedded deeply in global routinized operations throughout the company			Situational, dependent of profit, sales, stocks, share value—internal/external financial representations
Hosted in corporate finance				Labile
Global				Long/short
Existing network monopolizing the external				

communication with the world				
<p>N-F Competence Network (2)</p> <p>Existing N-F competence network</p> <p>Hosted in corporate HR department</p> <p>Existing network monopolizing the view of the corporate world and internal HR communication</p> <p>Strong relations to FMN</p>	<p>Simplification and alignment of administrative practices</p> <p>IC dependent of hierarchy, roles, titles, chairs. A set of competencies to every chair. HR standardization.</p>	<p>Optimize HRM by simplification and reduction of complexity in daily administration of HR tasks</p>	<p>Structurally based in job descriptions at the individual level.</p> <p>Top-down alignment processes reducing the corporate list expressing level of wages and positions in numbers and complexity</p>	<p>Financial-perspective</p> <p>Linked to daily operations supporting the hierarchy in institutionalized processes—embraced by the financial network, part of it</p>
<p>Interventional N-F Network (3) (The Case)</p> <p>Project hosted in corporate HR department</p> <p>Extra-hierarchical</p> <p>Emerging network to manage individual knowledge and competence</p>	<p>Perform a flexible organization across time, space and hierarchy</p> <p>Visualize and value knowledge and competence generically and make it accessible, to know, “Who knows what, where?”</p>	<p>Increase of competitive global power</p> <p>Global management of knowledge and competence</p> <p>Displace IC to structural capital to supplement decisions based on FM through ICM</p>	<p>A letter of announcement from the president, the presence of a researcher in the organization, minutes from meetings, presentations, a site at the Intranet, a manual, a software system, financial costs from project in FM</p>	<p>Knowledge and competence - perspective</p> <p>In the phase of development a long perspective, in the phase of mobilization a shorter perspective, when globally deployed a proactive future oriented perspective</p> <p>Change and innovation</p>

Figure 34. Identification and characteristics in competing networks, by the author.

The three networks outlined in Figure 34 make use of different technologies and strategies that impact one another. The time horizon, the short/long perspective of corporate matters, influences technologies. The case study follows the steps of the actors—the humans as well as non-humans, including this researcher—in the four moments of translation that constitute the general processes of translations and where the identity of actors, their opportunities to interact, and the margins of maneuver are negotiated.

8.2.1 The First Moment of Translation: Problematization

In this section, the actions by human and non-human actors are described chronologically as they occurred during the process of problematization. They are registered and analyzed-in-the-making. This illustrates how academic and experience-based knowledge collaborates being mutually integrated⁶⁰ when activated by competences (Polanyi, 1974; Tsoukas, 2005) and constitute an example of methodological performativity. According to the previous list⁶¹ of case activities, more attempts to anchor the case study were conducted, and the following describes the progression of the case study locating it simultaneously in its theoretical understanding.

Like the researchers in Callon's article (M. Callon, 1986) who, quite reasonably, are suspicious of how experiences to cultivate scallops on the other side of the world, in Japan, are transferred to France, this researcher is assigned a similar role as the developer of the IC concepts. In the initial meetings connecting the GCC and the researcher, the options, therefore, were double-sided; on one hand, the meetings had to identify the future sets of actors; and on the other hand, the potential actors had to sign up. To produce an organizational framing, the top manager, (Actor TopM), decided to "sell" the purpose of the project as an investigation on how to improve "self-management" and "management at a distance"⁶², which were two organizational features already identified in the company as matters of concern. The question, therefore, did not remain a simple question, but was reframed: Will a technology translating individual knowledge and competence into calculating devices as TICs give agency to processes identified as self-managing processes? To that end, the notion of "self-management" acted, as referred⁶³, as theoretical element-based proxies in the surveys' questionnaires for TIC's power to connect.

Potential participants had to be convinced to profit from the result by investing in processes unmeasured by the current KPIs. The organizational chart⁶⁴ did not enable Actor TopM, representing the top management of GCC, to decide and ask other actors how to receive the opportunity to engage in the project. There was no direct power relation between Actor TopM and the other actors. The initial meetings between the researcher and Actor TopM resulted in a list of 17 names of managers that Actor TopM proposed as potential participants in the project. But the researcher, (Actor Res), had to gain access through the hierarchy to these managers. The researcher had to create allies and present the project to activate a network of allies, which

⁶⁰ Chapter 5.4

⁶¹ Figure 32

⁶² Introductory information mail from the President in March 2010

⁶³ Chapter 7.2.1, 7.2.2 : Proxies and Hypotheses for Surveys

⁶⁴ Chart 2012

proved difficult. The first step was to inscribe the project in the governing company strategy⁶⁵ and produce “sales” PowerPoint presentations in order to be able to present the project.

During the phase of problematization, four attempts⁶⁶ were made to anchor the project in different departments. The sales department was chosen as a potential allied in the first round. However, hierarchical relations prevented accessibility and Actor Res did not succeed in getting in touch with sales names on the list; no answers were received when mailing and telephoning. Actor Res did not have enough organizational power to connect to actors through actions, such as mailing or telephoning. Physical meetings had to be arranged to empower the researcher by the top management. The decision power in sales was geographically displaced all over the globe, so the process had to wait for the quarterly co-present meetings in sales. In the meantime, another potential anchorage emerged.

The first accessible potential participant was a manager in department “A,” a fast growing global service unit with regional financial results. After more than 40 e-mails, several presentations of the project in PowerPoint and by the presentation of the beta software system in six physical meetings between Actor Res and the local manager taking place from February 17, 2010 to June 29, 2010, the manager resigned in a letter due to “too much uncertainty in the business case and the time we calculate to invest in the project”⁶⁷. The global service unit was the first lost ally in the phase of problematization.

The second opportunity to establish potential partners was created during the quarterly meeting of sales over 2 days in displaced conference facilities. After the first day, on November 18, 2009, of 2 days of global reporting, Actor TopM decided that the presentation of the case project was to take place after dinner, at 10:00pm. Actor TopM had refused to frame the meeting openly; it had to happen when the time was right. Conducted by Actor TopM, the meeting happened over coffee after a good dinner in the dining room at a displaced conference location. The PowerPoint presentation that had been created to transfer the problematization to “sales” represented by the US manager was made by Actor Res. After a short discussion, the US manager referred to unreached corporate sales performance goals, financial KPIs, and, therefore, immediately closed the opportunity to enter as a partner. Sales had no time to spend on unnecessary things. The organizational chart did not assign Actor TopM with the power to connect the sales department to the project.

To eliminate hierarchical obstacles, the third attempt to identify actors was, therefore, carried out within the business unit, where Actor TopM was the top manager. To introduce and follow the actors, the organizational context is described: Actor Top M’s number two, Actor Q, with a wide range of responsibilities for MTs in daily HR operations, such as Recruitment, Talent Management, High Potentials, Analyses, etc. also headed how the GCC managed individual knowledge and competence. The management of knowledge and competence was not explicitly

⁶⁵ Data of company strategy and PowerPoint presentations

⁶⁶ Figure 32

⁶⁷ “Business case” refers to the GCC rules, black-boxed in MTs requiring new projects to follow procedures using templates in a stage gate model. This unidentified, non-human actor does not seem to be designed for iterative processes, except for the linear functionalist concepts. Therefore, the controlling stage-driven process asks questions at Time A about the planned results at Time B, which cannot be answered for iterative processes.

supported by any institutionalized process, but was embedded in the notion of competences in HRM processes⁶⁸. The staff CVs did not even inform about education levels in a systematically registered way.

Structural capital in the GCC revealed IT architecture mirroring a rational, hierarchical concept of a company financially managed and role driven⁶⁹. The total number of standardized job descriptions indicated the individual knowledge and competence stock. This perception was represented and maintained by routines; at the beginning of every meeting, colleagues from all over the world would spontaneously—and without knowing each other—always repeat the same act within the first 5 minutes of the meeting to position themselves within the hierarchy. They very often drew an organizational chart on the board and pointed out their own position in time and space in the organizational topography to optimize the meeting. Organizational charts had a strong presence as a non-human actor representing the hierarchy, and was maintained and given agency by employees in this way. Their intellectual resources and power were interpreted by means of this piece of information.

Corporate IT architecture comprised templates for competences, roles, and positions in relation to jobs and functions. A global process had been cascaded recently to reduce the number of roles⁷⁰, competences, and positions. Individual levels of competence were self-assessed and job-related in numbers from 1 to 5 within predetermined roles of competences.

When estimating existing possibilities to answer the question: “Who knows what where?”⁷¹, reductions in registration practices and the value of data implied that:

1. The question could not be answered because knowledge and education were not recorded separately and individually.
2. The practice to register knowledge and competence in a mixed concept focusing on actual work capacity defined by actual positions excluded data about individual human knowledge. IC capacities exceeding the actual demand for capacity in existing positions did not get noted. The concept that linked knowledge and competence to existing positions was based on the existing hierarchy, which can be considered as a non-human actor supporting and defending its own rationale. The IT structure was not capable of deducing data on IC such as “Who knows what where?”
3. Self-assessed data are documented to be less valuable data (Andriessen, 2004b), because personal strategies would influence data to be either underestimated or overestimated.
4. Finally, data did not get distributed, but remained as administrative data that were accessible from privileged points but not integrated in operations management. Data

⁶⁸ Chapter7.1: General description of the Global Case Company

⁶⁹ Minutes from meeting with Q October 21, 2010

⁷⁰ Minutes from meeting November 19, 2009, with Bak in the GCC

⁷¹ Chapter 1 Introduction

were considered separate, static HR data, which were reserved as input to the top-managed processes.

One of Actor Q's managers represented and owned the derived processes to defend and maintain this hierarchical view of IC. Global processes recently had reduced and standardized the huge number of roles⁷² and a structure supporting the deployment of described, fixed roles was established as a managing scheme underlying evaluation processes, development, and unexpressed career ladders. By reducing the number of job roles, an administrative complexity was decreased as were the negotiations between groups. The construction of wages was simplified.

There was an emerging perception in the department (Actor TopM) that innovation capacity generally was a scarce, but desirable elements in the very competitive market. To act actively on the insight, the cultural features "inclusiveness and diversity"⁷³ were pointed out as process vehicles addressing the challenge, but the project⁷⁴ did not get connected to the management of knowledge and competence.

The dominant current administrative view on IC did not consider knowledge an operational resource, or did not take any instrumental consequences. These resources did not have separate identities. They were intertwined as a set of capacities hidden in description of jobs and in multifunctional competences⁷⁵. In a meeting, the manager, Mr. NN in charge of these technologies actively and explicitly refused to relate to individual knowledge; the GCC did not need knowledge, because the GCC had competences⁷⁶. He refused to connect to the constructed obligatory passage point⁷⁷ in the case: "Will systematic management of individual knowledge and competence qualify the output and save costs?" The reigning perspective proved to be a crucial weapon in the trial of financial versus N-F technologies that were to come.

Actor TopM thus decided to involve his own department as case, where he was in direct control; his subordinate middle manager Actor Q signed up to the case project in August 2010. She acted very enthusiastically in the beginning, identifying an upcoming trans-organizational global event—a leadership forum—as an initiating implementation vehicle for the project.

The conceptualized and manufactured ICMCS software was customized for this particular event. Potential global participants were identified and data lists with names, location, gender, title, company experience, photo, and age were produced in the right format and imported into ICMCS. To identify potential actors and mediate relations, Actor Res was asked to contact one of Actor Q's second-level managers, Mr. NN, to inform him of the project. Already, at the first meeting on November 19, 2009, with Mr. NN—1 year before his assignment by the hierarchy to enter the case project network—it became clear that he, whom Actor Q thus 1 year later defined

⁷² From 200 different global roles to 11 in one category (managers) and from 25 to 400 (production) to adapt to complexity in production

⁷³ Company reports and analyzes

⁷⁴ Chapter 7.1 General Description of GCC/ Existing Intellectual Capital Technologies in the GCC/ List of MTs, figure A4

⁷⁵ The notion of competences follows Dreyfus & Dreyfus

⁷⁶ Job catalog and competence catalog received by mail 04112010 from manager

⁷⁷ Figure 37

as the hierarchical passing point for the project, defended the existing technologies and maintained that he would take absolutely no steps to participate in the case project (mail and minutes). Nevertheless, he did obey his manager to enter the project, and in the fourth quarter of 2010, meetings were arranged to enter him as a formal actor. He repeated his known attitudes and his direct manager, Actor Q, let him defend existing technologies as the owner of the existing competence MTs and routines. Actor Res reported the negative outcome to Actor TopM and Actor Q, openly pointing out the differences of stance and definitions of knowledge and competence. But now, 1 month later, the radical changes had begun to happen in the industrial context, and the lay-offs began.

At a meeting October 21, 2010 Mr. NN refused⁷⁸ to enter into a mediation of the different options of knowledge and competence between the technology he owned (job related competence accounts) and the research project. He stated that “there is no need for registration of individual knowledge” or that “it is already registered.” He illustrated that after more than 10 mouse clicks he was able to open a static template with very few typed-in educations in a personal template deep down in the HR-SAP system. He claimed that at the beginning of 2011, organizational processes would be initiated to make some levels of staff type in their educations in the template. Actor Res argued that typed-in educations would not constitute dynamics on IT knowledge platforms, but stay segregated and ostensive. The method of data entry prevented the coordination and distribution of the resources. However, this was not a concern of the manager.

Now a hidden non-declared war of technologies (B. Latour, 1996) began. Mr.NN was well positioned to fight a war having access to the top level across the GCC, having allied and being well-connected and, above all, organizationally legitimate in his job position, which was not the case for Actor Res. Confronted by this attitude, Actor Q and her manager, Actor TopM, stayed passive and no longer actively identified potential actors for the project. The war of technologies was neglected and Actor Res lost organizational agency. The GCC had bigger problems now, financial problems that were made visible in the financial representations.

On October 26, 2010, only 5 days after the meeting, 3,000 employees were laid off mainly in Denmark⁷⁹ and whole factories were closed down. These operations were handled by the same actors, in the same time and space, in the corporate HR department. The event immediately changed the proportions and the time perspectives of future actions from the longer to the shorter range and empowered the networks of financial management processes and their owners. The power and legitimacy to act was transferred to the financial department. Legitimate long-range projects that had already been funded were stalled. The share value closed at 200 on October 25, 2010, and at 167 on November 1, 2010.

Still, in the hosting HR department, it was decided to establish a test group for ICMCS within the top management of the department, with deadlines for registration, meetings, and evaluations, to build up a local project network in order to catch failures and weaknesses before the global roll-out for the event: the leadership forum in February 2011. According to the plans,

⁷⁸ GCC minutes.

⁷⁹ Chapter 7. It tells the story “Business Context from 2008 to 2012.”

the top management was to enter their proper knowledge and competence in TICs in a special test system set up for them. As super-user, Actor Res knew before the decisive deadline that the management group did not enter the information as agreed. The meeting was not productive. Actor Q declined her participation shortly (5 minutes) before it was scheduled and neither Actor TopM nor any other actors had registered their knowledge and competence. The pilot made no sense. Even within the hierarchy, within the control of Actor TopM, the project had lost agency in the new context, which again still had no consequences, although circumstances had changed too much for Actor TopM to defend his faith in the project.

The non-communicated consequence was that the planned pilot in the leadership forum was stalled. The recurrent event, the Leadership Forum 300, (in contrast to the decisions already made by Actor Q's manager, Actor TopM, 5 months before⁸⁰), did not get asked to register in the customized software to initiate the roll-out of ICMCS in a global setting. Silently, and without wording or any visible action, meetings, communicated decisions, or information to Actor Res, the financial technology and routines won the battle of technologies within the heart of the corporate HR department. The contract of agreement⁸¹, written by Actor Res to explicit the project and create a visible non-human actor signed by Actor Q, was broken. The potential network of "300 global users," already imported into the software and present with names and photos, etc., in ICMCS, stayed undistributed, was not activated due to this lost, invisible battle. As a second-level top manager owning all competence processes, Actor Q had identified, proposed, and financed the "300" case project, but she did not, at any time stall the project openly. She did not break the contract verbally or in writing, but by acting. She broke it by omissions and taciturnity. In later meetings, she never referred to the topic.

If any organizational traces from the project, these might remain visible in financial representations as costs to adjust the on-line technology to the global launch of 300 users. Another trace is the customized, empty system, which is still saved on the servers of this case project.

The case project stuck to plans in phase 1, "the problematization," aiming to inspire managers to engage and identify actors for the project, entering its last round. Actor TopM's initial matters of concern⁸²: "Where is knowledge? Who has knowledge? How can it become accessible, mobile, and reusable? How increase management at a distance and self-management through knowledge driven processes?" were still not being translated into successful actions, because the addressed actors did not acknowledge that any alliance around the question, the obligatory point of passage: "Who knows what, where" would benefit them in their work situation. In contrast, they fought the problematization by any means possible.

In the operational context of terminations, the induced human insecurity and grief, the general survival processes increased, referring every little decision upward in the hierarchy. Everybody kept to the rules and acted to get measured. Everything that was not measured did not count, did

⁸⁰ Minutes from October 21, 2010 and signed Contract of Agreement.

⁸¹ Project contract.

⁸² Chapter 1 Introduction.

not exist, and was eliminated. Financial management gained general importance through the increased processes of identification both inside and outside the financial networks.

The ICMCS case project, invisible in financial management representations, added no credit and was even considered to be counterproductive in the short-term at this stage. Actor Res investigated possibilities to create N-F KPIs to lessen the barriers in existing patterns of motivation and enable participation or weaken the potential backlashes of doing so. In the present strategic setting, existing KPIs were constructed on several levels: corporate, departmental and section-wise. Departmental KPIs addressed injuries, absence, and employee-turnover at a corporate level, time to fill, internal fill rate and productivity in the hosting department. In total, 694 different possible numbers of metrics⁸³ were active. The government and even the board were involved and approved certain corporate KPIs. Projects were not represented in detailed financial measurements and incentive networks. The request from the researcher to construct a case project KPI was therefore refused by the responsible manager of “incentives and rewards.” As a valued actor in the financial network and relating to both the government and the board, from a case perspective he turned unwittingly into another warrior defending the financial rationale by preventing N-F KPIs.

The ICMCS case project had still no allies, objects or relations nor any operational network except for technical employees assigned to customize the software in the different potential project settings. These employees, guided by Actor Res, were indispensable and still available. As long as Actor Res referred to Actor TopM representing his matters of concern, organizational resources were more or less available. Assigned employees produced knowledge classifications in iterative processes to the project in formats, which were then adapted to special IT formats to become technically importable to ICMCS; various population lists and communication plans were produced as well as a project site on the Intranet. Other employees produced outputs about remote work and informed the project with historic HRM data and access to data to establish a base line for future benchmarks⁸⁴ and for IC BI to be produced in the ICMCS.

The case project’s production network for knowledge classification was unstable, because some of the assigned work force was employed as students or temporary replacements and had other managers pushing them to tasks in the line. This constituted an uncountable risk for Actor Res as resources were hard to access and only worked for the case project in residual time pockets. Planning in the case project was difficult and the project’s turnover rate was high. The human actors in the network were exchanged without passing on project experience, which, in an iterative process, altered the role of Actor Res into being the only actor going forth with knowledge. The production group represented an unstable network where attempts to consolidate were prohibited by the hierarchy, while new short-term conditions were fortifying the financially based network.

Along with the decreased share values from 682 Dkk in September 2008 (the date for signing the research contract) to 163 Dkk in November 2010, the contract-based supervision from Actor

⁸³ Company presentation: P&C strategy, policy deployment, business plans and KPIs, 2010

⁸⁴ GCC list exploring potential points of merging of existing measurement

TopM became increasingly rare, as illustrated by the non-human actor, the organizational chart. In November 2009, when the case project was made visible to the organization, Actor Res was named and broadly communicated in the departmental organizational chart as referring directly to Actor TopM. Ultimo 2010 Actor Res was moved one step down in the chart into a horizontal line of functions referring to Actor TopM. Then the name of Actor Res was removed from the organizational chart. In the first quarter of 2011, a new actor, the personal assistant of Actor TopM, replaced him in the project⁸⁵ and stepped in as the nearest manager for Actor Res. This meant that another actor had silently been placed between Actor Res and Actor TopM. When asked about the fact in a face-to-face meeting, Actor TopM answered that it was only a formality due to the general changes in the department; it would have no practical impact. However, in spite of his answer, Actor Res could not address Actor TopM directly anymore and the organizational chart—the important non-human actor—informed remote actors about the changed hierarchy, which influenced potential allies with less agency and the resources slowly dried up. The top management of resources was assigned to Actor Q and her assistant managers. The conditions for collaboration with remote actors actually signing up to the passage point became aggravated and was made extremely time consuming, because project support was almost inaccessible. Actor Res was a scarce resource in the project and every repeated action to acquire resources was a loss of time. This proved to be arms in the war of technologies: to diminish and exhaust the resources of the enemy.

The fourth attempt to identify actors was continuously performed in a parallel process initiated on November 25, 2009 during a meeting between Actor Res and a senior vice president (SVP) for a corporate support function. An introductory letter⁸⁶ from Actor TopM opened an opportunity to meet with the SVP⁸⁷. The potential future outcome of the project was negotiated up front and the SVP identified himself as an actor acknowledging individual knowledge and competence as potentially competitive parameters able to improve the quality of work in a cost-saving way. He made his local business case claiming a calculated savings of five to seven employees representing DKK 10 mill.⁸⁸. Approved by the president as a pilot project, another parallel logic to economy was represented by the SVP's question: "Which other departments will participate?" He argued that, "if ICMCS was to be deployed in the GCC and if I, with my department, enter as pilot, I want to be as sure as possible that a full roll-out will take place, because this technology optimizes its output by the number of data subjects, thus noted dispersed individual knowledge and competence objects". But Actor TopM did not give any guarantees. The demand fueled the aforementioned other attempts, because the researcher feared that this contract would fail if the network did not include more departments.

The signing of the Case Agreement Contract ended the processes of problematization on a positive note with the case being able to continue in the GCC. Therefore, it was possible to proceed to the phase of interesement (M. Callon, 1986). But the concern of the case partner, the

⁸⁵ 15 December, 2010

⁸⁶ Mail October 11, 2009 from VP

⁸⁷ Organizational chart April 2010

⁸⁸ Presentation March 2, 2010.

SVP, to engage more departments in the case to optimize results, was not met by any guarantees from the President, unfortunately, but only by positive concerns.

8.2.2 The Second Moment of Translation: the Interessement

The agreement⁸⁹ to enter the project network was signed by SVP mid-year 2010, before even opening the third attempt of “problematization”⁹⁰. The SVP negotiated the contract altering and précising the scheduled time consumption for his employees, and assigned a project manager as an actor (ProjM) in the emerging network. The construction and definition of the obligatory passage point (OPP) is shown in Figure 35 below.

The question representing the OPP was: “Will systematic management of individual knowledge and competence qualify output and save costs?”

⁸⁹ Agreement about Participation in Research Project: “Planning for the Unknown”/PLATUN.

⁹⁰ Two pages ahead.

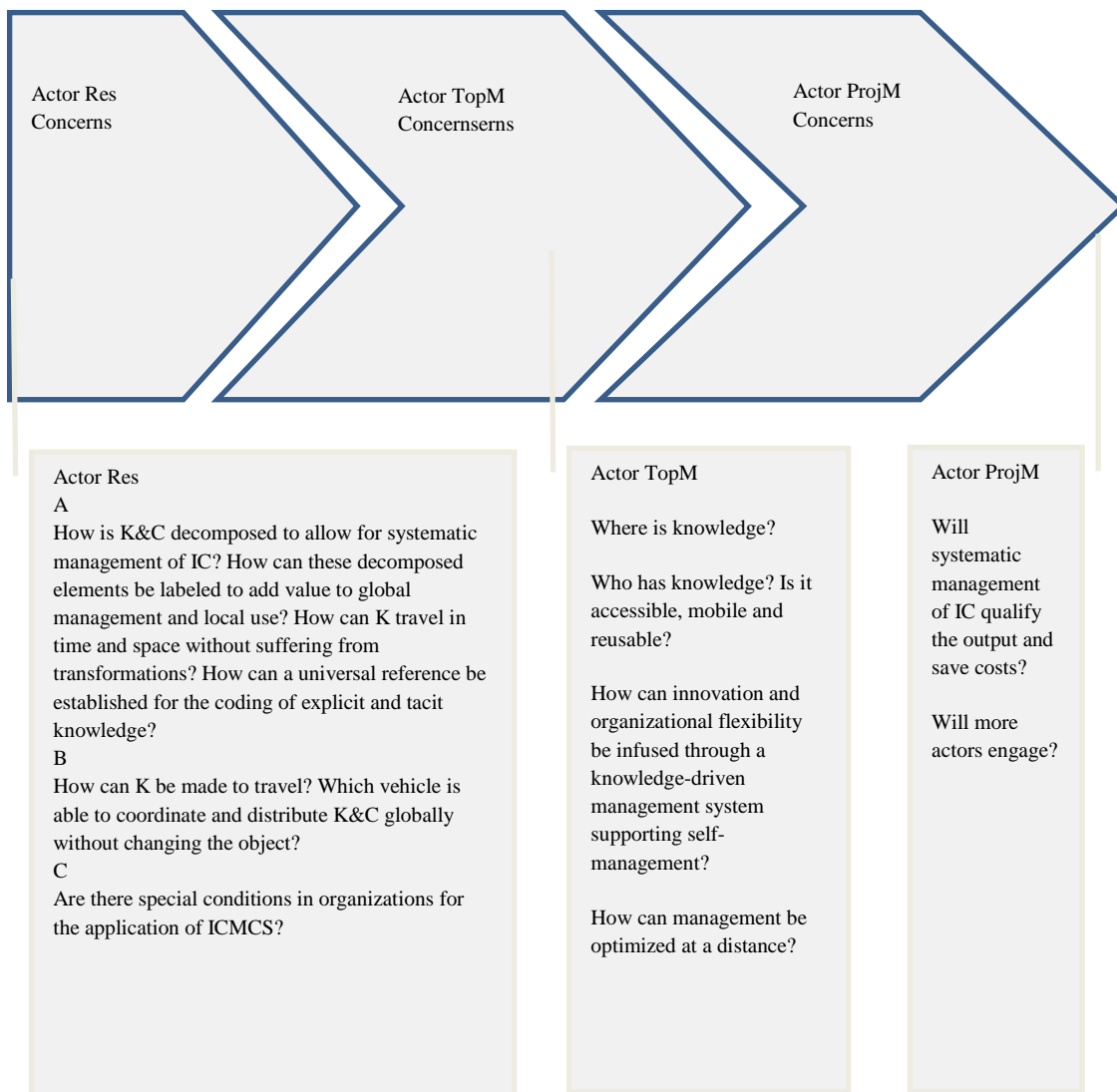


Figure 35. Actors' concerns in the construction of the obligatory passage point – K= Knowledge, C= Competence

The above Figure 35 explicates three points of departure to mediate one OPP. The theoretically founded expectation was that actors would go through a series of translations to reach a stable network (M. Callon, 1986) and black-box TIC (ibid.).

The question, “How is individual knowledge and competence decomposed to allow for systematic management of IC?” was answered by the concepts made visible and accountable in structures, as described in Part I. When coordinated and distributed in the phase of mobilization, the travelling of these valued objects was to be explored both in global management and in local use. Common notions of an ICMCS would be established in the emerging network neither destabilizing actors nor networks if TICs were circulated as immutable mobiles. The network

would provide access to knowledge independently of the demand’s geographical location, of the suppliers’ location (individual knowledge and competence owners) and the knowledge and competence values, and actors would connect to knowledge objects and initiate negotiations to allocate it. Independently, actors would leave hierarchy behind virtually in a moment of time and collaborate across borders in (managed/self-managed) knowledge-driven digital spaces without offending hierarchy. This was the vision of organizational flexibility⁹¹, which was revealed to potential actors by Actor Res in the sales presentations to make them connect to the project.

So, if the process was able to answer the OPP: “Will systematic management of individual knowledge and competence qualify output and save costs?” it was, because the actors knew and had agreed upon the concepts of ICMCS, and had connected in networks and believed in a qualifying difference provided through the ICMCS network.

In the problematization process, outlined in Figure 36 below, only the fourth attempt to identify actors was as described successful:

Attempts	Attempt 4	Attempt 3	Attempt 2.5	Attempt 2	Attempt 1
Identification	Global legal	Top 300 managers	Hosting dept. top management	Sales	Global service unit
Status	Successful Identified as an actor	Declined Not formulated Hidden reasons	Declined Not formulated Actor Q defending existing technologies	Declined Formulated Financial sales KPIs scrutinizes other actions	Declined Formulated Estimates project to be too time consuming & risky

Figure 36 Attempts of problematization, by author.

During this phase of organizational exploration and attempts, outlined in Figure 36, to anchor the case project creating allies the following actors were identified:

Actor TopM: represents the GCC as *president*, and at the same time head of the corporate hosting department.

Actor ProjM: represents a global critical support department *SVP and head of department*. He is represented by several actors in the project network.

Actor IC: represents non-human actor, the *individual knowledge and competence* of the employees—IC—which is given voice.

⁹¹ Case-based presentations.

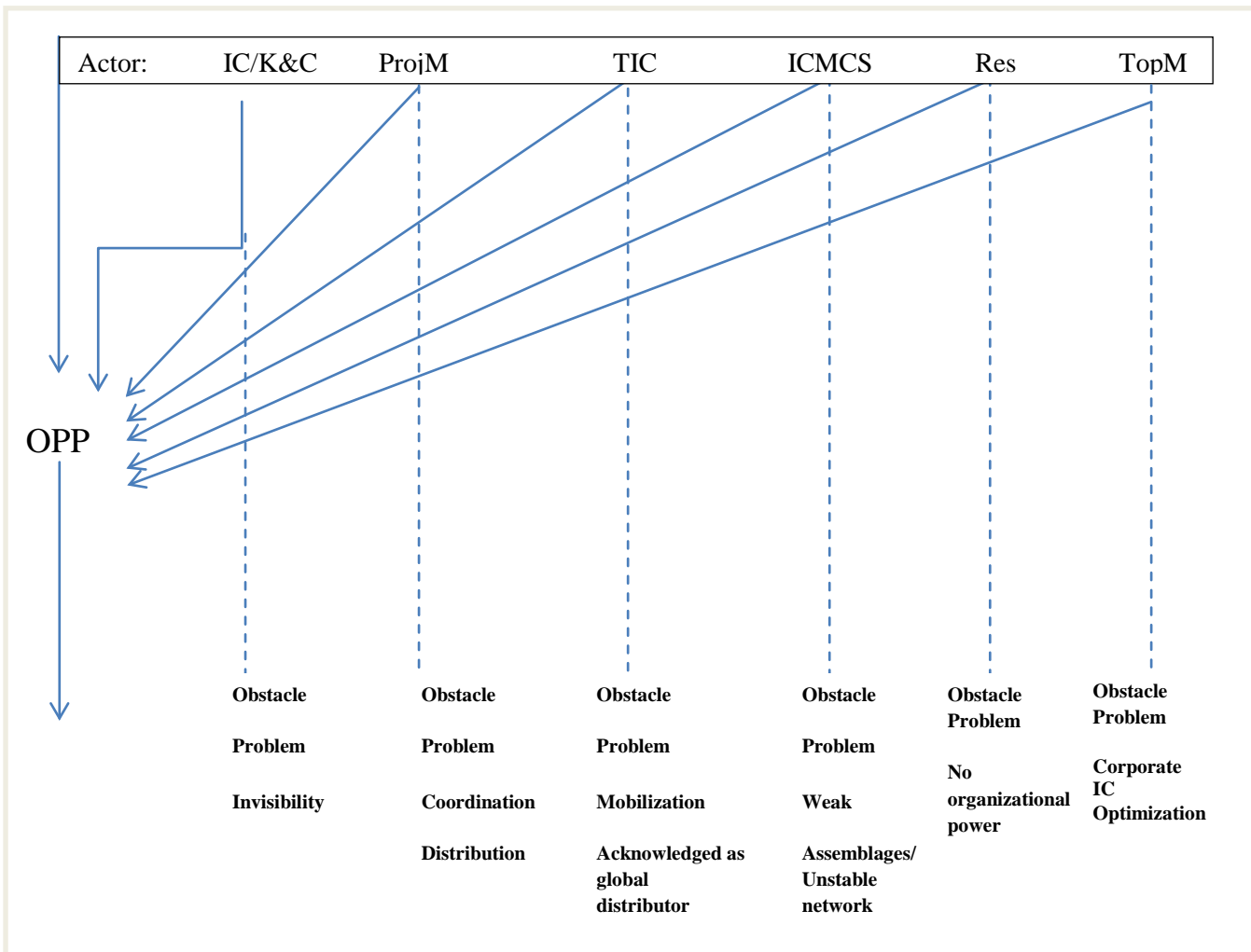
Actor ICMCS: represents a non-human actor: *ICMCS system*, a vehicle to distribute actors in the network.

Actor TIC: represents a non-human actor, *TIC, the N-F measurement unit*, which is the translated N-F values into inscriptions, to negotiate IC power distribution in the network.

Actor Res: represents a human actor, the *researcher*.

These six actors recognized that their alliance around this question could benefit each of them, illustrated below in Figure 37, but to constitute a network required that they connected to each other, gave each other agency and had allies. The entities:

Actor TopM	Actor ProjM	Actor IC	Actor ICMCS	Actor TIC	Actor Res
President	SVP	Knowledge and competence	ICMCS	TIC	Researcher



OPP:
Will systematic management of individual knowledge and competence qualify the output and save costs?

Entity goals	President Actor TopM	SVP Actor ProjM	Knowledge and Competence Actor IC	ICMCS Actor ICMCS	TIC Actor TIC	Researcher Actor Res
	Optimize exploitation and exploration of global IC	Enhance quality of work Save cost Promotion	Become visible in accounting	Coordinate & distribute IC across dispersed unites	Negotiate collaborative power relations globally	Increase knowledge about how IC can be deconstructed, labeled and accountable
	Optimize self-management & organization Innovation power	Quarterly/ Annual results			Measurement unit get accepted by use in daily operations	Increase knowledge about how IC can be coordinated & distributed in global, dispersed contexts

Figure 37. OPP, Goals and obstacles, mediating the identification of the actors in the network (M. Callon, 1986), applied by the author.

Figure 37 above outlines the respective obstacles and goals for human and non-human actors willing to sign up for the N-F network. Representing the GCC, Actor TopM was, as previously mentioned, concerned about tools to find out who knows what, where. Until now, strategic corporate goals were reached without managing individual knowledge. This insight related him to the project. His own department reacted to his enrolment 6 months later by activating a new network in his department, in the IT department, and in the financial department, to process systematized registration of educations (individual knowledge) in existing HR IT architecture. Actor Q identified the new initiative as a parallel, competing action and assigned a manager to design processes to enter educations in existing MT templates. It was only by accident that Actor Res learned about the competing processes and asked Actor TopM about the goals of the parallel process. Representing the corporate level, he stated that operations could not wait for one project to be completed, which indirectly confirmed the existence of two parallel processes. Actor Res registered the case project to suffer from these competing processes of apparently redundant capturing of information, because—to employees in a pressed workday—it made no sense to register “the same information” twice, so some refused to answer the case-project’s surveys. The quality and the capacity of potential data differed in the two processes; but “it played no role” and would request a lot of information to explain, which the daily operations management in this period of huge lay-offs couldn’t prioritize. The parallel registration process was another effective weapon in the war of technologies, because some employees in this case project’s population were to refuse registration for two reasons: (1) they felt that within a short space of time they had already registered the same information, “we are not going to have two systems”; and (2) for hierarchical reasons, “I do not refer to the case-operating department

asking me to register now, but to the financial department, and I am not allowed by finance to use more time and repeat the process”⁹².

So, in spite of the fact that tapped-in registration in templates deep down in the existing IT structure didn't generate any shared, dynamic access to individual remote knowledge assets nor establish coordination and distribution of global IC, the competing process succeeded in preventing some data from entering into the case project. The short-sighted stability conquered the long-sighted change (Busco et al., 2007).

Actor ProjM subscribed to OPP, but had general management concerns and a relation of hierarchical logic between him and Actor TopM.

Individual knowledge and competence wanted to become visible and accountable, but how? Actor Res induced the conceptualized method to visualize individual knowledge and competence in an organizational context with no such corporate experience, no practice of knowledge calculation or representation, and no N-F accounts; GCC only had the described mappings of some departmental competences. The concept was presented to the actors as part of the problematization process and acted as an interessement device together with Actor TIC. Actors intimately connected to Actor TIC representing the value of Actor IC in an organizational logic. Actor TIC created doubts as to whether the elements of design led to amplifications and justified the valuing of individual knowledge and competence in a simple way⁹³. Research informed about the importance of simplicity in management accounting tools. But now, the mobilization of networks generating IC accounts was able to verify the correctness of translations and the functionality of the accounting model's concept. Actor TIC therefore acquired the identity of an interessement device by the other actors in the network in their shared concern to make knowledge visible, accessible, and accountable.

The roles of Actor ICMCS were versatile as actor, mediator, mobilization device, and network. ICMCS was the provider of distribution mechanisms and a vehicle for other actors: for Actor IC, creating overview and access to IC; and for Actor TIC, as a mediator between human actors owning individual knowledge and competence and the distribution of IC. Over time, the ICMCS actor would change agency and become the only actor able to provide direct access to the network and to provide the relation between new actors and the network. The ICMCS network enabled the transport of Actor IC and Actor TIC, and would thus make knowledge travel if the actors gave agency to actor TICs and considered the value representations reliable. In the analytic understanding, Actor ICMCS performs in this process as “a towline of the scallops.” Potential networks may find the act of connecting too radical, too innovative, and too difficult. Human actors may find it too hard to collect the effects in the organizational logic. Relating actors may not wait for its performance to assure balanced present and future exploitation and exploration of IC (March, 1991) threatening the consolidation of the emerging network, which would then break.

⁹² Mail from an actor in the population.

⁹³ About the MT Balanced Scorecard it is stated: “... It is the simplicity entailed by the method and its visual clarity which makes management accounting tools performable” (Busco, 2007, p. 143)

The last identified actor, Actor Res, the researcher, had a problematizing role offering methods to explore and exploit K&C. To learn how knowledge can be decomposed, be fluid, and travel in networks, an ultimate obstacle would be an unstable/broken network where intersement devices were not able to convince actors to connect. To increase knowledge about how calculative practices (Miller, 2001) are able to perform IC and make knowledge travel, the actors must stay connected and the devices of intersement must consolidate social links. Here a “triangle of intersement” was constructed by the non-human actors TIC, individual knowledge and competence, the ICMCS, and the human actors. Here, TICs in ICMCS represented what the towlines were for the scallops (M. Callon, 1986).

Actors became allies in networks signed up through OPP by defining each other in competing strategies and mechanisms that were adopted to bring about interruptions or stronger agencies.

TIC constitutes an intersement device extracting individual knowledge and competence from its incarnations making the values visible and accountable in networks. TIC plans to enhance its agency by being globally exchangeable; it is designed to be capable of communicating values of individual knowledge and competence in figures in the same way around the globe independently of where and when it is used or translated into TIC. The same object of knowledge is incarnated in various persons with differing talents to activate its objects. Therefore, the measurement unit is constructed of three elements⁹⁴. The data entry method is designed to guarantee high quality data. By means of TIC’s valuation method, inscriptions are constructed that order, label, and translate individual knowledge and competence from the heads of the employees to a 2-dimensional digital medium, TIC, accessible for new dispersed actors. Actor ProjM believed that this device would enable him/her to reach their goals, as well as the other actors believed to reach theirs through the OPP⁹⁵.

8.2.3 The Third Moment of Translation: the Enrolment

According to the analytical model, the next event is an activity where the actors get locked up in an enrolment construction graphically depicted in Figure 38 below. Applied here in-the-making, the event is described in the following paragraph; to fortify relations a strategy was agreed between Actor Res and Actor ProjM, who is substituted by an assigned project manager, to identify local and global knowledge in the current global department.

The actors agreed to adjust the topography of knowledge classifications. The method presented by Actor Res applied two punctualized networks (J. Law, 1991) in the construction of the TIC: the academic science network, which is the oldest and most global network, and ⁹⁶Laborsta, an international standardized classification of the European labor market used in the EU by supranational institutions. The following section describes how.

⁹⁴ Chapter 5.4: The Concept of The Intangible Currency™.

⁹⁵ Figure 37

⁹⁶ The classification of international labor market change, also represented by Ilostat, <http://www.ilo.org/ilostat/>

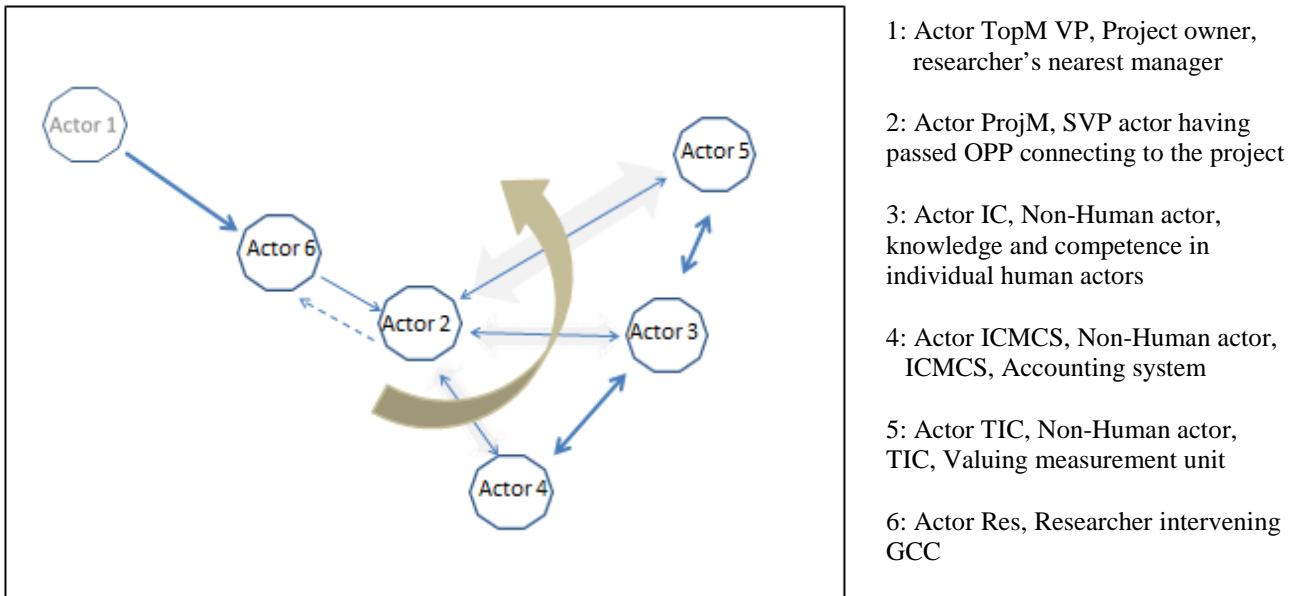
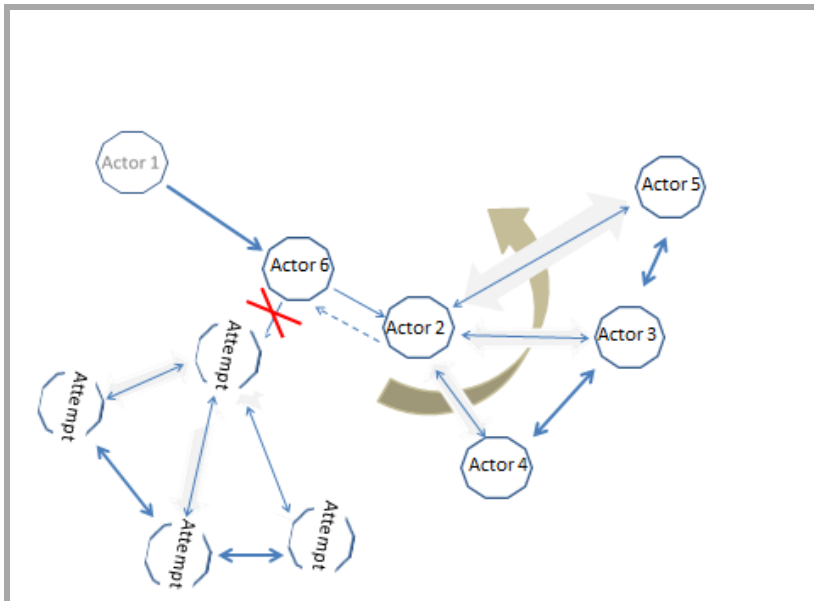


Figure 38. ANT Process Dynamics (M. Callon, 1986) adapted by author.

The diagram, Figure 38, expresses dynamic movements in agencies occurring during the processes where Actor Res or Actor ProjM tried to lock up the construct of interessement. In Actor Res' perspective, the non-human actors 3, 4, and 5 were dependent of Actor ProjM and were able to gain agency through qualitative relations to Actor ProjM and vice versa, because Actor ProjM's involvement created the defense of a customized system. This practical work to customize the concept impacted the agency of Actor Res and satisfied expectations between Actor Res and Actor TopM. Actor Res had to weaken or cut relations to Actors 3, 4, and 5 and hand over to Actor ProjM to influence them to lock the interessement construction. To fulfill the demands from Actor ProjM, the network had to include one more pilot case from another department, but attempts to engage more pilot cases (actors) failed, as previously referred. The failed attempts negatively impacted relations between Actor Res and Actor ProjM. The cut relational arrows in the figure below show the four "attempted" anchoring project relations. Relations between Actor ProjM and Actor Res became destabilized and weakened as depicted in Figure 39 below.



- 1: Actor TopM VP, Project owner, researcher's nearest manager
- 2: Actor ProjM, SVP actor having passed OPP relating to project
- 3: Actor IC, Non-Human actor, K&C in individual human actors
- 4: Actor ICMCS, Non-Human actor, ICMCS, Accounting system
- 5: Actor TIC, Non-Human actor, TIC, Valuing measurement unit
- 6: Actor Res, Researcher intervening GCC

Figure 39. Enrolment between actors 2, 6, 3, 4, and 5. Callon (M. Callon, 1986) adapted by author.

Figure 39 shows network dynamics during 12 months. The size of the gray arrows indicates the strengths in the relations showing strong activity between actor 6, 2, and 5, a movement initiated through the customizing of Actor TIC and a changed effect on Actor ICMCS. It also shows four failed attempts to connect in the phase of problematization. In spite of this, the network did not break, although the human actors knew that the requirement of a second pilot or a manifestation from management to roll out the system after the pilot had not been met.

The knowledge topography and the methods introduced by Actor Res were concerned with both explicit and tacit knowledge. Supportive resources assigned by Actor TopM to digitalize and export classifications to ICMCS fortified the agency of Actor Res, who was now able to present various principles for IC stocks labeling knowledge to Actor ProjM translated into the functionalities of the IT system:

1. Academic knowledge: representing the explicit knowledge from public educations
2. Experience-based knowledge: representing tacit experience-based knowledge from labor markets
3. Company knowledge: representing company-specific knowledge
4. Other knowledge: representing local knowledge.

Actor Res and Actor ProjM renounced developing a methodology to map local knowledge conserving digital space and functionalities for the local entering of individual knowledge and competence, but, in contrast, they agreed on recognizable structures reusing existing classifications from the GCC site for training and courses, which then were technically imported into the IC accounting system.

During the problematization and intersement phases, and the negotiations between the potential actors considering OPP and enrolment, some principles for the construction of inscriptions were settled. These principles stayed onboard after the OPP process, although the actors changed, because new actors accepted them as intermediaries to their own goals. The OPP question: “*Will systematic management of intellectual capital qualify the output and save costs?*” required strong relations between Actor Res and Actor ProjM to negotiate and agree on methods labeling knowledge locally that still respected the concern for knowledge to travel on a global scale. The scalability from micro to macro had to be evident and documentable. For a while, a laboratory was established that could “lead us to a world” (B. Latour, 1991). The task was to develop a series of translations that would act as intermediaries in emerging networks of the future. During the first attempts to connect to human actors in the GCC and to encourage them to identify themselves as allies, iterative processes were conducted based on the concept.

Entering data in ICMCS represents agreed knowledge conditions without missing any object’s identified roots in an academic main field. With convergence tendencies in some knowledge domains, but also because multi-disciplinary collaborating is on the verge of becoming very common (Harvard Business Review Press, 2011) knowledge objects cannot be understood without their original disciplinary context.

To guarantee a global topography in global processes of demand, the ordering principles of globally shared classifications in the concept were accepted. A classification of academic disciplines was adapted and connected to in punctualized networks in TICs, the knowledge-inscriptions, which noted both the horizontal and vertical quality parameters⁹⁷ of a knowledge object (M. Callon, 1991; J. Law, 1991).

Actor TIC was introduced as a trapping device in order to mediate different strategies of the human actors.

Summing up, Actor Q and her related networks, which in the organizational logic were subordinate hierarchical elements to Actor TopM, were not able to establish alliances across existing calculating processes that they owned and were defending. Their routinized, calculating practices of competence confused the notion of knowledge and they defined IC resources as “competences” in operations management. Knowledge remained entangled and invisible in this notion. In the existing organizational logic, competences are only visible and calculated when related to existing roles, titles, and departments. The proposal of a measurement unit, TIC, only enhanced the intensity of trials, and it was argued that:

“We don’t separate knowledge and competence, knowledge is not very important to the production, we only use GCC knowledge, we know, who knows what”⁹⁸. (Minutes from February 2010)

However, the TIC had been a convincing argument to Actor TopM, but Actor Q did not align. Actor TopM chose to ignore his own lost representational power when confronted by Actor Res

⁹⁷ Chapter 4.7.3: Knowledge Dimensions.

⁹⁸ Minutes from meeting with LB February 2010.

with that fact. His identity had changed. He transferred his engagement to Actor ProjM and he put it this way:

“To obtain success in the pilot project in the GCC the alliances with actor ProjM has to be fortified and has to function, has to be a success.”

In this section, events and processes have been outlined according to the source text (M. Callon, 1986) and they will continuously be the objects for analysis in the next section.

8.2.4 Analysis of Enrolment

The process of interessement defined and produced relations between actors, although every actor had obstacles to enforce the relations. To be able to reinforce relations in mediating strategies, the obstacles were important hooks of negotiation.

Actor TopM defended corporate, strategic goals, and had to handle both short- and long-term business perspectives. To know “who knows what, where” might contribute to strategic options in the longer perspective, because the GCC had no MTs or communication devices for IC as a resource in its own right and had no registration of knowledge resources. However, he was under pressure by decreased share values which reduced his radius of actions from long to short terms, at the same time gave more agency to financial management and its representations. Long term projects turned illegitimate.

“When we signed the contract in 2008, we could buy the world with a share value of > 600. What a pity that the project waited 1 year and first was initiated late in 2009.”⁹⁹

His overall goal was to gain global competitive advantages through excellent fact-based management of his department. “Management at a distance” and “self-management” were tools in that box; “management of individual knowledge and competence” was the tool in the remote management box and the self-management’s box.

Actor ProjM was related to Actor TopM hierarchically as he was in a position under Actor TopM, but was located in another department geographically displaced. As manager, he was responsible for career satisfaction for himself and his subordinates, for organizational complexity, competition, lay-offs, throughput time, and failures in his production, and for costs. His goal was optimization, more global quality in his production, and faster production at a reduced cost. He believed in the concept of the case project and signed up to the OPP in the project contract. To reach the next phase, his goals had to be obtainable in alliances within the project. He was willing to engage as first user and have an initial impact on the development and customizing of ICMCS, but he also was fully convinced that he would not reach his goals if the project remained a local pilot project in his (global) department: “The value of ICMCS is not fulfilled until a major part of the global workforce is enrolled and mobilized”, he said. Therefore, he asked Actor TopM for a publicly communicated commitment to roll out the ICMCS in the GCC after the evaluation of the pilot. This requirement was lethal for the

⁹⁹ Supervisor meeting nr 1, minutes.

emerging network, because a decision to roll out was made, which depended on the evaluation of the pilot by Actor TopM. During the system development process, this question was raised many times and Actor TopM confirmed every time that a satisfactory evaluation of the pilot project would enroll ICMCS in the GCC. Up until June 2011¹⁰⁰ the answer protected the connections between the allies, which were increasingly under pressure from the questions of distribution and mobilization, and from an industrial business context that became extremely short-sighted.

Actor IC, a non-human actor, faced a range of obstacles too. For the capital, which was unrepresented in financial accounts as “underlying resources” and thus with no monetary value, it was difficult to gain any agency in a network. The concept’s method of translation was accepted by human actors in the N-F network when they supported the OPP. Still, Actor IC faced some obstacles that made it completely dependent on N-F actors: evasion in the process of IC registrations. If future users of the ICMCS did not register individual knowledge and competence, then the concept’s translation to materiality of Actor IC would not be explicated, visible or accessible, and the goal of global optimization of individual knowledge and competence would not be reached.

The non-human actor, ICMCS, had obstacles too, representing radical as opposed to incremental solutions for the distribution of resources. It is generally acknowledged that incremental development produces fewer obstacles in the decision-making processes than radical development, especially in IT architecture and integrated solutions¹⁰¹ (C. Argyris, 2004a). Furthermore, it is acknowledged that the initial high costs are an obstacle to decisions, as are effects collected on a long-term instead of a short-term basis (C. Argyris, 1990; Lynn, 1999; Sarker et al., 2006; Simonsen, 2007). All three obstacles were present in this case: materialization of individual knowledge and competence in a new N-F accounting system producing new BI, not only on historical data but also on forecasts and budgets on IC. Actor ICMCS would produce visible representations of hidden values, which, the project network believed, might add financial value in the future, if managed. To apply IC accounting methods represented an amount of time and money in incremental processes, and potential results would become verified on a time horizon exceeding the normal framework for projects. Nevertheless, Actor ICMCS acted as an interestment device, as “towlines” for the collectors of individual knowledge and competence, because its research identity was able to prevail over the identity of the financial context for some time (M. Callon, 1986).

The non-human actor, Actor TIC, also produced obstacles in the emerging network. The general method represented in the OPP process was not directly and fully adaptable to the individual knowledge and competence resources of the department. It had to be negotiated along actual knowledge dimensions. Another obstacle was doubt about whether amplifications in the translations exceeded the reductions locally and globally. This doubt could be explored only

¹⁰⁰ Minutes from meeting TopM, 2, 6 June 2011.

¹⁰¹ Science and Technology Studies, STS, research.

through mobilization, so the goal to be acknowledged as a global currency able to value IC resources depended on the next phases and the future users of the ICMCS.

Finally, having described the obstacles for the other actors only the obstacles for Actor Res remain to be explicated. The goal for the researcher was to explore how and if conceptualized methods and artefacts worked, which were designed to enable managers in global contexts to make knowledge-based decisions across locations founded on outputs from operations of individual IC capacity. Any threat to the emerging network was perceived as an obstacle and had to be handled actively. Any obstacle to other actors was, therefore, viewed as obstacles to Actor Res. Competing networks, time, and money were all obstacles disguised in many roles, objects, elements, and processes.

These are the positions of negotiations for actors in the network. Now, in the following subsection, the actions and factual events will be described.

8.2.5 Process of development of knowledge classifications

Both as an extended interessement device and in the processes of mediation/enrolment, Actor Res proceeded to transform arguments to actions. Throughout 2010, student workers in the GCC were assigned to extract disciplinary content from the websites of eight Danish universities. In spite of being governed by equal regulations, the Danish tradition for autonomy in the choice of syllabus within the same educations is still defended and alive in universities. This turned the creation of academic knowledge lists difficult, because every description of educations had to be captured locally on separate university sites. Importable lists in Excel format were produced from public websites from all Danish universities by several changing labor resources, which made it difficult to calculate the investment. This was a part-time job for several student workers over a period of 6 months.

The Danish Ministry of Education was not able to provide an overview¹⁰² of the academic content in the educations or disciplines in universities. The universities, which did not adapt proactively to industry¹⁰³, but did to the political goals in the Bologna process¹⁰⁴ rather than to academic requirements, changed the mix of courses and their titles repeatedly; this challenged working ostensibly (Catasús, 2008; A. Hansen, 2011; B. Latour, 1986; J. Mouritsen, 2006) with a topography of knowledge.

Nevertheless, because knowledge dimensions are mirrored isomorphically in systematizing knowledge classifications¹⁰⁴ in constructing ICMCS, time is stopped in the laboratory while an ostensive research approach to knowledge is practiced and registration takes place.

¹⁰² A number of ministerial employees were consulted over a period of 8 months from November 2009 to June 2010, ending up by advising the use of websites from eight universities as the most recent material, having produced no overview themselves.

¹⁰³ Laura Louise Sarauw PhD, *Kompetencebegrebet*: "The thesis explores the curricular implications of the concept of 'competence' that was introduced into the Danish Framework of Qualifications for Higher Education 2003 as part of the national implementation of the European Bologna Process... What my study shows is, however, that the framework of the study programs was so tight and the 'competence goals' defined the learning outcomes so stringently that there was no place in the study programs for free and formative learning. As a consequence, I conclude that by trying to continued 97: translate the 'real values' of the Danish university tradition into performance oriented 'competence goals,' the academics became co-producers of a new kind of steering in which knowledge has become truly performative, and in which all values that could not be translated into 'competences' applicable to employment were excluded. The effect was to narrow the role and function of the university, because little room was left in the study programs for anything not related to preparation for the labor market."

¹⁰⁴ 5.1: Classification of Knowledge.

Performativity in the application (flow) of knowledge searched and found in the knowledge bank (stocks) in operations will update classifications along both dimensions through a series of calculative practices adding new knowledge and new levels to the knowledge bank.

This network of alternating student workers was a threat to the interventional project as a whole, because knowledge about this partial, special work process was lost in translation. The work took several months and resulted in more than 50 A3 pages of classified academic disciplines, which had to be translated into English and technically transferred to an accessible medium—the web-based software program, ICMCS, which were hosted in an external company and affiliated by a business contract to the project.

The classification files were sent by mail from the GCC to the external company, which imported the files into the software. This transaction was repeated many times, because the lists were revised. The mere task to order and keep account of the various versions of the lists was a challenge to the network of student workers, to Actor Res, and to the external company, represented by four to five different coding staff members. Every transaction of data import represented both time and money.

While the GCC's share value diminished, as referred, the rationale of financial management gained organizational power. The case's financial representation in budgets and accounts was the only locus that made the case project exist outside the hosting department. Within the HR department, it was visible in the organizational chart as a PhD project affiliated to the president. The project had a financial account and acquired, as time went by, several account numbers according to the various events of appropriation. The relations to the external IT Company and to other external suppliers were controlled by processes of appropriation by Actor TopM, and accounts were controlled by controllers from the financial department placed in HR. From 2009 to 2010, the financial department increased its organizational power. During the phase of intersement activities, Actor Res encouraged Actor TopM to take the initiative to inform the head of finance about the project. In the organizational charts, the chief financial officer (CFO) was aligned with the chief executive officer (CEO) as a double top management team, although his major role was internal. Actor TopM stated that this presentation was risky business, because he did not expect the CFO to respect or accept N-F project visions. As he was the most powerful actor defending the existing business logic, Actor TopM preferred to follow a strategy where evaluations from the allied case department after the enrolment and mobilization phase proved a success. This, rather than a visionary project description, would convince the CFO. It was not to be foreseen that the CFO's department indirectly could prevent mobilization.

In series of translations agreed upon between Actor ProjM and Actor Res making knowledge visible in an accessible classification illustrated by Figure 40 below, four groups of diversified knowledge were customized, each requiring different methods of visualization.

Knowledge	Academic; From public educations	Experience based From documented job positions	Company knowledge From taken courses	Other knowledge Local and self-managed
Explicit Structuring topographic principle	Standardized global classification Scientific disciplines, global existing structure	Standardized global classification, description of labor market	Internal, standardized classification Makes no external sense, but is operational at corporate level	Makes only local sense, only operational at corporate level for BI
Tacit Structuring topographic principle	Tacit	Indirect information in non-operational conglomerates of knowledge	Company experience translates into the knowledge classification	Local company experience translates into the knowledge classification
Specific Structuring topographic principle	Embedded in the course classification	Taken courses	Firm-specific course classification The global structure of corporate learning system	Local instructors
Local Structuring topographic principle	None	None	None	Structure left to departments, local actors
Global data entry and use	Yes	Yes	Yes	
Local data entry and use				Yes

Figure 40. Knowledge data structure, by author.

The emerging N-F network agreed upon the four group-identities for knowledge in Figure 40. Thus became the HC/IC assets, individual knowledge and competence (K&C), displaced to the distribution device, ICMCS, and the concept's generic translation methodology proceeded like this illustrated below in Figure 41:

Chain of translation for individual academic knowledge and competences

Matter of concern : How to make IC managable, knowledge visible, accountable and accessible in a global context
 Matter of form: - Employees with knowledge inside their heads, hidden bios on paper, no systemized documentation

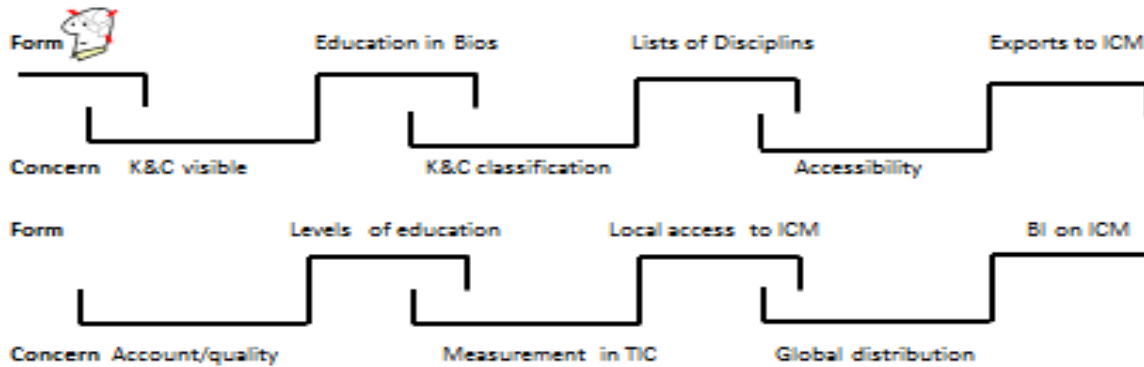


Figure 41. Academic knowledge in disciplines: series of translation, by the author.

By the seven elements of translations shown above in Figure 41, knowledge was transferred from employees to a piece of web-based software, thereby becoming visualized and globally accessible.

In shared processes between actors in the N-F network, it was agreed that educations in CVs documented the academic type and level of knowledge belonging to individual human actors, and the number of months holding a position in an industrial sector on the labor market documented experience-based knowledge in terms of type of work and level of work. It was agreed that these two types of knowledge captured explicit and tacit knowledge of the human actors. Lists of knowledge fields from university educations were ordered in classifications to register the context (Augier et al., 2001) and identity of every knowledge object. The knowledge objects' path dependencies were conserved in the translations into Excel format and later when exporting the lists to ICMCS. Labor market positions were translated into international lists labelling labor market sectors in the EU¹⁰⁵.

Having now established a distributable, global, accessible classification of knowledge, the process of mediation proceeded to the next matter of concern (accountability), and thus to the next element of translation, (measurements). The intervention required employees to enroll in identical registration processes, thereby globally establishing accounts of existing knowledge (stocks). In this element of translation, the measurement of personal competence was added to knowledge.

Technically, every human actor was globally enabled to search and find individual knowledge and competence now, because individual registrations were displaced as data in a web-based system; according to plans, global distribution should be the next step. By means of the seven

¹⁰⁵ International governmental processes have striven for more than 20 years to harmonize educations in and between the EU and the US.

elements of translation, knowledge had become accountable, visible, and accessible, but to create evidence on the management of individual knowledge and competence, the network was to engage in the mobilization of TICs, register and use the system in operations of and through IC.

The last element noted in this chain of translations as a matter of form (Figure 41 above), “BI Intellectual Capital Management,” expressed future output from the ICMCS, after the mobilization. Below, Figure 42 presents the processes of translations from something inside people’s heads to attainable managerial objects.

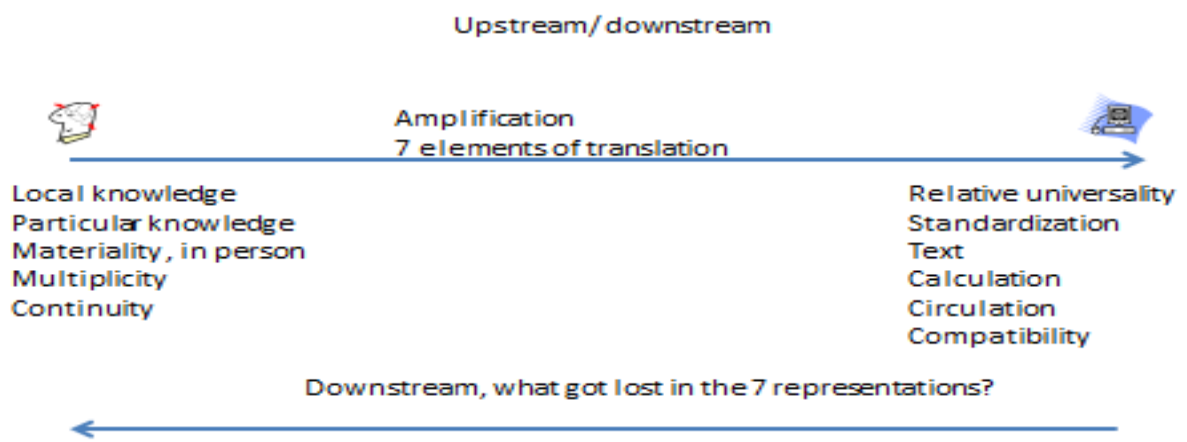


Figure 42. Upstream/downstream translations, by author.

Figure 42 sums up the translations pointing out an important question, because empirically founded answers to this question about amplification/reductions in translations must await an evaluation of the mobilization of ICMCS, the effects and an exploration of users’ practices¹⁰⁶. To finish the analysis of enrolment processes, three more knowledge topographies are explored, which are translations of tacit, company specific, and local knowledge.

8.2.6 Translation of Tacit Knowledge

As an element in the co-developing processes, the description of the capturing processes of tacit, company-specific, and local knowledge will follow. The concept’s general translating principles have been accepted in the OPP, but the domestication of the general principles will follow.

During the processes negotiating the strength of relations, any well-argued option put forward by Actor ProjM or his representatives concerning decomposition of conglomerates of special knowledge in operations was received and transformed into the technical logic by Actor Res. Actor ProjM presented options about knowledge, which she considered as vitally important and causal for global search and the application of knowledge. The legal pilot department was

¹⁰⁶ Referred to Future Research.

handling every aspect of law in the global industry sector and for operations as recruitment processes, talent management, internal knowledge search, teaming and quality control processes, it was of utmost significance for the estimation and judgment of resources, for final management decisions at a distance, for practicing remote control on the basis of an IT system's IC business information—that knowledge based on experiences: tacit knowledge—was pinned out according to specific features. “*Some parts of the legal knowledge body are specific to local jurisdictions, nations, or regions, around the world*” the substituting actor for Actor ProjM pointed out. When the aim was to identify useful and mandatory design elements for a global knowledge search, it was, therefore, not only necessary to register in which country a given education had taken place, but also necessary to register in which geographical locations tacit knowledge had been acquired. Furthermore, legal practice also differs in professions and business lines¹⁰⁷. To satisfy the need to distinguish legal tacit knowledge, the classification was adapted to these demands and extended to include the registration of nationalities in the different positions and where work experiences had been obtained. Thus, adaption to the abovementioned knowledge dimensions were respected and applied to the tacit classification based on the public Laborsta¹⁰⁸ classification.

The systematic decomposition of tacit knowledge into objects of experience-based knowledge, according to general requirements from space and time, was satisfactory to the allies in the network, because the properties of special knowledge was respected and made visible and operational, and because the translations enabled the kind of inscriptions that makes knowledge travel free of time and space.

It was not possible to reuse the valuing methodology qualifying knowledge objects from academic knowledge, because the academic levels of Ba, M and PhD make little sense to the quality of experience – based knowledge collected in labor markets. To translate the vertical quality dimension in tacit knowledge, it was agreed to conserve the notion of five levels (1–5), and relate the level of knowledge to the number of months of experience/title/work location (country).

Informed by scholars, tacit knowledge was considered to be constructed by business discourses of nations, sectors, branches, cultures, hierarchical levels and stay-on time (Collins, 2001; Duguid, 2005; Polanyi, 1974). The proposed translation model in Figure 43 below tends to capture values of tacit knowledge indirectly through registration of intervals of stay-on time within the extended options of knowledge.

¹⁰⁷ Eight physical meetings between actor ProjM and actor Res negotiate and mediate the classification and accounting principles in the OPP on April 15, 2010; November 23, 2010; December 21, 2010; January 27, 2011; May 9, 2011; May 19, 2011; June 8, 2011; and July 18, 2011; mail and documents.

¹⁰⁸ <http://laborsta.ilo.org/>

Chain of translation elements for tacit knowledge

The matter of concern : How to make knowledge visible, accountable and accessible in a global context

The matter of form: Employees with knowledge inside their heads

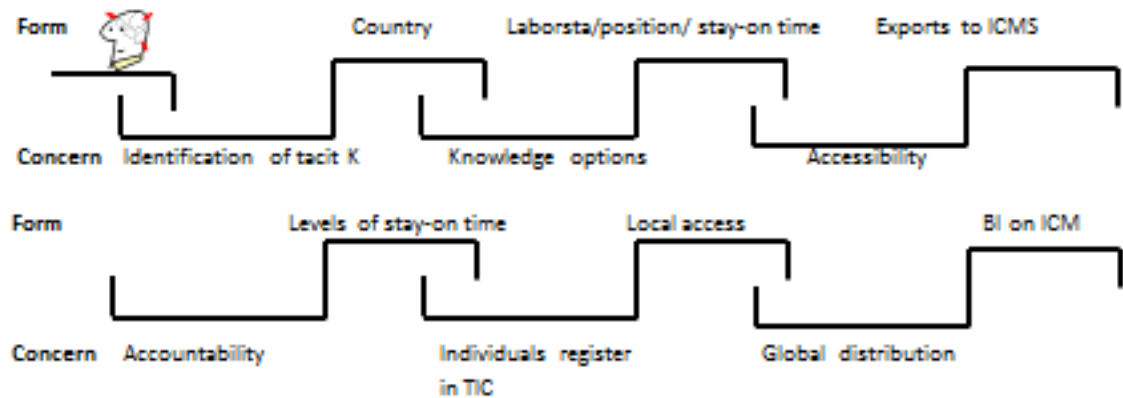


Figure 43. Tacit knowledge; Series of translations, by author.

To capture tacit knowledge from the elements mentioned in Figure 43 above in an accounting practice they were translated from available, aware forms:

- countries in which the owner of knowledge has received education and worked
- sectors (private/public) branches, and business lines
- time exposed to these features.

The elements are in calculative practices to be translated into the figure-based language, indicating levels of tacit knowledge.

In the process the TIC model was confirmed as accepted, although it was also extended to include the mentioned adjustments.

Actor ProjM emphasized the importance of the control of tacit knowledge across locations. In distant allocation processes, managers must be guaranteed not only the employee’s quality in knowledge of law and jurisdictions, but also their capacity to move about successfully in foreign cultures and countries. *“An immature violation of unwritten laws proves often prohibitive for business”* Actor ProjM argued; “immature” was meant as inexperienced.

In addition to a demand for academic knowledge, Actor ProjM was satisfied to be able to estimate and manage an allocation as a demand for tacit knowledge by the descriptive devices to context and locality (geographically and labor market), time and position.

8.2.7 Translation of Company Specific Knowledge and Local Knowledge

The N-F network's human actors agreed on the design of classifications for academic and experience-based knowledge, but company-specific and local knowledge were remaining categories. Again, a punctualized network was considered the point of connection in the network, this time for two reasons:

- to ease the fast use of ICMCS in the GCC by interfacing to existing networks with published strategic goals and proper financial calculative practices
- to optimize the information power of the labeled knowledge.

Therefore, the classification generated by the GCC's own Company Academy was chosen, which is globally connected to the global value chain and to operations. It has an independent, digital identity, its own website, and routinized processes of administration. Every employee is familiar with its rationale.

The Academy was administrated and managed by the corporate HR department and its paradigm was well adapted and used on self-service sites to sign up for courses. Its classification was transferred to Excel by technical actors in the GCC and imported into ICMCS as a special knowledge classification for company-specific individual knowledge and competence by the external IT supplier.

The representation of the value of knowledge acquired through course participation was negotiated because the methods already agreed upon and applied in the other two knowledge classifications did not make sense: the principle of a valuation from 1 to 5 was dismissed, because the vertical quality dimension of knowledge lost its importance. When searching for knowledge to estimate and calculate future team capacity across locations, or considering a strategic forecast, it was considered that it made sense to interns, whether or not the courses had been taken, but in an external recruitment process, it was irrelevant. It was decided to keep it simple and only record it on a binary yes/no level.

Finally, it was agreed that local knowledge issues and their ideas of classifications should remain local. The capacity to arrange parties, sports, events, and other local activities was important to share locally; therefore, it was agreed that the classification of local knowledge remained open and was left to the users to order and arrange in future bottom-up processes. For local users, new employees and global employees, access to that kind of information might significantly reduce time-to-function without disturbing local employees. The construction of data is designed to inform corporate BI on different local issues and thus offer new possibilities to manage IC, also across locations. It was decided to leave this process to locality and evaluate its use at a later date.

This decision finished the process of customization and co-development of elements in the various identified species of knowledge translations proposed in the TIC concept: academic, experience-based, company-specific, and local knowledge.

The enrolment process was constructed by actions related to present human actors or by remote actors that activated it on the demand of the present actors. The actors or their representatives had used various techniques (M. Callon, 1986) during the enrolments. Psychological violence (“*we don’t use knowledge here, only competence*”, *unformulated decline of prepared case*); threats (“*requirement of a general, but company-specific process of an approval of a project, a ‘business plan’ for the project, a time consuming process exceeding the project’s framework*”); seduction (“*if knowledge and competence is translated applying the TIC technology, knowledge and competence becomes visible and manageable*”); temptations (“*higher quality, faster for less cost*”); and persuasion (“*if the department engages as a pilot, its future impact on the solution is second to none, and KPIs good*”). These were the occurring psychological elements during the co-developing processes to reach the adapted, materialized artifact, ICMCS, which was now customized and ready to launch globally.

The following section is about testing the artifact as a distribution mechanism to coordinate and distribute individual knowledge and competence.

8.2.8 The Fourth moment of Translation: Mobilization

The next step in the GCC process consisted of taking the case from a few, local allies to greater numbers of global allies. The step represented the launch of the distribution device, ICMCS. Would human actors connect to TICs and start calculating?

Almost two and a half years had now passed since Actor TopM signed the project contract in light of a share price of > 650 Dkk till now, in the beginning of 2011, where the share value had reduced to around 180 Dkk.

Mobilization was aligned with processes according to the culture in the GCC and was designed by the pilot project group. Mobilization was the roll-out of ICMCS in the pilot case, where employees were instructed to register their individual knowledge and competence in ICMCS. By establishing a centralized individual knowledge and competence database (IC stock) at a global level, individual knowledge and competence were translated into knowledge objects to be searched for by every user worldwide who had been granted access. Human capital was transferred into structural capital. When identified, knowledge objects were to be materialized locally—face-to-face or in digital teams—by the remote allocation of team members.

Mobilization was important to satisfy the allies and their goals. If dispersed human actors as users did not experience added value balancing their investment in time to register, deployment would be complicated or impossible. Distributed digital accounting traces from the N-F decision-making of IC values in dynamic representations of IC budgets and IC accounts across the GCC locally and aggregated representations would not be created and the outputs for fast knowledge-based management decisions would not be generated. Therefore, the ultimate challenge was a broken project network, because without mobilization, dispersed actors would not be able to connect and an N-F accounting network would not occur (CHUA & MAHAMA, 2007; J. Mouritsen, Mahama, & Chua, 2010).

Actor TopM, who was in charge on a corporate level, was the only actor in the network with an overall company insight. For him, the chance to produce a piece of substantial evidence that individual knowledge and competence, an aspect of the rationale of his department (HRM) could become manageable and add proven, measured value, became increasingly illegitimate and risky as the share price declined. He knew about and conducted lay-offs, deficits, and upcoming troubles in operations and in financial management, which other allies did not know.

The corporate value of the project was at long range and tightly related to mobilization. In phase 1, the problematization process, various numbers of pilot populations from 40 to 300 were at stake. Actor TopM had already expressed in the initial meetings¹⁰⁹ that he considered 200 employees as an appropriate number in a pilot case, and he stressed during the years to come that global verification and feedback were important elements in the process. Cases turned illegitimate by becoming too small. Actor TopM accepted 40 employees as the lower limit, but the population, having other qualities, counterbalanced the confined number of employees. This insight was a threat toward the emerging N-F network all through the failed attempts of interestment.

Actor ICMCS, the adaptive non-human actor, mirrored the mediating processes of enrolment by importing emerging classifications of the different kinds of knowledge and by the processes of ordering and labeling in recurrent processes. The software was technically tested, approved and awaited deployment processes. Actor ICMCS was ready to displace the centers of calculation of individual knowledge and competence worldwide.

Actor ProjM introduced a demand for the production of six initial elements for the mobilization process according to the organizational logic. The work was incumbent on Actor Res to produce a website, Figure 44 below.

¹⁰⁹ Minutes from supervisor meeting nr 1

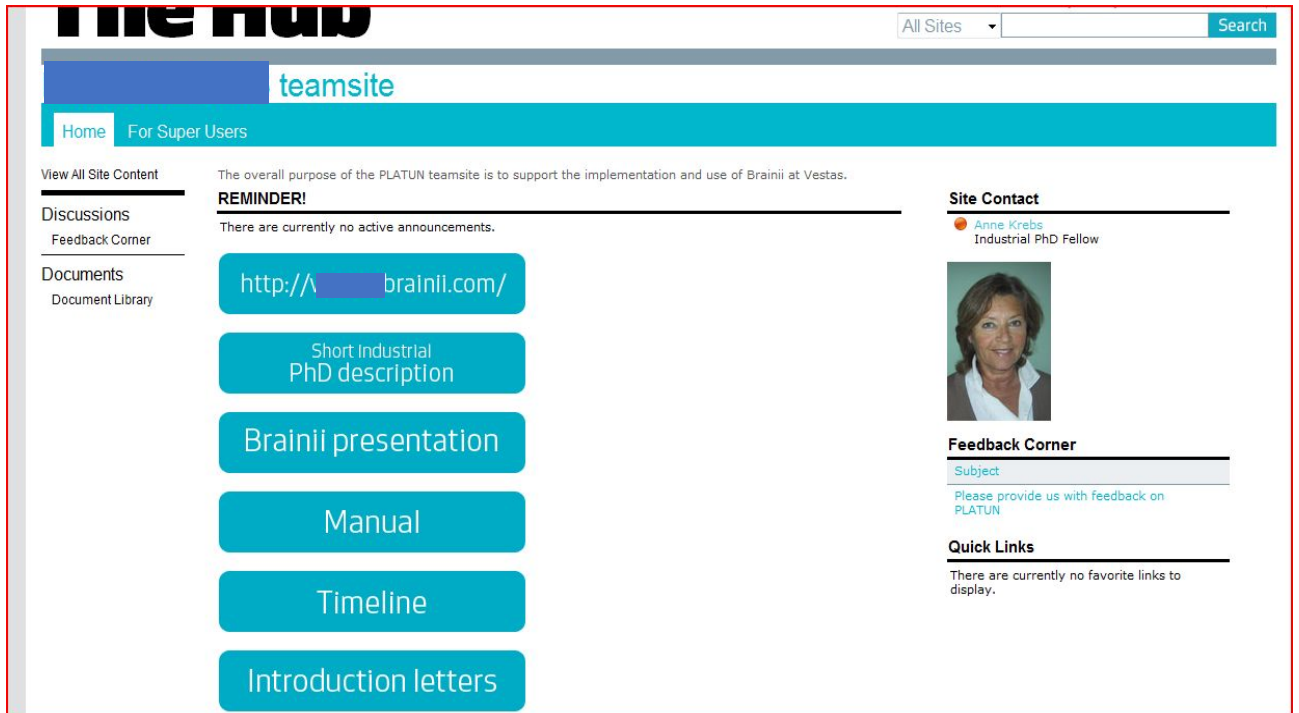


Figure 44 GCC intranet website for pilot case project, “Platun”, acronym for the name for the pilot project “Planning for The Unknown”

The website, Figure 44 above, provided access and the distribution of the necessary range of documents and links concerning the global launch of the ICMCS consisting of:

- A letter of announcement for the future users¹¹⁰
- A manager project presentation¹¹¹
- A user presentation¹¹²
- A user manual¹¹³
- A document stating the project steps incl. a project time line¹¹⁴
- A project website shown in a screen dump, Figure 44.

Actor Res introduced the need for a seventh element, two surveys, according to the empirical logic of the pilot case. The agreed plan was to launch antecedent surveys to the pilot population about “knowledge” and “self-management” to explore elements of awareness, attitudes, and the use of knowledge and self-management before the mobilization. During the project period, the same surveys were to be answered again two more times¹¹⁵ at different stages of operations of ICMCS to explore movements in the relations between an increased awareness of the application of knowledge and self-management.

¹¹⁰ Letter of Announcement with links.

¹¹¹ Announcement letter from head of department, Actor ProjM.

¹¹² User presentation.

¹¹³ Annex A2 Industrial Manual.

¹¹⁴ Short description.

¹¹⁵ Chapter 3: Method and Case Company/3.2 Mixed Methods/Quantitatively: Proxies and Hypotheses for Surveys/Table Time Planner.

The above demands opened up a series of new negotiations between the human actors revealing new positions. Over a period of 6 months the creation of the seven items was negotiated between Actor ProjM and Actor Res. Physical and virtual meetings framed intense collaboration and customizing involving temporary internal and external actors too. The management of document versions was a huge challenge in every element to be launched. Having no shared administration of the founding documents, an extreme discipline had to be delivered by every short- or long-term actor. Having no managers, only symmetric actors (M. Callon, 1986), the knowledgeable (research project) Actor Res may have exerted some hidden management through being in charge of the initiatives and the power of production. Actor ProjM, being knowledgeable (company, pilot department), managed the interfaces to the demands, values, and visions.

The movement of positions of allies was slowly unveiled during the numerous corrections of drafts in the produced documents. The point of departure originally settled by OPP and by the Contract of Agreement between Actor Res and Actor ProjM was challenged by changes in positions expressed in the following explicit concerns of Actor ProjM¹¹⁶:

“Deployment must not impact established management routines, department boundaries or hierarchy. We want guarantees that ICMCS will be deployed in a bigger part of the GCC, because the true benefit of ICMCS relies on the registration of the masses.”

Both concerns were not expressed in the initial Contract of Agreement, which, in detail, described the development process and its goals; however, the concern about dissemination had been presented in meetings.

These new positions/identities were to be negotiated with Actor TopM, the only actor in the network in a position to mediate these types of concerns.

The processes of production and negotiations of the seven requirements (the website, a letter of announcement for the future users, a manager project presentation, a user presentation, a user manual, a document stating the project steps including a project time line, and surveys) took place involving more actors over period of 6 months. The ICMCS was customized and ready for roll-out and was now accessible from the new team site.

Actor TopM had provided resources for the construction of the intern ICMCS website, but being increasingly unavailable for Actor Res (and thus substituted by actor Q, who had proved an enemy of the project as member of a competing network) the resources were growing fewer and more difficult to attain. It was costly in terms of time for Actor Res to produce some fundamentals to negotiate with Actor ProjM. It required repeated actions of mails and meetings, a pattern that reproduced itself in relation to other actions requiring resources in the hosting department: resources to provide surveys, analysis, population lists, photos, and export formats to ICMCS. Actor Res had to fight for resources now. It was obvious that the organization had

¹¹⁶ Mail May 12, 2011 from actor ProjM: “Before we embark on the roll-out of the pilot project and activate the participants and their managers, JP and I would like to meet with you briefly to understand the level of commitment and resource the organization intend to invest in the Project, in order to manage expectations on all sides.”

changed; it was shaken by dismissals, its resources for daily operations had been reduced, it was less willing to spend time on non-KPI work, and every decision was shuffled upwards as staff was afraid to get sacked in the next round of terminations. The hierarchy became steeper.

However, in June 2011, the site was ready to launch. It gave access from the referred Intranet site to the letter of announcement signed by Actor ProjM, to ICMCS, to manuals, presentations, and the project's timeline. A process was agreed after having considered other solutions, including the development of distributed super users, the development of teaching material as virtual learning videos to be distributed at the site, and physical, handy memory cards in the format of credit cards with the calculative key information and the road shows to different regions to connect local managers up front to act as local ambassadors to prime further distribution. For several months the plan was to launch the project in a video conference, where Actor TopM would initiate mobilization; Actor ProjM would emphasize the importance to his department to register and use the ICMCS in daily operations; and, finally, Actor Res would present the functionalities of ICMCS and point out the personal advantages of using it. These plans were abandoned.

But, on May 23, 2011, Actor Res was, for the first time, excluded from the relevant decision process¹¹⁷. How the decisions were argued and how the plan finally ended up in a non-interactive method of deployment is impossible to describe. The meeting took place between Actor TopM, Actor ProjM, and the appointed substitute to Actor ProjM. Organizational logics and hierarchy took over and showed, once again, the strength of the financial network and the change of identities.

8.3 Obstacles Crystallize

From this point of time, elements for answering "How do obstacles crystallize during implementation preventing distribution of IC?" slowly began to materialize. They are focused and outlined in the next three paragraphs.

Actor TopM and Actor ProjM identified these decisions as corporate decisions that were not to be shared with the researcher. At this point, the double identity of being actors in two competing networks was handled in a way where the financial, hierarchical paradigm took over. Between the negotiated methods of launch, the chosen method became the most silent one with the lowest profile making the least organizational noise; it was the less costly and the fastest removable method that was designed to leave vague memories with the staff and almost no organizational traces. The time and costs spent on the supportive production network would be blurred by daily operations, because the activities were not provided with a budget.

During the last part of the co-production of the launch documents, Actor ProjM became very concerned to fulfill only parts of the signed Contract of Agreement and thus started to change the OPP. Approaching the launch date, the identity of Actor ProjM moved toward organizational

¹¹⁷ Mail from substituting Actor ProjM, SVP 230511: "Hi A (actor Res), We've (actor ProjMs) had the meeting with R (TopM) this morning. Let's catch up tomorrow on the next steps. I shall also be revising the draft announcement. We can also go through the survey questionnaires. Regards S"

concerns instead of staying tuned to the identity of the emerging N-F network in the case project.

To answer the OPP question “Will the systematic management of IC qualify the output and save costs?” required every actor in the network to be alive and active to affect and evaluate the systematic management of IC on agreed terms. “Systematic management” comprised the deployment of the three modules in ICMCS (Module I: Knowledge bank (stocks) giving access to existing individual knowledge and competence represented in TICs; Module II: Team module giving access to forecasts, the creation of team settings, allocations at a distance, management of team portfolios and remote digital teams, etc (flow).; and Module III: identifying and planning future knowledge production informed by the actual, global demand for individual knowledge and competence in operations (budgets and flow). If all three modules were not deployed and used on a daily basis it would be impossible to answer the OPP question. Still, actor ProjM defended the right to deploy only Module I and required a delay in time—surpassing the case project’s timeline—before deploying the other two modules. She argued that global recruitment and team setting were important, but feared that the interventions supported by Module II and III would cause changes in routines and hierarchy¹¹⁸. She feared damaging effects on the hierarchy when decisions of allocations and empowered remote management of IC was to displace power to access and actions at a distance.

Due to the restricted project time, a delay in the deployment of the modules was not within the scope. This argument was represented by Actor Res during mediation processes.

The pilot case department represented by Actor ProjM feared that operational changes would displace power as a consequence of system deployment. She stressed that hierarchy was not to be influenced by the case project, and was afraid that the aspect of self-management was a hidden way to change the organization and expected a future loss of control. To unfold her aspect: self-managed teams, which Module II supported, would activate bottom-up teaming processes as well as top-down/or manager-confirmed processes to initiate teams across the borders of sections, departments, functions, regions, and countries. They would be knowledge-driven and plan optimal teams for tasks. She feared that managers allocating cross-departmental team members may experience a lower efficiency that would be reflected in the annual financial KPIs. This would affect incentive systems and annual bonuses. The current construction to enhance efficiency seemed to protect the organizational architecture and the hierarchy and at the same time prevent flexible, global exploitation of IC capacity. In a knowledge-based view, it could be argued that the financial incentive system was counter-productive to a knowledge-driven economy, thereby reducing or preventing diversity and innovation in teams and in the end through hampered IC distribution be less profitable.

The assumed organizational flexibility of self-managed, knowledge-driven teams was not a concern of Actor ProjM, but of the very top manager, Actor TopM. Actor ProjM believed that managerial processes would be influenced in spite of the contrary intentions; furthermore, Actor

¹¹⁸ Collaboration documents.

ProjM wanted the confirmation from Actor TopM that other parts of the company were going to implement the ICMCS too. Actor TopM, on his part, claimed the converse: that experiences and output from the pilot case were to inform this decision of further distribution, but that he—on the other hand—did not initiate a pilot project, if he did not believe that further deployment was likely and wise.

Actor TopM did not guarantee a global roll-out, and actor ProjM had to accept this. Actor Res had no choice: Actor ProjM considered the speed of deployment of the modules to be management decision issues and was not going to speed up the phased process. These were conditions for the launch if the network was not to break down.

In this catch-22 of management decisions, the international business situation went from bad to worse. On May 23, 2011, the price of GCC shares was 156 Dkk and competitors were doing better than before. The nearest competitor had already reached its total 2011 goal in the third quarter of the year.

These movements in the market are similar to Callon’s analytical model where obstacles in the sea and the weather in Fishermen’s Bay, hard currents, bad weather, and black nights before Christmas (where prices rise) tempted the fishermen to break the OPP and “satisfy their immediate desires rather than a hypothetical future reward”: the industrial context changed and the allied human actors satisfied the shortsighted pressure rather than the hypothetical future reward.

8.4 Launch

On July 25 and 26, more than 50 e-mails were exchanged between Actor Res and the project network, and on July 26 at 10:00am an e-mail with a link to the project site, signed by head of department Actor ProjM, was sent to the selected global group of 40 dispersed employees, inviting them to participate in the pilot case. Actor TopM was quoted in the first slide of the project presentation to signal the organizational anchoring of the project. Legal concerns about different local laws of registration of data were addressed in the ICMCS by the creation of mandatory answers from future users to accept legal conditions¹¹⁹ before entering the software.

According to the project timeline¹²⁰, surveys had to be filled in immediately after the launch. The surveys were facilitated from an external web-based service¹²¹, which separated future analyses from any dependency on the GCC, parallel to the situation for the hosting of ICMCS.



¹¹⁹ Screen-dump from ICMCS

¹²⁰ Chapter 3: Method and Case Company/3.2: Mixed Methods/Quantitatively: Proxies and Hypotheses for Surveys/Table Time Planner.



¹²¹ Annex A 5.1 “Knowledge” survey; and A 5.2 “Self-management” survey.

The organizational detachment from the GCC proved to be an advantage for the completion of the research project, because Actor Res' personal computer containing the research data was removed without warning shortly after, when the research project was terminated by the GCC. The project timeline was respected by the respondents. As the event of data entry into the ICMCS approached, new actors inscribed in the network by phone or by e-mail to Actor Res. One employee, erroneously identified as a respondent by Actor ProjM, was pulled out from the pool of respondents.

A few weeks later, the project was closed down by the GCC without further notice. The fourth moment of translation—the mobilization—had been interrupted because the N-F network of allies was broken.

8.5 Betrayals and controversies

How did it become possible to break the contract and close down the pilot project? To trace the series of changes of identities, every sign of loss of representation was noticed. It was investigated where actors or spokesmen for the actors became “questioned, negotiated, rejected, and discussed” (M. Callon, 1986, p. 217).

The case developed within the span of two different logics: (1) the organizational rationale constructed by hierarchy and financial control; and (2) the case logic, which differs from (1) by having a time constraint, an N-F valuing method, where actors are not inscribed in the hierarchy, and actions are not visible in financial representations as KPIs and financial accounts. The two logics were manifest through their representations in the networks of human and non-human actors. Some of the actors were active in both networks: Actor TopM as president and carrying the highest formal position in logic 1, and actor ProjM as SVP and Actor TopM's substitute, number two in the department, who was a senior specialist in their department. Actor Res was visible in the hierarchy represented in organizational charts for a limited period of time, but everyone knew that the presence of Actor Res was temporary; she was not *really* a part of the company, and as a researcher she had no impact in operations. During the first month in the GCC, Actor Res learned that the part of the organization closest to the CFO was not accessible, because the managers related to financial management on Actor TopM's lists¹²² of potential allies in the project to be contacted did not answer e-mails nor did they want to attend meetings.

During the 24 months of the case, the agency of Actor Res was changed by incremental, almost invisible events that nevertheless aggregated to a reduced representability (M. Callon, 1986, p. 222) and caused controversies, which are important to outline, because the agency of the processes of induction were silently undermined by these events.

One of the accessible shared, but to the pilot case project unidentified actors documenting these small events identified itself as the non-human actor, the organizational chart. Its actions went from an organizational representation of actor Res to a non-representation creating less organizational agency for the project. Another effect was produced through the physical location of Actor Res' work station in the room. When the case contract was signed, Actor Res appeared

¹²² List of employees to be contacted Nov 2009.

in the edited organizational chart with her name as referring directly to Actor TopM. During the problematization phase, and as repeated attempts to enroll actors in the emerging N-F network failed, access to the president (Actor TopM) slowly vanished. From an initial position at a table with individual storage space next to his office, with her name printed at a glass plate, and able to walk into his office for informal chats, Actor Res' table was slowly moved some tables away, and his secretaries only allowed scheduled meetings. From November 2010, after extensive layoffs, the department moved to another town in order to cut costs. Many employees in the department had already left, but the square meters were reduced even more. Actor Res, who was present in the company on a part-time basis, was no longer provided with a workstation. Thus, the physical presence and visibility of Actor Res in the office was reduced, and she was offered changing work stations, when necessary and when available.

Actor TopM argued that the mentioned changes in the organizational chart were of no importance¹²³. In spite of the formal contract regulating the relationship as one of Actor Res reporting directly to Actor TopM, his PA was inserted in a revised published organization chart between Actor TopM and Actor Res without any dialogue with Actor Res. When Actor Res discovered the new chart on the Intranet by accident and asked Actor TopM about the change, he understated the importance as a mere formality due to organizational development and logic. Nevertheless, step by step, the PA came to demand that every communication to Actor TopM was addressed through him, as he had to rank its importance and relevance. He soon replaced the role of Actor TopM and reduced accessibility and frequency of meetings with Actor TopM to a minimum. He limited the economy of the project and warned Actor Res that the project was to be closed down if the pilot did not succeed. The employees, forever sensitive to issues of hierarchy as an expression of power and agency, read this as a clear signal, although it was expressed through “the silent language” of the chart.

Another accessible, shared non-human actor was the share value and its effects, which was represented by the changing agencies in the competing financial network.

During 2010, financial representations took over the focus and the agenda of Actor TopM and his corporate HR department that had to handle an outdated, but in the listed company still communicated and defended dramatic growth strategy as well as the burden of stressful, massive layoffs. The increased focus on short-sighted financial management triggered by the GCC's market performance and share price impacted the legitimacy of any actions. The declared long term and hidden short term business logics were battling in the employees, who had to balance both disruptive perspectives at the same time in their work. The psychological context was stressed, and some decisions were defended only with great difficulty in the light of lost colleagues, closed projects, and future insecurity. Future layoffs were announced and an overall uncertainty dominated the attitudes in a company, clearly not used to uncertainty. One effect of the experienced growth in share values for the last 8 years seemed to prevail: “We did not have a sales force, only processes of order intake; everybody wanted to buy our products without really fighting for it” until the summer of 2008. The average seniority was three years,

¹²³ Chapter 8.2.1: The First Moment of Translation.

one of every two colleagues had in meetings never met before, and corporate memory and discourse did not include a decrease in share value. In 2009, the company was acting like a successful child star: it was not suspecting a bad destiny, but it was heading straight for one.

Slowly, the shares continued to fall, but this did not have an impact on the communicated ambitious growth strategy; uncertainty became manifest only from October 2010, when the board, for the first time, acted on the current present. Up until then, the company had a steady focus on the future and had invested in a future global presence and production capacity¹²⁴. Uncertainty had come to stay and gave increased agency to financial management: budgets were cut and projects were closed down.

To retain a pilot project with a long-term perspective had turned risky in the financial logic. The identity of Actor TopM was impacted by the double membership of competing networks. The OPP lost his support and relations between Actor TopM and Actor Res lost its power, not only internally in the network, but also through the silent language of the signals known to the actors in both networks. When employees heard/saw this kind of language they dared not give agency to connections, and the representability (M. Callon, 1986) of Actor Res got lost.

As a consequence, Actor ProjM grew worried and required guarantees from Actor TopM. Walk-out questions were formulated by allies: if top management didn't guarantee a roll-out to a larger part of the GCC after the pilot, there would be no pilot project.

Actor ICMCS, which depended of financial resources allocated by Actor TopM, was scrutinized by the actions of the PA, representing Actor TopM. Financial control of expenses necessary to adapt ICMCS, required by Actor ProjM, designed by Actor Res, adapted by Actor ICMCS, and realized by an external supplier, changed from an economic frame with significant project autonomy to a detail-oriented straitjacket. In a very short time, the budget was reduced to zero.

Actor IC and Actor TIC were both in an interdependent relation to Actor ICMCS, the distribution device, because individual knowledge was only able to travel independently of time and space when Actor ICMCS actively connected to users asking them to enter individual knowledge and competence applying TIC.

Competing corporate HR initiatives were launched into partly the same population at the same time as the case pilot, which caused confusion and refusals to cooperate in the pilot project. In the “trial of technologies,” this proved to be an effective weapon, because managers in the financial network could not differentiate between the two and considered the pilot to represent double work with the same goal. In spite of the GCC's attitude expressed late in 2009 that “we are not interested in knowledge, only competencies,” Actor Q—head of the HR-section—initiated activities to register individual knowledge a few months later using an education-based classification. From never having registered any educations in the personnel files, a selected group of employees was asked to do so. With direct access to managers and to structural and

¹²⁴ HR administrative corporate capacity “Foreign Country” HR capacity was established late 2010 and closed down in 2012

financial capital, this took place before it was possible for the N-F pilot case to build up a network and enter the phase of mobilization.

Actor Q assigned one of her employees to the task of recording educations in HR suites within the existing IT architecture. He created an extended template in the existing personnel SAP folders with information about leave, wages, addresses, etc. The template asked the users to type in—after their own choice—the name of the education(s) held by the employees.

The interesting part is what can be done with such recorded data. Information on knowledge can be found by a search—by the HR employees allowed to access the HR system—such as a search in the Yellow Pages, but only when the names of educations are known beforehand by the searcher. The practice of recording does not make knowledge travel nor does it make it manageable. Dynamic, real-time BI on individual knowledge and competence is not technically possible. However, the activity from the competing network created biases against Actor ICMCS from connecting to the employees, because they had already entered “the information” into this existing IT structure.

Actor Res’ nearest collaborators and allies became insecure in their positions. In-house support became difficult to obtain and was not accessible anymore for some services, meetings, or e-mails. Some employees told Actor Res that Actor Q had closed down support to the project.

The supremacy of the financial network, irreversible in its black-boxed state, was never questioned, and only entities in the N-F network were affected. The representation and the changes in agencies between actors in the N-F network induced a new spirit of mistrust, which was particularly destructive in an iterative development process. Relations became biased by changed expectations and beliefs, and the identities changed. The sum of all these silent signals became the mechanisms of closure, because “closure occurs when the spokesmen are deemed to be beyond question” (M. Callon, 1986, p. 220). Actor TopM enacted his betrayal by asking the PA to dismiss Actor Res from the company. This act stopped the entry of data of individual knowledge and competence in the ICMCS. Thus, the OPP question could not be answered in this case.

8.5.1 Trials of Technologies

The following section explores how the three principles established in the introduction were applied and discusses how the financial network won the trial of technologies.

The principle of *generalized agnosticism* (M. Callon, 1986) was applied in considering market artifacts, the context in which the GCC operates, and the social contexts in which elements of agency were elaborated and shaped. Consequently, doubts and uncertainties about plasma (B. Latour, 2006) and actors were reported in the same way.

The principle of *generalized symmetry* (M. Callon, 1986) demanded similar ways to analyze controversies in both the organizational context and the case context. The same vocabulary was used in the four phases of translation and for both non-human and human actors. The six categories of actors were equally important and described. Company logic was not reduced to a

power of balance; controversies were explained through small changes in translations and representations.

The third principle of *free association* (ibid.) has been followed, outlining the different attempts of interestment and unpredictable relationships by allowing identities to fluctuate. Who could have guessed that the legal department was able to become an actor in a radical project in the GCC? Who could have predicted the fast decrease of share value of the world’s leading company within its business, and its consequences?

By following the events (the translations and displacements in every phase), the advantages and disadvantages of the role of the “engaged scholar,” (Van de Ven, A. H., 2007), and her biased view have been managed and described in terms that are not open to interpretations. Every phase, event, and object has been faithfully described.

When exploring how the identities of the allies in Network 3 in the below Figure 45 changed over a period of 24 months - to understand why the network disconnected - the number, kind, frequency, and quality of representations and allies are elements of interest, because network and the power of network are effects of representations and allies (B. Latour, 1991; J. Law, 1992).

Network 1—Financial Network	Representation	Allies
Type	Every material and immaterial item in the world is translated into financial value representation and routines	From top to bottom in the hierarchy All the existing capitals, structural
Number	Uncountable	All employees
Frequency	Incessantly	Uncountable
Quality	Punctualized, representing a whole network in one point, every human/non-human actor representing a black boxed strong agency Black boxed	Visible clear representation in department with CFO in double team with CEO, one identity Distributed and integrated into every process
Distribution	Internal and external distribution	Unquestioned and known by all
Duration	Always	Always
Where	Globally	Globally
<p>Network 2—HRM in Financial Network</p> <p>The representations, actions, and processes generated in Network 2 are not subject to questions and changed agencies, because Network 2 has powerful allies in Network 1.</p>		

Network 3—N-F Project Network		
Kind	New processes translate the matter of concern, knowledge, into inscriptions and digital representation No calculative practices yet No routines	3 human and 3 non-human actors
Number	50–100 generic websites in the ICMCS In meetings during the pilot case	6 allies
Frequency	0	none
Quality	Only representing 1 actor, 1 translation, 1 process	2 multidimensional human actors, allies who change identities
Distribution	No distribution	Organizationally separated
Duration	12 months	24 months
Where	2 local offices	2 local offices

Figure 45. Characteristics of the three networks by the author.

The Figure 45 shows that Network 1 acted as a verb (Hernes, 2008) by refiguring value representations in its own logic in every process, event, and actor, incisively, in a never-ending reconfiguration of the world (Lynn, 1999; Sarker et al., 2006), while Network 3 did not have the power to do so.

Two black-boxed networks (1 and 2), presented themselves against one emerging network (3) differing in the number and frequency of representations. The competing networks had defined themselves within the financial narrative, the existing financial network controlling the structural capital through integration and numerous value representations, routines, calculative practices, non-human and human actors, and alliances at the very top of the hierarchy; and the N-F network initiating control of values in the knowledge-based organization with almost no value representations, had no routines and both non-human and human actors, and alliances anchored in a department with a top manager referring to CEO. The three networks and their characteristics are summed up in Figure 45 above. The representations, actions, and processes generated in Network 2 were not subject to questions and changed agencies, because it had powerful allies in Network 1 and followed the financial logic. No actors from Network 1 were identified openly as actors in the new N-F network (Network 3), although a proposition to involve potential actors from the dominating financial department was activated. Actor TopM did not support the idea, and as he was the nearest manager in the hierarchy the question was closed.

8.5.2 Hidden Actors, Multidimensional Identities and Marketing

In the ANT methodological context, this refusal produced a failed actor, a hidden actor (Sarker et al., 2006). The referred study also found that actors could be multidimensional and subject to change, which was a finding supported by this case; hidden actors in the competing financial networks mediated the agency of relations to the N-F network, which had no mobilization, few representations, and no routines. Allies' identities were changed by multiple, ongoing representations in the financial network. Therefore, the intersement phase should never be considered a terminated phase but an ongoing parallel phase during the phases of enrolment and mobilization where identities are actively maintained in relevant frequencies to avoid a broken network (Luciana, 2008).

Before allowing the mobilization of the ICMCS, Actor ProjM decided to renegotiate the project contract¹²⁵, especially with respect to the desired future enrolment of the GCC and the expected effects of ICMCS. Actor ProjM required two types of assurances on top of the signed accord: that Actor TopM guaranteed a sequential organizational roll-out of the ICMCS, and that the managers' right to lead and control (hierarchy) work would not be affected by technical features supporting self-management.

Actor ProjM feared the loss of resources and an erosion of the managers' right to manage, which were introduced silently and without open negotiations. He did not welcome a potential organizational, horizontal flexibility. Actor ProjM feared that the KPIs would tell the short-term story about unreached goals, but not the story about increased quality and innovation, speed, captured possibilities, and optimized, knowledge-driven, self-managed teams collaborating across borders. Actor ProjM developed a multi-identity attitude, and preferred to fight self-managed collaboration by preventing the deployment of Module II¹²⁶—the team module (flow)—because “*the organization is not ready for this tool.*”

New joint forces in the changed context became connected between the hidden actors. In this system development case, initially two completely unconnected networks joined forces during the case process due to macro-economic developments: the macro-economic network represented by share values and financially based narratives represented by the financial management control system and its calculative practices. When the case was initiated, these networks were not connected, because the high share price allowed long-term management decisions with uncalculated risks, such as the one to engage in a project of the development of an N-F management control system. The company was vision-driven, was used to acting on its future expectations, and routinely rejected any attempt to let financial restraints prevent or delay strategic investments. As an example, the global production capacity of the GCC was expanded in the US and the UK although sales were decreasing. The loss of global trust in the company became visible through the decreasing share value, and for the first time the effects were translated into action; for example, dismissing 3,000 employees, which was handled by the case-anchoring HR department. The company became more top-down managed and the two networks

¹²⁵ Minutes, Case Department, February 2011.

¹²⁶ Minutes, Case Department, June 2011.

(1 and 2, figure 45) were connected; decisions became short-termed and were characterized by risk avoidance (C. Argyris, 1990).

The dismissals were a game-changing event that transformed the research project from a promising opportunity to a risk. The multidimensional actors in the N-F, emerging case network, Actor TopM and Actor ProjM, who were part of the top hierarchy and the business logic, from now on were caught in the cross-fire from their different identities that were linked to the two opposing networks: long term and short term, and known and unknown processes¹²⁷. The case developed from a promising, but unknown path to lasting, competitive advantages in the long term, into a short-term risk able to harm not only human actors' reputation as having sound abilities to estimate business. Changed reputation was a threat for actors in a very unstable context focusing on costs and reductions of staff when supporting an unnecessary activity compared to dismissed core production capacity.

The financial narrative having been around for a long time soaked every action into financial perspectives and surrounded it with repeated representations, translations, and routines that were so well founded in the structural capital that the defense of the same financial rationale did not get perceived as costs. This contrasted the conditions for the defense of the new N-F network, where every translation, calculative practice, event, and addition to structural capital (Actor ICMCS) was made visible and risky. The ICMCS was not yet able to produce trusted representations of future instabilities, which would indicate—in TIC based budget terms—that future crucial shortage in IC would be as risky.

The case network did not stay legitimate, because it was not able to maintain the interessement process throughout all the phases of translation (B. Latour, 1996; Sarker et al., 2006) producing the same frequencies with equal organizational penetration of IC value representations, calculative practices, displacements, and mobilizations as did the black-boxed, competing financial network, and because the cost of self-defense in this network was hidden. This change, from being promising case project to become a threat, influenced the identities and the allies lost agency.

The anchoring in top management, which substantial research (Avison, Jones, Powell, & Wilson, 2004; Simonsen, 2007) suggests as an important prerequisite for an implementation plan to succeed, was not a guarantee for this project to be completed.

Time went by and the general business context became even more cost focused and top controlled as recurrent waves of staff dismissals washed through the GCC, blurring personal and local strategic considerations. The anchoring of the project in top management was negotiated through manifest calculative practices and representations of financial narratives (contracts, budgets, financial accounts, and a financial management shift from frame to detail), but nevertheless, the N-F project involved illegitimacy and risks for everybody, even for Actor TopM, who had a double relation to the emerging network. Identities were standardized. Top-anchored projects are not always safer and more certain of being accomplished.

¹²⁷ Figure 34 describing the three networks.

8.6 Conclusion

The chapter explores processes of interventions-in-the-making; namely, the commissioning of the N-F artefact, ICMCS, revealing how deployment processes depended on aligned enrolment and hidden actors. It outlines how the pilot project's mobilization of humans and non-humans in the GCC was distorted and illustrates—by studying the roles played by the context, the financial statements, and the human and non-human actors in structuring the power relationships in a trial of technologies—how agencies of relations in the emerging N-F network are changed over time by black-boxed relations in existing N-F and financial networks. Competing financially based, existing networks, and another N-F, existing network influence and change actors' identities in the ICMCS emerging network, which, therefore, weakens and is finally broken and removed in the very first moments of the digital roll-out in the fourth point of translation: the mobilization.

By using an analytic performative view (A. Hansen, 2011) applied-in-the-making, the case shows that a financially based network of technologies and routines opposed an emerging N-F network even though it was supported by top management. Black-boxed networks defended themselves in institutionalized practices (D. J. Cooper, 2006; Miller, 2001; Miller, 2001) that impeded and prevented the deployment of non-financial practices of the calculation and mobilization of structural capital.

The formal structure of this case aims to balance an ostensive (Yin, 1984) method with explanations from performative research closely following actors, events, translations, and facts-in-the-making. The construction allows the “future” to enter into the framing of research, and into the planning of up-coming events, which is different to explorative research which studies, what has happened. Therefore, this thesis is able to illustrate actors' change of identities and networks-in-the-making and, at the same time, to analyze the occurrences and develop predictions.

The case shows that the TICs designed as immutable mobiles¹²⁸ and the ICMCS system designed as their vehicle in order to install global decenters of calculations and control at a distance, became victims of the trials of technologies¹²⁹. So, in spite of TIC's useful calculative elements made visible in the surveys and the technically approved tests of TICs and ICMCS, weakened external agency in the global business context as dramatically declining share values shortened the long-term business perspective and generated internal conflicts. Financial management became more powerful, converting traditional investments in activities of the case-anchoring department (employees, knowledge sharing, learning, recruitment, talent management) to costs, which had to be cut. Supporting an innovative intervention introducing some actors' matters of concern to increase competitive global advantages, communicated in the GCC as the possibility to manage individual knowledge and competence, as self-management, and management at a distance, the enhanced financial managerial perspective grew into a personal risk for the GCC-managers when giving agency to the long-termed case. For allies

¹²⁸ {{120 Latour, B. 1999}}

¹²⁹Aramis or the love of technology {{312 Latour,Bruno 1996}}

measured on financial KPIs it turned illegitimate to invest time in a project that did not support actions that were invisible in the financial KPIs.

During the 24 months of interventions, exogenous variables in the context transformed the role of the project from a proud investment in IC to a burdensome cost. In the short term, wages represented a possibility for a fast reduction of costs. This radical change in the perception of agency in matters related to IC was dramatically documented in October 2010 by mass terminations. The voice in the public space increased through press-related events like special “Breaking News” in digital media over the weeks to come.

As a by-product of the longitudinal case conclusion it is found that financial value representations acted as relative figures, because IC investments were transformed into costs; they were still the same figures, but they were perceived as a threat, rather than a hope.

Furthermore, the case showed that the management of N-F values (e.g. individual knowledge and competence) may create controversies between the financial and N-F management of values, because N-F values escape the boundaries of financial KPIs, as well as department boundaries. So, to appropriately allocating IC and corporately profiting the firm, TIC may financially be contra-productive for bonuses at short terms in some locations. In this case, some human actors expressed negative concerns for the distribution of individual knowledge and competence, because the hiring out of employees to other departments through appropriate allocation processes might impede them from reaching their goals and from getting the bonuses.

Moreover, negative concerns were expressed that the transparency in management of IC may undermine management’s rights to manage, because knowledge-driven decisions may interfere with hierarchically driven decisions. Managers in the pilot department feared that the deployed ICMCS may disturb hierarchy. This last fear of displacement of power to act and control was very articulated.

The anchoring in top management, which is considered a guarantee for success (Simonsen, 2007) did not prevent negative effects on the long-term investment in IC. In the dramatically changed financial business context, this project turned slowly illegitimate.

However, surveys showed in the former chapter that the calculative elements in TIC did not get rejected as global IC value representations for the N-F values of individual knowledge and competence and that the elements of design probably would work technically and socially. This was illustrated by the hypotheses 1-4. The processes of co-development added more complexity into IC calculations and added notions of geographical locations to TICs for the achievement of both tacit and explicit knowledge and competence.

In spite of dramatically changing world markets, business contexts and slowly formulated endogenous effects, the implementation of ICMCS, being prerequisite for coordination and distribution of TICs, was conducted to the last point of translation, the mobilization. The two artefacts, TICs and ICMCS, were technically proven to work and accepted by the GCC to be deployed, but the final step completing the social proof of ICMCS, the mobilization, was hindered in the very last minute after having mailed out user-names and passwords to the pilot

population. The official GCC's argument was that money was up and the case department's argument that hierarchical distribution of power may be disturbed.

The framing of IC into visibility and calculations in the N-F network was stopped as effect from outputs generated in the financial paradigm, which produced and implemented shared images of the world "as is" and as "would be" through budgets and calculations (Skærbæk & Tryggestad, 2010). The IC system development process was completed to the very last step, the fourth point of translation, where the mobilization of TICs was to be explored. In the DSR view, the technical and social interfaces of TIC was positively tested indicating individual willingness to future connections between human and non-human actors, while the technical tests for ICMCS were approved but the social tests only partly completed for the ICMCS artefact.

The conclusion is that the technical part of the construction of evidence in the DSR rationale has been positively satisfied, because the ICMCS (and TICs) has been customized in the collaborative processes between GCC and research and, GCC through the provision of local manpower and financial means has prepared and initiated the launch of ICMCS to an elected, imported, identified, dispersed pilot population in GCC. This is hold as the technical proof of the construction of evidence: That TIC and the ICMCS technically work.

However, to fulfill the demands for evidence the artefactual concepts have to be socially tested too. The former chapter outlined the positive social testing of the concept of TICs.

However, as referred, the social testing of ICMCs distributing TICs was stopped in the very beginning of the 4th moment, the mobilization. The very detailed ANT-based analysis has identified, visualized and explored unrepresented human and non-human actors and external events impacting the process of implementation and changing the identities of actors in the social part of the construction of evidence. These events are unusual dramatic and un-expected. Therefore, it seems reasonable to propose that the processes of implementation may have developed differently in stable, less labile business contexts.

The conclusion therefore is that ICMCS technically works and that ICMCS socially may work in contexts of less dramatic and labile character.

Conclusion Part II

Part II described the empirical testing of the artefacts of TIC and ICMCS developed in Part I. N-F control is active only if human actors connect to the TICs and start calculating to optimize their work. Based on this insight, Part II explores whether the concepts are technically and socially valid by separately exposing the design elements in TIC quantitatively in surveys and qualitatively, in a longitudinal research format by exploring the co-development and tests of the ICA management technology.

Through force of circumstances the ICMCS tests were technically completed, but only partly socially tested in this case¹³⁰. However, the software is essential, because it acted as a prerequisite for establishing and conducting the case project. It was the materialized concept, the artifact that convinced actors in the GCC to engage in the project and its conceptualized KM model informing and framing the hidden values of knowledge.

The quantitative testing of TICs was framed by the hypotheses H1–H4. The study shows that because H1, H2, H3, and H4 did not get refused, then human actors are supposed to connect to the calculative elements in TIC. By the intermediary help from proxies, the surveys are argued to tell something about the future. TICs' inherent features, the identified elements of design, are shown to make human actors calculate. TICs will provide overviews over HC/IC at the comparable, individual level in stocks. As TICs are visible in ICMCS, access would enable human actors to allocate co-present or remote intellectual capacity by estimating the number of vertical/horizontal values in the available IC supply represented in the ICMCS stocks. Then human actors connect to TICs trusting the IC-value representations and change behavior by choosing more satisfying individual knowledge and competence for collaboration and team allocations than before, because the stock displays *all* IC in TICs and allows for actions to collaborate with the chosen HC.

Thus, quantitative analyses indicated that TICs probably will connect to human actors and vice-versa and that human actors start acting as calculative selves. When actors become N-F calculating selves, then knowledge and competence is systematically distributed by ICMCS, which is then mobilized providing corporate IC transparency, predictability, and operability. Consequently, knowledge will become coordinated and distributed by human actors, when acting as calculating selves, because surveys showed the respondents' willingness to optimize their practices of allocation and their use of individual knowledge and competence in operations.

The findings show that if management gets supported by ICMCS, then management will be informed by N-F value representations; for example, real-time figures about IC capacity as well as by KPIs from for instance “teamwork-at-a-distance” or the “allocation of strategic knowledge across locations”. The designed artefact TIC applied in the management control system is supposed to collapse distances, and the results represent a concept of knowledge accounting in flows and stocks, which makes individual knowledge manageable at a distance.

Micro-processes of interventions were qualitatively explored. The commissioning of the N-F ICMCS reveals how the deployment process depends on contexts, aligned enrollment and hidden actors. It describes how the mobilization of ICMCS is influenced by a changing context. Competing existing financially-based networks and an emergent N-F network influence and change actors' identities, which are weakened, and the network finally breaks down.

With the use of an analytic performative view applied-in-the-making, this part of the case showed that financially-based networks of technologies and practices opposed and finally suppressed the emerging N-F network, although it was supported by top management. Black-

¹³⁰ A description of each of the ICA modules can be found in the Annex A2–A3.

boxed networks defended themselves in institutionalized practices that prevented the deployment of N-F practices of calculation and the mobilization of structural capital for establishing a managerial IC accounting practice.

The chapter illustrates actors' multidimensional identities and change of identities and fragile networks in-the-making, simultaneously analyzing occurrences envisaging the potential future case development. It shows that weakened agency as declining share values may have shortened the long business perspectives and generated internal conflicts making financial management more powerful, thereby converting traditional HR investments into costs, which due to emerging exogenous variables had to be cut. At the micro-level, it indicated embedded contradictions in financial and N-F management of values, because financial KPIs required boundaries for exchange of individual knowledge and competence represented in KPI and bonuses. These requirements may be financially contra-productive preventing optimization of IC across the hierarchy and the organization, because the most satisfying individual knowledge is prevented from being allocated to the appropriate tasks.

The case conclusion summarizes that the agency of a financial accounting value representation is relative as an effect of other value representations, because investments developed into costs. It is still the same values expressed in the same metrics, but they are oppositely interpreted. In this case, every step of transformation is described showing how relations between human and non-human actors slowly changed. Even the anchoring in top management, which may be considered a guarantee for success, did not prevent a negative effect on this case representing long-ranged investment in IC. Human actors acted on the changed financial perception in the changed financial context, and the pilot case slowly turned illegitimate.

But this does not eliminate the fact that the identified design elements in TIC did not get declined as N-F global mediators of IC values making human actors calculate within the IC. TICs are as core components in ICMCS therefore still supposed to be able to establish IC transparency and access to assets in IC. TICs are supposed to process more qualified allocations making management and self-management able to compare, estimate, choose and calculate displaced individual knowledge and competence separately at relevant qualitative parameters to qualify (their own) work in secure processes. The standardized format is designed to grant calculations with speed and reliability, transporting data as immutable mobiles collapsing distances of knowledge and locations. Through these calculative processes, human actors are supposed to coordinate and distribute the now visualized and valued assets across boundaries by choosing appropriate IC ex ante in operations, because they connect to TICs and the online software automatically outlines choices between satisfying matches of individual knowledge and competence and the demand for knowledge and competence. Every object of knowledge and competence is searched and compared independently of time and space, because TICs objectively and in absolute figures note the quality and quantity of the entered individual capacity creating digitalized, comparable, shared spaces for global calculations in the capital.

But sections of the social part of evidence did not get conducted to the end. In the unusual dramatic business context, which changed during the longitudinal construction of evidence,

exogenous variables are likely to have acted so exceptionally powerful that conduction of the pilot in the beginning of the research period in a more stable context had been carried out more successfully. Therefore, because the two artefacts are shown to work technically and TIC is assumed to work socially, it is concluded that ICMCS still may be proven to work in less dramatically changing business contexts.

Part III—Overview

Part III consists of chapter 9, “Discussion, Conclusion, and Contributions” and Summaries in English and Danish.

Chapter 9 discusses the partial conclusions I and II, the use and usefulness of the proposals and their potential implications. It compares control of organizational performances in financial and N-F numeric representations and discusses the potential added value of TIC-based N-F accountancy in ICMCS and the financial paradigm of control.

The interdependencies between the notions of ostensivity and performativity in the design and envisaged use of stock and flow in the system of N-F control are discussed, revealing some limits in both. The separation of the valuing of individual knowledge partly from the owner and partly from individual competences is considered to assign TICs with the capacity to exist in ostensive situations as stocks and to become performative when concretized and connected to individuals in processes of allocations framed as flows. It is concluded that TICs (i.e. the explicit elucidation of horizontal and vertical qualitative values in knowledge and the values in respectively performance and creative competences) enable reliable calculations in the capital across distances when managers connect to them and calculate. This raises the belief that human actors’ will access TICs in the distribution mechanism, ICMCS, calculate, act and thereby coordinate and distribute IC in dispersed settings, and that the actions will mend information gaps and create better conditions for increased competition. The result seems to support the long-standing idea of the “rational man” or the “economic man” who is motivated by actions that optimize his/her proper outcome, here by choosing and collaborating with more appropriate and satisfying HC/IC resources, until now unattainable.

Furthermore, contributions to theory and practice are presented in this chapter. The proposals are outlined; however, an empirical study of the managerial and organizational effects of ICMCS is referred to future research. The output from ICMCS is supposed to provide IC value representations automated from the ICMCS as a result of TIC-based decisions and actions in operations, which will enable management to make knowledge-based decisions at a distance. The case did not disconfirm the artefacts’ assumed impact on practices of allocation, because a convincing majority of respondents expressed the will to estimate and choose resources differently according to the calculative elements embedded in TIC. The respondents indicated a will to change behavior by optimizing and focusing the HC/IC capacity regardless of space and time. The artefacts are estimated to contain the plausible potential to make knowledge operable in and between companies in dispersed contexts.

The chapter is concluded with summaries.

Chapter 9

Discussion, Conclusion, and Contributions

9.0 Introduction

This chapter discusses in a critical, reflective light how the proposals to answer and solve the research question came about, the results and their limitations outlining the need for further research. It is discussed whether the results can be considered valuable proposals for a 4th wave in the IC literature and if so, why and in which way. The dissertation was motivated by intriguing practical problems, which also will be confronted in this chapter to discuss and account for the solutions proposed to the class of problems. Firstly, distinctions between the 3rd and the 4th wave are being considered, then the gap and the necessary prerequisite in the changed notion of knowledge is mentioned and its implications for the calculating rationale in the proposals. Subsequently, critics of the methodology and reflective comments follow as well as comparisons to the financial and KM paradigm of control to finally finish by presenting the contributions, their limitations and the need for further research.

9.1 The Possible 4th Wave in IC Literature

Both James Guthrie, Federica Ricceri and John Dumay's article "Reflections and projections: A decade of Intellectual Capital Accounting Research:

"We must challenge the status quo, employ innovative methodologies, experiment with the novel and take risks. We encourage you to watch the ICA space in the next decade for more critical field studies which will provide empirical studies of IC in action and help develop broader theoretical research" (Guthrie et al., 2012, p. 79)

providing important overviews over the field's used methods and IC journals' publishing interest and Jan Mouritsen's article "Problematizing intellectual capital research: ostensive versus performative IC"

"(1) What does IC do? (Rather than what is IC?)
(2) Where is IC located? (Rather than who owns it?)
(3) How is IC related to value? (Rather than is IC valuable?)" (J. Mouritsen, 2006, p. 837)

which emphasizes the distinction between ostensive versus performative IC underlining dynamic perspectives in IC, moves research toward the 4th wave described by some as the adaptation of an additional view, an ecosystem perspective taking research from within the firm to include the firm's stakeholders. Critics of the 3rd wave indirectly described the 4th wave "... advocates a move to a more ecologically and eco-justice-informed approach (see Gray, 2006) which promotes the sustainability of the eco-system in which the organization exists, rather than just the organization itself." (Dumay, 2013, p. 7). The eco-system has been studied in an Italian University finding that:

IC management needs to change to incorporate an ecosystem perspective, reflecting the fourth stage of IC research. The IC management at the university incorporates its core goal (what), the collective involvement of internal and external stakeholders to achieve the goal (who), the motivations behind the achievement of the goal (why) and, finally, the processes activated inside the university (how) and indicators to assess value creation. (Secundo, Massaro, Dumay, & Bagnoli, 2018, p.157)

These features of double movements bring the research focus from the 3rd to the 4th wave by choosing dynamic perspectives and by involving external actors and the external context. However, IC elements are still collective and not individual, valuation is still served by indicators, disclosures are situated and the view is rear-facing. The ex-ante managerial aspects of the values in HC/IC's assumed impact on innovation, production and competition and the lack of coordination and distribution of the HC, the financial markets difficulties to estimate and account for HC/IC and the different types of disclosures have not been significantly treated in IC research.

The thesis tries to take the above double movement a step further by taking research from an organizational level of analysis to focusing at individual knowledge and to control of individual knowledge. It assumes that some kind of knowledge is more adequate than other knowledge in processes of allocation and that the choice is crucial for the result of the company / the network/ the country. As individual knowledge is only controlled by individuals that own the knowledge, it may leave the firm, as the firm, likewise, may use external knowledge. Therefore, the boundaries for individual knowledge have been extended from the above defined eco-systemic view to a global perspective. Moreover, wired collaboration is taking place and constitutes a widespread global fact between individuals in and between firms to which reality the view aligns. The generalized argumentation leaves out situated details and considers the identification as part of the meta-requirements for the class of problems, allocations.

Consequently, the 4th wave incorporating global perspectives define new requirements in accounting and control of the HC representations contrasting the situatedness in KM and IC research: the valuing elements of accounting cannot stay interpreted and as situated indicators, but have to be absolute, recognizable and globally useful. The system of accounting to be globally useful has to be auditable stating that certain relations between the ostensive and the performative situations of individual knowledge represented in valued objects in HC/IC are being conducted, with which result and by whom. These requirements in the RQ then took the focus from inside the company to the global arena and introduced at the same time the control of dynamics in IC values as mandatory for the automated generation of useful disclosures supporting the double movement in the IC research identified above in both dimensions: to the global arena, leaving the situated view and the mixed definition of knowledge and competence, to dynamic perspectives leaving the ostensive research and the IC statements, from collective to individual notions of knowledge noting the relations between managerial decisions of HC/IC flow in operations and the construction of disclosures.

These three theoretical moves are proposed to add to the change from the 3rd to the 4th wave and they are enacted in the proposals finalizing this chapter.

9.2 Critic of the Legitimacy of the Methodologies

During empery's problematization and interesement processes in the multi-sited and longitudinal case, myriads of input from the GCC were ordered and related to the proposals concerning deployment and daily operations of the proposed software in order to convince departments to identify themselves as participants/allies in the case-in-the-making. Because acceptance from practice is contributory to the legitimacy of the proposals, their practical concerns of "How to update" and "How maintain the growth of the system" were concerns emphasizing research about ostensive and performative features in the concept as "important questions." Acceptance is in an ANT setting understood as actors connecting to the concept, co-developing, and testing it. The GCC actions were performative, giving agency to some solutions and not to others. The concerns anchored in practice shed light on daily operations of the proposed concept, because data actuality is a qualitative/quantitative issue (daily data update without time consumption for actors) and actions like the planned expansion of staff also required system adjustments/scalability. Both demands were technically translated into the instrumentality of the system and guaranteed simultaneously the set through of both concerns, because the methodologies of translations were reenacted in every single technological process. Recalling the various dimensions of knowledge referred to in figure 45¹³¹, the control system, Module I in the ICA model, ICMCS¹³², includes a knowledge bank giving access to the so-called "frozen" state of knowledge, now seen as corresponding to an ostensive view of knowledge. Module II¹³³ gives access to scenarios and allocations, the teams in which knowledge becomes "fluid," when related to by human actors. When dissolving the boundaries of knowledge in teamwork, the concept becomes dynamic and knowledge is perceived as performative. The system hosting and giving access to these processes, therefore, is considered performative too. The newly developed knowledge from human actors inside or outside the GCC is recorded in the system, updating it. The growth of the system is a functional consequence of the development of knowledge objects, which may represent a growing number of registered human actors or newly developed registered knowledge objects. Assuming the N-F accounting system conducts knowledge in both ostensive and performative ways, because the system is designed to acts as financial accounting systems act (Brännström et al., 2009) then stocks of knowledge centralized in the bank (aggregated individual knowledge accounts) or decentralized as individual knowledge accounts are updated overnight. Agencies to act are thus interchanged during the case development.

Criticizing methodologies, the focus is conducted to critical views on the analysis of the system development process. The theoretical framework from Michel Callon's famous article (M. Callon, 1986) about the scallops of St. Brieuc Bay was used, because the method allowed for explorative processes of inductions-in-the-making at the micro level analyzing human and non-

¹³¹ Chapter 4.7.3 Dimensions in Knowledge Objects

¹³² Annex/A2/Module I.

¹³³ Annex/A2/Module II.

human actors. It may be argued that a company is not a sea, and that the social construct of a company as a context is not equal to nature. However, the principle of free associations is carefully followed, where no prior distinctions between the natural and the social are accepted. The events were not induced by any strategic actors acting on a strategy, nor owners pursuing specific goals. Likewise for the company: during the process, events occurred like the dramatic decline of the share value lowering the organizational temperature and causing tempests of mass layoffs. These elements were perceived as uncontrollable insecurities negotiating the relations between the interventional project and the actors within the GCC. Figure 46 below shows the decrease of negotiated reductions of staff in the GCC department anchoring the project during the project's timeline.

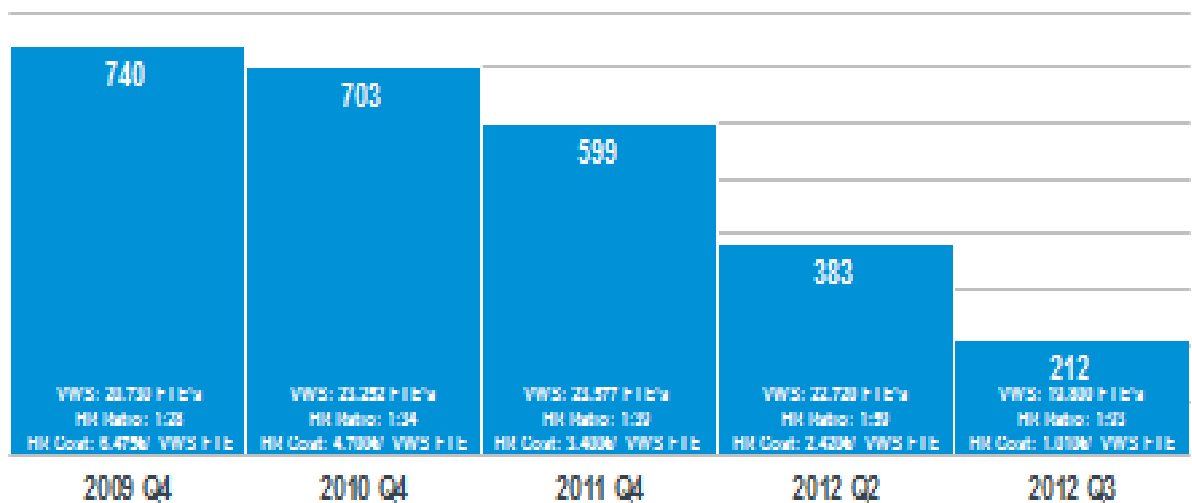


Figure 46. The number of employees in the anchoring department during the case in GCC/time.

The above Figure 46 illustrates dramatic cuts in the number of employees during the span of the case, which entailed contextual changes implicating diminishing legitimacy for the pilot project, because processes and employees considered necessary for core operations were terminated while the longer-ranged “unproductive” research project survived. Employees in the anchoring department changed from representing proud investments to easy (financially) cost reductions.

To clarify the role of the researcher, this topic in Callon’s article is referred to as “a matter of style.” The researcher is only indirectly present in his article and plays no visible role. But in this case, having an active role-in-the-making introducing the concept to the GCC, it seems appropriate to explicate my stance in executing the interventional research. The principle of agnosticism requires that no point of view is privileged. But I acted as an engaged actor: when entering the GCC, I had plans for research. The objectives were transmitted to top management. Two methodological problems occurred: one of performativity and one of engaged scholarship. To treat the last one first: Van der Ven (Van de Ven, A. H., 2007) points out four degrees of engagement when applying the attitude of an engaged scholar:

1. Basic science with stakeholder advice
2. Co-produce knowledge with collaborators

3. *Policy/design science evaluation research for professional practice*
4. *Action/intervention research for a client*

This work is the second degree of engagement, a co-producing knowledge process with the GCC and its reliability has to be judged as such. For the reader to estimate if principles of agnosticism have been followed within the regulatory framework of “industrial PhDs,” the objectives for this education is quoted below:

“

1. *Produce researchers at a PhD level with knowledge about industrially focused research and innovation*
2. *Create growth in the Danish business sector by promoting research and innovation collaborations between universities and privately held Danish companies, and*
3. *Facilitate knowledge transfer and networking between Danish companies and researchers at universities in Denmark and abroad.* “

*Danish government/ Innovationsfonden*¹³⁴

As “an engaged scholar” in this framing, the ANT principles have been helpful, because readers might be suspicious of my talent and persistence in reserving an impartial role. As this research method assigns equal agency to documents and events, they have spoken for themselves. This relieves me from the challenge to value my narrative as an actor more than narratives from other actors. My point of view will not be deliberately privileged, but is inevitably partial.

In spite of the chosen method, I will argue that knowledge produced in this work cannot be categorized as situated knowledge, (Biagioli, 1999; Haraway, 1988; B. Latour, 1999; Moser et al., 2007) even if I am inevitably partial, because I follow the methodological principles and seek to create transparency in every aspect of the views. Still the knowledge production from “an engaged scholar” will challenge the demand for a scientific objectivity. This view from nowhere that constitutes an aperspectival objectivity (Biagioli, 1999) will become blurred by the stance, acknowledged or not, of the researcher. “Aperspectival” is supposed to represent the opposite of the perspectival view. In *The Concise Oxford English Dictionary in English Dictionaries & Thesauruses* “perspectivism” is explained as follows: a theory that knowledge of a subject is inevitably partial and limited by the individual perspective from which it is viewed.” Therefore, the researcher’s personal perspectives have been treated. When the researcher’s conceptual research and intervention in the GCC include a new labeling of the world (B. Latour, 2005) with new words, a new language and a new context in which to communicate and understand the world—here accounting of individual knowledge and competence—known as elements in discourses, then the scientist, actually by creating a discourse at the same time, performs another reality and leaves the third main principles of the methodology: she is engaging in a privileged view being the knower, but she can make an effort not to value one narrative more than others, and she must not expel some actors and choose to follow others.

As the dissertation descends from the critical tradition and simultaneously strives to produce radical new knowledge and not only confirm existing theories, I am conscious that I run risks being placed in an institutionalized framing, where my task is to bridge science and practice. As

¹³⁴ http://innovationsfonden.dk/sites/default/files/guidelines_for_industrial_phd_09.03.2015.pdf, noted 2016

shown, I do tend to reduce the risks by conscientiously establishing as much transparency in my stance, objectives, and methods as possible. The presentation of occurrences in the system development process is minutely laid out and the ANT methodological rules have been applied, explained, and respected.

Having presented some weaknesses and critiques of the chosen methods and argued for its legitimacy this theme will be extended when later in this chapter discussing the limitations.

9.3 Discussion of the Additive Potential Value to OM of the Proposed Framing of IC

This subsection discusses the concept's framing of IC an ANT view. It argues why it by précising processes of allocations and by the enablement of knowledge-based decisions across distances is assumed to create more value than existing tools. It offers account for why TIC is considered a strong inscription and why it is able to act as a global mediator in operations. Considering the underlying resources as "internal externalities" links the framing of IC to market failures, because the values are invisible and unvalued, uncoordinated and undistributed. Assets are there, but unattainable.

" ... it is not on moral grounds, but on the grounds of collective efficiency and the optimization of resource allocation that the existence of externalities and various possible ways of eliminating them preoccupy economists to such an extent. In economics, the concept of externality is linked to a more general category: that of market failures." (M. Callon, 1998b, p. 3)

Furthermore, framing acts as:

" ... boundary within which interactions—the significance and content of which are self-evident to the protagonists—take place more or less independently of their surrounding context ... it presupposes actors who are bringing to bear cognitive resources as well as forms of behavior and strategies which have been shaped and structured by previous experience: the actors are capable of agreeing (an agreement which does not have to be explicit) on the frame within which their interactions will take place and on the courses of action open to them. But the framing process does not just depend on this commitment by the actors themselves; it is rooted in the outside world, in various physical and organizational devices. This is why framing puts the outside world in brackets, as it were, but does not actually abolish all links with it." (M. Callon, 1998b, p. 4)

In this case, the actors inexplicitly agreed on the values of the introduced calculative features and documented through the surveys their will to negotiate contracts based on the devices, which are rooted in the "outside/intangible/ underlying" world. This indicates that the loans from financial theories to the N-F concepts may work successfully for the design of N-F calculative devices for IC—even without the price mechanism.

There is little empirical work on system development processes and the construction of inscriptions (merged) and their role in stabilizing/destabilizing existing managerial practices, and even less on the development of management control systems based on N-F metrics valuing individual knowledge and competence as objects in a global context. But the dynamic issues in logic of accounting are indirectly addressed:

“ANT builds upon the assumption that reality is not directly accessible but is continuously translated or constructed by actors in practice. Thus, reality has a performative rather than an ostensive character, since an ostensive definition states that:

... in principle [it] is possible to discover properties which are typical of life in society, and could explain the social link and its evolution, though in practice they might be difficult to detect (Latour, 1986, p. 272, emphasis in original), whereas in a performative definition “it is impossible in principle to define the list of properties that would be typical of life in society, although in practice it is possible to do so” (Latour, 1986, p. 272, emphasis in original). A performative view radically challenges assumptions about reality, theory, and knowledge mobilized in conventional ideas about case study research. According to Feldman and Pentland (2003), the concepts of ostensive and performative have many analogies. In terms of music, the ostensive part is similar to the musical score, whereas the performative part is the actual performance of the music...”

(A. Hansen, 2011, p. 117)

Parallel to music in the quote above stocks of TICs in knowledge banks are considered ostensive, activated knowledge in flows (operations) is considered performative. Therefore, when inscribing visualization, measurement, and operations of individual HC in an accounting regime, the framing of these unknown, unmanaged resources is supposed to occur concurrently. This is opposed to existing information about these inputs, which are ostensive and restricted to CVs not mobilized in daily operations, or ostensively represented in self-assessed job-dependent multifunctional figures describing situated input estimations or accrued in situated, multifunctional, partial, and subjective event-driven output. The question is, as argued, whether the proposed concept constitutes a better framing than many existing KMTs, such as Intranets, Yellow Pages, and Best Practices do. The latter often present multidimensional aspects of collective knowledge and do not represent individual resources in an accounting quality, because individual HC is invisible. The technologies¹³⁵ do not operate accountable inputs, but are constituted in historic, multifaceted, segregated, event-based outputs (Andriessen, 2004b). They do not operate in ostensive and performative modes at the same time enacting accountancy. The representations cannot be regarded as inscriptions or explanations (Robson, 1992), because they have no mobility, they are not stable, and they are not combinable. They are locked into time and space. KM theories and ICM technologies can be described as calculative, but they are linked to time and space (Andriessen, 2004b; Qu & Cooper, 2011), backward looking and unreliable at a distance and, therefore, unsuitable for dynamic operations of IC across boundaries. Performance Measurement Systems’ focus on motivations in companies, behavior and managerial tools links pay and rewards to incentive systems, but this focus, consequently, does not consider individual knowledge and competence as manageable input and certainly not as assets to be managed across units and companies at a distance. The context of individual knowledge and competence viewed as an asset in diffused operations has been identified as market-like. In the article “Actor-Network Theory, The Market Test,” Callon (M. Callon, 1997) explores markets and whether ANT contributes to the understanding of economic markets. P. Miller proposes to explore calculative practices as technology of government (D. J. Cooper, 2006; Miller, 2001). “Calculative practices” are here understood and applied in an extended Miller reading into an N-F context. A shared regime of calculative

¹³⁵ Figure3, A 1.5, A 4,

practices representing accounted for values of individual HC/IC may become the processes of intermediations (Miller & Power, 2013) between actors as calculating agents negotiating intellectual power and performing markets (M. Callon, 1997; M. Callon, 1998a). In other words, TICs are designed as data to globally communicate the values of individual knowledge and competence, which is assumed to be antecedent to calculative practices (K. Kreiner & Mouritsen, 2003). TICs are designed to constitute future calculative practices and are, in the long term, envisaged as “technologies of government” (Miller & Power, 2013), as potential framing elements of IC independently of time and space able to fill in the information gap preventing the economic paradigm from instrumenting perfect markets.

To inform knowledge based management in dispersed companies, technology has to address dynamics between ostensive and performative situations (stock and flow) in global contexts as well as in the company view and IC development at both the short term and long term, which requires an automated output that creates the power to act at a distance 24/7. Existing HRM tools seems unable to satisfy these requirements.

But is the design of TICs strong enough not to be submitted to local interpretations?

“To act at a distance the explanations or inscriptions should provide powerful explanations through which to act upon all relevant contexts.” (Robson, 1992, p. 691)

Did the design of TICs “provide powerful explanations” to act in “all relevant contexts?”

Distinguishing between the firm context (1) and the global context (2) the process of design concludes that (1) is contained in (2)¹³⁶. The requirements for the design, maintenance, transmission and assimilation of TICs are therefore fueled by (2), but at the same time adapted to requirements in the context (1).

“Ideally, to hold the one element in A it is possible to know, or make subservient, the elements of any or all contexts B, C, D, ..., etc. In this way the problem of distance is confronted not only between two contexts at any one time, but by holding the elements in A, one can act upon many contexts at once. Action at a distance implies not merely physical space between two points, but the capacity, through ‘strong’ explanations, to influence many contexts at the same time. If knowledge is oriented towards acting upon a remote setting, then it is produced and sustained not by ‘true’ correspondence but by its power in securing long-distance control, through the provision and maintenance of networks for the gathering, transmission and assimilation of inscriptions.” (Robson, 1992, p. 691)

The design of TIC addresses 125 different combinations of individual knowledge and competence within one object of TIC and furthermore horizontal and vertical dimensions of HC, when combining numbers of TICs in personal accounts, which is thought to replace the CV, now in the dynamic version. TIC is considered to produce strong inscriptions, because it is designed to own equal properties as circulating references, as mobile, stable and highly combinable inscriptions. Both the representation of knowledge and the representation of competence in TICs are mobile separately calculable objects, but in the proposed design objects, which are linked together, because the numerical competence metrics in the measurement unit characterizes the possible/required use of knowledge and thus provide a passage point to the incarnation of knowledge, somewhere, sometime in the network. Only human actors own

¹³⁶ chapter 4.3, Figure 33

competencies. The mobility is manifest between human actors in the network owning the indicated quality of HC and between geographic loci, where the capacity will be applied. The inscriptions are designed to determine the quality of the searched-for/offered resources across locations in every context at the same time and in globally recognizable ways providing explanations through which to act upon.

The methodological stability as immutable mobiles implies a certain (J. Law, 2008) stability of relations between inscriptions and the context to which it refers. There are several dimensions to be recognized when using TICs; that is, which kind of knowledge is represented and its quantity and quality. Meta-knowledge relates to several orders of knowledge, to global classifications argued to be used and recognized worldwide. The use of numerical notation tends to reduce the room for local interpretations; text-based inscriptions as CVs weaken equal recognitions, because allocative actions of fast overview, comparability, prioritizing, and choice, and the entanglement of knowledge and competence objects, are slow, different, and unlike.

A last requirement to a “strong inscription” is explained by the notion of combinability:

“Combinability allows the actor to accumulate inscriptions, aggregate them, tabulate them, recombine them in order to establish new relationships, and calculate ‘norms’ through which to compare the settings to be influenced in accordance with his or her specific objectives, aims or ideals. Inscriptions can take many forms, as the examples of the previous sections have indicated. The map, for example, has the potential to facilitate action at a distance, and display properties of mobility and stability that, it is argued, are central to the use of quantitative inscriptions in accounting. Accounting, however, has a key advantage in respect to the third of the properties of inscriptions amenable to the achievement of action at a distance. Although numbers are both mobile and stable, combinability is the most obvious triumph of the numerical inscription.”

(Robson, 1992, p. 697)

To obtain “combinability,” comparisons to money and to numerical inscriptions are accentuated by Robson. Knowledge, creative competence, and performative competence have, as referred, 125 numerical combinations embedded into one inscription, TIC, and this fact enables theoretically innumerable combinations between TICs when entangling K&C objects in processes of allocations determining the level of performance with great power of discrimination. ICMCS’s Module II¹³⁷ is designed to instrument the human actors’ managerial decisions and affect the choices as remote coordination and distribution of IC.

TIC is designed to satisfy optimal demands for quality in operations ex ante, in-the-making and ex post (evaluation) and it is considered a strong device, because it is able to travel from unstructured contexts to human actors, or to several actors remote from the ordering context and to empower actions across locations, thereby framing IC through classifications, numbers, and calculating processes.

The objects expressed by TICs can technically become combined endlessly in profiles of demand for HC in projects for instance, which allows for precise searches of very specific knowledge combinations. Persons with special knowledge located in the corners of the world will, if connected, be able to offer supply of knowledge wherever and whenever, and can be

¹³⁷ Annex 3.3 ICMCS, Module II – Operations management, Figure 59

found and allocated or link to the actual network. Therefore, the evidence processes in the surveys and in the co-development have tried to create validity for the occurrence of technical processes of entanglement, when human actors (employees) relate to TIC by becoming calculating selves. TICs enabled actors to estimate individual knowledge and competence supply across locations and use TICs as market devices that frame IC in companies changing ICs status from being an “internal externality” in the economic framing of the world to become an operated, measured, and managed capital.

Distributed by ICMCS, the coordination of knowledge has to take place in the control system, because human actors make decisions informed by TICs in the system framework (Hevner et al., 2004). When connections happen, the system registers mouse clicks and is able to generate various accounts like for instance total accounts of aggregated individual accounts of knowledge and competence. Budgets are automated system outputs in TICs. The IC reports and various outputs produce evidence for the connections to have happened.

This section discussed the results against the background of existing understandings and notions of knowledge and its derived MTs. It pointed out why TICs theoretically are able to frame IC and account for HC/IC in dynamic value representations that are contributions to existing technologies. It was stressed how and why TIC enables calculative practices and disseminations that may power calculative regimes in and between firms. These features have not been found in existing ICM.

9.4 Overflows in TICs

TICs viewed as circulating references, remain reversible and are traceable, and the elements of which the object is composed contain the same qualities to be able to transport truth, and if not, it cannot be trusted.

This section discusses the limits in the construction of this truth and therefore initially will outline the design elements assessing their relation to operations in the light of these limits.

First, TIC consists of one word identifying one object of knowledge in the global body of knowledge within the chosen classifications (mapping academia, the labor market and firm-specific knowledge), accompanied by three segregated figures from 1 to 5. The first figure represents the vertical dimension of the chosen knowledge object; the second figure represents the creative competence, CC, and the third figure represents the performative competence, PC, with which the knowledge object is supplied into or demanded to act in the context.

The mapping process was enabled by the artefactual view of knowledge separating knowledge from competence and by supporting the notion of knowledge as objective objects in the global body of knowledge. The mapping of knowledge in classifications are connected to TIC as punctualized networks (B. Latour, 1991; J. Law, 1991) locating the object of explicit knowledge to the measurement unit. Second, TIC measures human competence to activate knowledge objects. The chain of elements to verify the representation of the values in TIC has previously been studied¹³⁸.

The figure 11 demonstrated the single steps of valuation of knowledge. TIC measures individual value or quality of knowledge and competence in a unit to be understood and used generically, connecting to punctualized networks of academic and experience-based knowledge. The metrics from 1 to 5 are

¹³⁸ Figure 11

designed to be equally understood, because the educational systems transferring knowledge from text and pictures are applied worldwide in Bachelor's and Master's degrees. These processes are still part of the ongoing active processes of harmonization between international institutions (Reinalda & Kulesza-Mietkowski, 2005; Sarauw, 2012; Sarauw, 2012). It is argued that the unit, TIC, is "relatively universal" (B. Latour, 1999) when representing the quality of individual knowledge, but equal education's syllabuses vary globally as do the qualities in institutions (N. C. Liu & Cheng, 2005). These variations may represent overflows. To mention the concrete example from the case in the GCC of the fear of leaks: remote estimations of the quality of knowledge at the same level in the same knowledge object may need précising elements of information as "which university, where," because the output level of the quality of knowledge owned by the candidates differs, which represents potential leaks in the framing.

Besides, all humans have personal characters, which filter behaviors (Friis & Hansen, 2014; A. Hansen, 2009/2010; A. Hansen & Mouritsen, 1999; Hopwood, 1973; Rajan & Reichelstein, 2009). These psychological aspects, various social family contexts and different educational standards are excluded from the concept, but are considered plausible potential areas of leaks, which require additive MTs and actions.

A similar analysis for individual tacit knowledge visualized as experience-based knowledge gained in relation to labor markets is expected to reveal leaks that are generated not only through the design of the objects, but also in the classification.

The labelling of the competences is split into two notions¹³⁹ roughly addressing routinized and more innovative perspectives, respectively, in order to satisfy the contexts' requirements for capacity to activate/allocate individual knowledge in organizations for different operational purposes. This is to simplify the complexity of information about competences and enable managerial distinctions *ex ante* between the intellectual requirements for processes in both daily operations and development. The used taxonomies are globally applicable independently of time and space, and the elements of design for representing the values of competences are argued to provide true representations¹⁴⁰. TICs, therefore, tend to represent amplified value representations of individual knowledge and competence, designed as calculative devices. Gaps between the concern and the objects, the "matters" and the "forms," constitute the limits of truths in its ostensive edition, which produces overflows, but knowledge's performativity infinitely changes the gaps by the development of new knowledge. The artefacts, TIC's construction, which includes individual competences to change the knowledge objects and dynamic embedded features for acting in ICMCS, could be said to reflect IC's performativity when framing, and overflows happen.

There are weaknesses in the design. When transferring the world into words, figures, and data, it loses complexity. This loss can be minimized by amplifications, which allows the former local phenomenon to be generalized and understood in new settings across locations.

Up-stream and down-stream gaps are supposed to be influenced by reductive elements as locality, or by difficulties in identification and separation processes, because human actors understand objective knowledge objects through views that will, to some extent, be painted by

¹³⁹ Chapter 4.7.1

¹⁴⁰ Chapter 5.3, 5.4

their prior experience-based knowledge and local contexts. The competences being personal, by which knowledge is activated, dissolve the objectivity in knowledge objects in their utmost verticality¹⁴¹, where research is located (J. Law, 2008). These examples hamper the transportation of truths. If they seriously distort measurements, only managerial accounting output based on ICMCS in operations will show this.

In the reduction and amplification processes viewed in TICs, it is of interest to point out different perspectives. In the conceptual perspective, the gaps and overflows in the successive stages translating the values; that is, K&C, defining, creating, recognizing, locating, and communicating the inscriptions that have been touched upon above, matters to represent the truth. In the organizational perspective, the coordination, exploitation, distribution, development, storage, accessibility, and planning of TIC matters for the representation to be predictive and useful in operations *ex ante* and *ex post*, and finally, in the strategic perspective it matters how N-F values become recognized as being strategic, and how they are planned and exploited at the right place at the right time. In this paragraph, only the conceptual perspective was discussed; the remaining two perspectives are discussed in the next subsection.

The above discussion implies that leaks may distort the device to some extent, making the use of it senseless in operations because the conceptualization does not carry the relevant part or enough of the relevant part of the truth.

9.5 TICs, OM and Strategic Perspectives

Having discussed TIC's usefulness, reliability, and some potential overflows, the next focus is first directed toward TIC's capability to coordinate, exploit, distribute, develop, store, and plan IC. Second, the strategic perspective discusses whether IC values are supposed to be better recognized as strategic, and are better planned and exploited in the N-F paradigm of control than by existing financial controls. Predictability is touched upon too. Overflows from organizational actions, having not been executed in deployed software, will be discussed only at the conceptual level, because empirical data about actions and their effects remains. This subsection, therefore, is focused on the concepts' assumed supplementing data to existing regimes of control.

If TIC is given agency as useful value representations in operations, then the unit will measure and represent IC values in system outputs to become managed across boundaries. If the amplification into valuing inscriptions proves stronger to human actors than the contemporaneous reductions and overflows in the systems of control—and if the technological devices enabling individual knowledge and competence objects to be managed across locations are mobilized through dynamic distribution mechanisms allowing for organizational heterogeneity—then it is possible to explore the interfaces between existing technologies and the output generated in TIC. By creating visibility through the presence of accounts, the organization creates an actor in the actor–network view of the organization (Catasús, 2008; B.

¹⁴¹ Annemarie Mol explores the practices for doing lower-limb atherosclerosis in the health services of a town in the Netherlands. What she discovers is that since the practices in each of these locations is different, so too are the realities that these enact. In theory, the disease is one (this is assumed if you read a textbook), but in practice it is not. Hence the oxymoronic title of her book, *The Body Multiple*. In practice, the disease is more than one but less than many. The proposal, then, is that the world is not simply epistemologically complex. It is ontologically multiple too. Or, to put it differently, the heterotopic lies within.

Latour, 1987). Accountability can be regarded as a form of governance between an interest and an account of practice. Accountability is an either/or concept in the sense that either you are accountable or you are not (Catasús, 2008). This property is assumed to mediate and negotiate IC allocations at a distance.

A draft of how interfaces can be operationalized and integrated into existing IT architectures in GCC is sketched out and found in the Annex 4.1¹⁴². Keeping the mapping of explicit and tacit knowledge generic—and, therefore, not an effect of existing capacity in particular entities—constitutes the relevance of TIC in global markets. Technically, this conceptual choice enlarges the potential for TIC-based management in existing IC MTs, because the customizing of company-specific knowledge—in particular business units—is practiced without linking knowledge objects to local positions or functions. Optimizations in the practices of allocation may happen by establishing an inner knowledge market represented in TICs. Knowledge-based decisions are based on output shown in Figure 47 below:

Expected organizational perspectives for decisions informed by N-F metrics in ICMCS				
TIC output				
K&C	Existing IC	Operations of IC	Future IC	Potential actions for management/self-management
Storage	Access to global updated bank of individual knowledge and competence	Diminished search-time and enhanced output quality	New IC under development is visible in TIC constituting an arena for expectations and previsions	Browsing global knowledge banks of existing and future knowledge may influence planning for avoidance strategies in IC risks, because the stocks explicates future gaps in strategic knowledge
Planning	Gaps between future need for knowledge and competence and existing capital express the details and values in TIC	Shared predictability whether decisions and actions will succeed in a knowledge perspective	Adjustments between supply and offer of IC in operations may slim investments and adjust expectations	Structurally based predictability in IC development enables comparisons and adjustment ex ante
Development	Focused, leaned development of IC considering locations and quality	Planning across borders of IC	Available IC will always satisfy operational needs in time and space	Adjustments-in-the-making based on N-F real-time metrics and KPIs

¹⁴² Annex A 4.1: TIC integration to existing technologies.

Coordination	The calculating self-coordinate IC	Management's context and attitude to self-management is regulating factors	Having decentered access to IC, value chains are supposed to qualify calculations	Ex-ante and ex post drawn N-F metrics indicate in teams and at a distance output to act on
Distribution	The ICMCS distributes calculations	Any slack in IC is supposed to vanish, because capacities are found in demand for HC or terminated	Technically, the newest, most updated knowledge will be assigned tasks	Ex-ante and ex post drawn N-F metrics indicate in teams and at a distance output to act on
Exploitation	N-F metrics inform real time for balancing, timely decisions	Sustainable balances between exploration and exploitation of IC may develop due to comparable IC metrics from operations	Application of new knowledge accelerates innovation	Alignment of global and local N-F KPIs and financial KPIs

Figure 47 Expected organizational perspectives for decisions informed by N-F metrics in ICMCS.

Figure 47 drafts some of the envisaged potential managerial implications of ICMCS implementation and it formulates new areas of decision making in the right column. These implications are only valid if the concept of TIC is considered to transport the truth, which is conferred in the above paragraph, is implemented and fully used.

Strategic perspectives are visualized as functionalities in ICMCS, when the demand for future knowledge is identified and noted in Module III¹⁴³ in TICs. The knowledge demand for entering potential markets, new services, and develop new products, and legislative and organizational potential implications, are expressed in TICs, and are structurally accessible to the relevant distributed powers of decisions. The structure supports the decentralized, but shared conductions of prioritizing processes, the outcome of which is global/local IC budgets¹⁴⁴ that define the future demand for HC. This outcome from centralized, global processes directs and distributes the strategic planning of IC, where operations are decentralized, but the result is centrally controllable ex ante in IC budgets, plus in-the-making and assessable ex post in IC accounts. Contrasted with the financial outputs of control, the proposed ICMCS technology enable shared perceptions and actions to occur that are related to the planning of IC, because TIC in operations informs ex ante about the content of knowledge and competence within the strategy. This predictability may prevent unwanted situations of scarce capacity to occur (like bottlenecks) , because IC control may add predictable actionable information about IC values to the existing IT architecture.

¹⁴³ Process described in Annex 2 Module III, pp 337-364 and A 3.4

Other recent studies conducted inside the GCC have shown that collaboration in mean figures did not exceed a distance of more than 30 m¹⁴⁵. Management of IC (of 22,000 employees) thus stayed local and was dependent on face-to-face meetings, accidental or planned, unexpected occurrences, and hazards. Chapter 2 explored why personal knowledge is poorly registered in existing KMTs. Unfortunately, as referred, evidence-based correctives to the undistributed IC is not delivered here, but applicable methods and some evidence has been provided to coordinate and distribute IC globally in the future.

The deployed concept is supposed to make actors connect to ICMCS and enter their proper knowledge and competence measured in TIC, thereby creating an accurate digital representation of the HC values they sold to the organization when hired. This process may involve invited free agents and stakeholders too. The ICMCS generates personal HC accounts, stores them centrally in an overview—the knowledge bank—and simultaneously makes the centralized qualitative data of TICs accessible across locations. Theoretically, the calculating selves are enabled independently of time and space, whenever allocation or human actors are to choose IC capacity, because estimating actions for calculations are activated through the use of ICMCS. They make TIC a market device, which frames the underlying resources { {441 Callon, M. 1998} }

9.5.1 How ICMCS is Designed to Add Value to Financial Control Mechanisms

TIC carries its own context for human actors in unstructured contexts to identify capacity, how deep and how wide the knowledge objects are, and with which competences they can be activated. ICMCS provides overviews and comparability in a range of issues that the respondents find so interesting that they want to connect to the non-human actor, TIC. The proposed “equipment” may constitute qualitative markets of HC (M. Callon & Muniesa, 2005).

The theoretical framing of this thesis comprised four sets of determinant distinctions influencing the conceptualization of accountable knowledge and the testing of concepts: (1) entanglement/disentanglement; (2) ostensive/performative; (3) contexts of order/chaos; and (4) organizational dynamics/frequencies. This is accomplished in the intersection between IC and KM, initially by tabulating each of the sets in relation to the visualization of individual knowledge and competence, the valuation, and an accounting model of HC input and output. The following part of the discussion illustrated in Figure 48 below is structured by Figure 23:

¹⁴⁵ Output of an undisclosed, but handed-out internal GCC report.

Theoretical founding elements in (1) the conceptualization and (2) testing of IC accounting				
Distinctions	Visualization of knowledge and competence	Valuing of knowledge and competence	Model of accounting	Output from accounting
(1) Disentanglement/	Between knowledge and competence objectifying both, and between knowledge and competence and human actors	Individual valuing of objective objects	Supply of IC as measured input made individually accessible	Individual accounts/budgets Search and demand for knowledge and competence in processes of allocation, recruitment, tasks
(1) Entanglement	Demand-driven combinations of knowledge and competence profiles	Various levels of aggregations	Optimized match of individual resources and tasks	IC value representations in processes ex ante/ex post of allocations
(2) Ostensive/	Demand for global recognition of resources, stable representations	Demand for global accept of valuations	Value representations as HC stocks in N-F accounting systems	Daily IC accounts/budgets, daily forecasts for tasks
(2) Performative	Individual capacity is negotiated in the network	Comparison, choice of quality and quantity of individual HC and action at a distance	Real time negotiations, mediations and update of knowledge and competence	Real time, on-line business intelligence about HC/IC
(3) Ordered Context	Mapping of underlying resources in firm contexts	Strategy defines strategic HC	Mobilization of values at a distance	Calculating selves framing knowledge markets
(3) Unstructured Context	The boundless firm; human and non-human actors connect to TICs independently of time and location	Qualitative Markets of HC	Boundless, global quantities of devices and actors connect in networks – network based models of accounting	-
(4) Organizational dynamics/ frequencies	Technology connect TICs in stocks and flows when activated by human actors	The design of TIC allows for ostensive and performative accounting processes	Control of assets is updated and accessible anytime 24/7 from anywhere	Output from updated value representations of control of processes of allocations, teams etc

Figure 48. An overview of the theoretical elements that frame the use of N-F measures in organizations, by the author.

The figure mentions the conceptual relations and results between the 4 theoretical constructs in the left column and requirements in the RQ (upper row) to be investigated and conceptualized in order answer the question.

However, the envisaged implications of the output mentioned above in Figure 48 are to be sketched out next in order to compare and relate output of accounting in the two capitals.

Global economic actors have given agency to economy-based translations of the world and connected them in vast institutionalized networks mobilizing the global economic narrative, granting financial metrics familiarity, meaning, and variable measures of reliability. Based on financial representations (e.g. annual accounts), external investors make decisions about future investments, so economic figures activate actions (Fløstrand, 2006). Historically based figures create representations of the future in budgets that are performative and create the future (Skærbæk & Tryggestad, 2010), but this thesis shows that financial value representations are interpretable entailing managerial decisions opposing strategic directions. By changing the construction behind the sense-giving of financial figures, the investments turned to costs¹⁴⁶ (Bino Catasús, Maria Mårtensson, & Skoog, 2009).

Economics in this case is, therefore, shown to have malignant embedded context-dependent narratives of financial explanations¹⁴⁷ that distort stability, so an additive N-F valuing mechanism may be appropriate as a stabilizing factor to financial accounting, when creating the future. ICA may be able to reduce uncertainties—which are problems that in practice are actually considered to be the most important¹⁴⁸ uncertainties—and furnish financial figures in managerial accounting with wider perspectives and less space for interpretations by taking account of the underlying resources in TICs, as shown in Figure 57, Annex 1.6. The table lists comparisons between financial and N-F accounting outputs, which are outlined in relation to their managerial relevance.

Figure 57 shows in the right column how TIC-based accounts generated through operations in ICMCS are envisaged to add to financial accounts. TICs are supposed to add value by new processes of control of the underlying resources. It shows how N-F figures in TICs are conceptualized to ex-ante prime economic decisions-in-the-making. Furthermore, selected data provide new management information, because N-F accounting is potentially predictive outlining budget data to act on, which are not available today. Above the proposed N-F data, which are real-time data generated through dispersed operations automating traces of data in the system 24/7 are the dynamic data of control that are dynamic and representing flow and stock movements in IC. The timeliness of IC data is, therefore, new and considered to be useful due to the designed IC accounting consistency, the economic power in the highly valued IC elements and to ongoing, flexible adjustments to the fast changing market conditions.

Based on the design and technically proven functionalities in ICMCS the table imagines how the output differs from and adds to financial accounting.

¹⁴⁶ 8.5.1: Trials of Technologies.

¹⁴⁷ 9.2: Critic of the Legitimacy of the Methodologies.

¹⁴⁸ Global consultancy companies, Mckinsey, Deloitte, Ernst&Young 2013.

Finally, ICMCS is envisaged to add KM practice too. One of the fundamental IC premises is that some individual knowledge and competence is a better match to tasks than other knowledge and competence and, therefore, provides more value in the processes of allocation. However, this individual knowledge and competence have to be found, chosen, and acted upon in operations to create better financial results. This happens among other things in practices of allocation and recruitment; however, KM practice seems not to acknowledge this premise. Today, the practice seems not look for intellectual quality in these processes, but is more focused on cultural homogeneity (Brix, 2010; Rivera, 2012). This gap may leave room for further development within KM by including the management of knowledge assets into existing KM routines and technologies being hereby able to prove KM's contributions to operations. .

Implementation and case-based research now remains to thoroughly explore whether the theorizing and its artefacts makes sense.

9.6 Ecological IC Implications

Bringing in the global view this paragraph unfolds visions of deployment of TICs. Traditional IC and KM theories often are based on closed-system models, which is problematic to innovation, because the external environment, and its complexity and speed of transactions, is more important to innovation than the closed system model suggests (McGrath, 2013). Representing the “underlying resources” and “intangibles,” the IC resources are invisible as allocative objects of value, but they are assumed to be out there. Performance management, which stays situated, with a bearing in economic and psychological theories, does not, as referred, explicate values of individual HC. In practice, the control of individual HC managed as input to operations is not found particularly widespread in rationales of KM technologies, neither in closed-system models nor in networks.

However, innovation can be viewed as results of ongoing processes of knowledge applied, chosen, and activated by human competences in and between units in networks of uncontrolled open systems with no coordination and distribution of the accumulated offer of HC in the network (Kao, 2009; McGrath, 2013; Rolandsson, Bergquist, & Ljungberg, 2011; Tushman et al., 2010). Applying this IC view to relations between knowledge and firms, firms' stakeholders being a special part of the context between companies, sometimes even being part of firms' IC when collaborating, the calls in the below quote are sought addressed by transferring the stakeholders and their objectives and goals into the firm's structural capital, into ICMCS. In the deployed ICMCS Module III, the stakeholders, their objectives and goals and the profiles of HC required to reach their goals or the commonly worded objectives between the stakeholders and the firm, are listed, accessed and developed. The HC requirement and IC demand created by the stakeholders, the customers and the internally decided organizational development is noted separately in Module III thus creating pools of demands of individual knowledge and competence with strategic impetus to be planned and managed¹⁴⁹. These inputs to ICMCS of the disentangled details of future HC demand is technologically constructed to generate corporate/region/departmental strategic HC budgets of individual knowledge and competence

¹⁴⁹ Chapter 6, Development of the distribution system and Annex 2 and A3.4

after having been made object to filtering, managerial, global processes of rankings of HC demands¹⁵⁰. In this way, concurrently, knowledge and competence budgets are kept as detailed updated value representations of future strategical knowledge and competence enabling HC planning at the various levels of interventions.

“We would further argue that the critical project in accounting may be reinvigorated and contemporized by meticulous research following the actors, both human and non-human, implicated in the processes of accounting for stakeholders. (...) Arguably, however, accounting for stakeholders requires a new form of critique that is located in its context of emerging complex, diffused, pluralistic, globalized spaces. Transnational networks of organizational practices, (...) mediate accounting for stakeholders. (...) We have very little understanding of the constitution and accomplishment of these global networks enabling accounting for stakeholders. Clearly this is an area that requires sustained field work to refocus critique from ‘pre-packaged assumptions’ about the sources, distribution, uses and connotations attached to power (Guggenheim and Potthast, 2012, p. 169), concentrating instead on the emerging micro-dynamics and structures of power shaping accounting for stakeholders. (AccountAbility, 2007). (Andon et al., 2015, p. 998)

Module III in ICMCS is viewed as an instrumentation of the eco-systemic perspective, because the stakeholders and their chosen impact are included in the firm’s IT architecture and operations embedding their supply and demand for HC in the customized corporate planning and use of HC.

The proposed concept is speculatively applied, demonstrating management of IC in the processes of innovation as engines of coordination and distribution in satisfying, pragmatic, and auditable operations through IC accounting; that is, processes of allocation of individual HC. The system creates supplementary and shared spaces of control and bearings for management of the identified and valued objects of individual knowledge and competence in the processes of innovation across boundaries – more or less closely connected to the chosen stakeholders. Therefore, ICMCS for a while leaves the closed-system model of accounting and the situated view of knowledge, thereby producing auditable output from individual HC allocations in networks constituting complementary data of value control from cross-border operations.

As a supply to financial control, this model may be interesting to apply in order to diversify managerial control in global supply chains establishing points and levels of IC driven interventions at a distance. It is envisaged that the N-F logics of accounting are conducted parallel to financially based systems of control visualizing and valuing individual HC in TICs.

IC assets are identified, and are satisfyingly applied and accounted for ex ante and ex post in the processes of planning, production, and reporting of IC in firms and networks. The assumed implications are that predictive IC KPIs will motivate operations. IC BI will in real time be able to inform knowledge-based decisions, such as allocations across departmental or geographic boundaries constituting auditable, comparable traces from operations in the capital. Then companies and networks will find timely distributed information about future gaps of critical

HC capacity. They may avoid scarce resources, recruit in time and globally, explore and exploit the total supply of IC, remove uncertainties and risks in IC, establish diversity in teams, add capacity-in-the-making, knowing who knows what, where. In shared paradigms of control they may innovate through precise, active management of HC/IC across boundaries and disclose today's hidden values in meaningful reports potentially understood by financial markets. They may plan to gain more self-management and better management at a distance, thereby reducing the number of transactions, conflicts, failures and their costs and time consumption. They may enhance general organizational agility, still controlling quality, but diminishing run-through time. They may increase results from wired collaborations in processes of open innovation in precise, surgical intervention without disturbing the hierarchy. In brief, through the management of individual knowledge and competence, firms are assumed to be able to gain more competitive power.

The disclosures from ICMCS are both situated and comparable to other firms, because they may indicate the stocks' (of knowledge and competence) existing and future relevance for the completion of the announced strategic goals in percentages, percentages of exploration/exploitation of internal/external knowledge, percentages of new knowledge/new strategic knowledge, percentages of used/un-used knowledge and competence, risks in IC and many more. Clicks in the single operations generate the accrued numbers for the percentages, which are disclosable 24/7. Thus, the metrics in operations are concretely connected to individuals and tasks and therefore situated, but the accrued figures constituting the percentages are auditable and globally comparable. They are hopefully useful too.

Finally, finishing the pictured, practical implication for the artefact, TIC, the measurement unit is viewed as new generic qualitative data, which is adaptable to future technologies and ICA systems. It is not linked only to ICMCS. It is assumed to be able to enter existing global systems of search to qualify, compare and measure available global supply of individual knowledge and competence in structured and unstructured settings, to serve for big data in designed contexts and maybe create qualitative markets.

9.7 Critical, Reflective Comments

From the described pragmatic, constructivist stance the motivations implied explorations of the dominant ontology and epistemology in the fields of IC and KM, "*refocus critique from 'pre-packaged assumptions' about the sources*" (Andon et al., 2015, p. 998). At the first place not only to find gaps in the literature, but to understand the underlying dilemmas between theories and practice effecting that companies "don't know, who knows what, where", and also to propose solutions to these important problems.

In order to engage in processes of conceptualization, the research process has therefore been critically exploring prevailing assumptions about notions of knowledge, calculations, operations,

and control and imported selected theories from economy and organization theories explaining why they were inspiring and maybe applicable¹⁵¹ (Boer et al., 2015; Whetten, 1989).

Shortly put, the thesis has rejected the processual, situated, disseminated notion of knowledge and proposed a new, global paradigm for management of individual knowledge and competence based on the notion of artefactual knowledge. The proposals were argued and developed in Part I and empirically tested and described in Part II. The separate technical tests of both artefacts were successfully conducted. When it comes to the social testing of the proposals, the relationships and connections were not falsified through the testing of proxies for the properties in TICs and data from case-based quantitative empery did not decline the hypotheses. Therefore, the concise statements in the hypotheses did correctly express what the theorization had expected to happen. Data from the longitudinal qualitative analysis of co-development and deployment of ICMSC spelled out hidden actors and biases for a successful completed implementation of the concept and undermined as a theoretical spin off the authority of the financial value representations by demonstrating its context dependency.

By criticizing KM based on situated and blurred notions of knowledge for being unable to represent individual values of knowledge at a distance and identifying why, the thesis shows why prevailing KMTs are generally unsupportive regarding (remote) management of individual knowledge and competence, specifically to processes of innovation, and why KM in dispersed companies and between units does not happen. The applied view of knowledge (R. Bohn, 1994) considers individual knowledge and competence as a sort of individual “matière première” (Epstein & Manzoni, 1997), acquired just as steel, oil, and aluminum for production purposes, and as organizationally valuable resources residing in the heads of individual employees. Therefore, the objectified view of knowledge entails a separate view of competence which differs from the predominant view of knowledge; MTs and systems in deterministic organizations, where the intermingled knowledge/competence view is applied, and related to departments, jobs, titles, or chairs (Mintzberg, 1993) do not produce foundations for qualitative estimations of knowledge resources either co-present or at a distance; in the artefactual, objectified knowledge view, organizations can be regarded as the total of organized, noted objects of knowledge and competence (stocks) in networks with some elements of knowledge and competence residing in the heads of staff and some externally in connected individuals (i.e. stakeholders). With “accountable knowledge” being a result of the objectified, non-deterministic knowledge view and processes of design identifying contextual elements which require actionable devices to be operated, it has been discussed whether these series of translations from this “something” in human heads to mobilizable data structures are too reductive or able at all to instrument knowledge processes in operations in useful ways.

In spite of this and adding to the above discussion of overflows and potential effects of gaps between matter and form, multiplicity is understood as phenomena of knowledge and may, in various contexts (order/chaos), diversify and remove (overflow) an originally established

¹⁵¹ A1.2: Logically Possible Organization Theories of Coordination and Distribution applied to Individual Knowledge in and between Companies

academic notion of a knowledge object and change the perception of content in the knowledge object on the ontological level as well as epistemologically, because the elements “knowledge” and “competence” are mutually performing each other. This phenomenon seems clearly demonstrated by the following quote:

“Annemarie Mol explores the practices for doing lower-limb atherosclerosis in the health services of a town in the Netherlands. And what she discovers is that since the practices in each of these locations is each different, so too are the realities that these enact. In theory the disease is one (this is assumed if you read a textbook), but in practice it is not. Hence the oxymoronic title of her book, The Body Multiple. In practice the disease is more than one but less than many. The proposal, then, is that the world is not simply epistemologically complex. It is ontologically multiple too. Or, to put it differently, the heterotopic lies within.” (J. Law, 2008, p. 636)

The quote may entail the argument that the defining notions are not unambiguous nor are the occurring processes isomorphic. To what extent these potential leaks perform may be studied by the help of an implemented ICMCS, because the academic classification of knowledge in each of the above locations may develop into countless sub folders to the knowledge object “*lower-limb atherosclerosis*” diversifying the object’s small differences in the labelling of the newly developed knowledge objects – which is negotiable in the connected networks. The above quote theoretically spells out that the disease “*atherosclerosis*” as an object of knowledge may be viewed as professional diagnostics, labeled in a medical discipline that acts as a knowledge object relating various actors. The knowledge object is not stable in time and space, being challenged by new actors relating their (specialized) knowledge of new medicine, new tools of measurement, new technological bio-chemistry breakthroughs to this knowledge object in an open process of development that occurs as sociological processes of associations, and the knowledge object will, therefore, be found in various stages of development. The quoted situated actors in the four locations are elements performing as human actors with differing acknowledgements of the object “*atherosclerosis*” and acting with different agencies in different contexts. But does this multiplicity then blur the construct of “*punctualized network*”(J. Law, 1986), because actors equally informed think they act on equal terms, but behave differently? To which extent do the labeling of the knowledge object “*atherosclerosis*” lose its power as an actor (immutable mobile) from a punctualized network? This is the network of specialized knowledge within the medical discipline, may be general conditions for knowledge objects, because knowledge is a social construct and, for now viewed as circulating references, has become “*relatively universal*” (B. Latour, 1999). Within the knowledge body the object “*atherosclerosis*” is globally recognizable by a limited group of specialists who, in their exclusivity as knowledge owners, are able to open the black-boxed object of “*atherosclerosis*,” turn it unstable by adding their competences in new objects to the framing and entering into a knowledge production process that becomes stable in time and space by the enactments of institutionalized social processes of knowledge (J. Law, 2008). Knowledge objects can become “*fluent*” for specialists, while they are stable for non-specialists and black-boxed turning universally relative. Therefore, by the use of punctualized networks in the methodology of mapping, the measured object in TIC is related to a global understanding of knowledge, which allows the context of it to travel, still as an immutable mobile. As the reuse of an explicit and a tacit knowledge object is auto-context

dependent (Augier et al., 2001), in the sense that its original roots influence reuse, then this ostensive feature in the knowledge stock in ICMCS, the knowledge bank, is transferred in the mapping method by the punctualized network, but soon in the active adaption of the knowledge object by the competencies of the owners, it is transformed into heterogeneous situations where development occurs from the original position of the knowledge object (Augier et al., 2001). This ambiguity produces leaks which in the global, scientific, dynamic framing of knowledge may become black boxed, may become too reductive and potentially break the accounting network.

The above is an example to critically discuss limits in circulating references interfaced with the information system demand for 1:1 relations. The disciplinary multiplicity may occur only as temporary overflows in the contexts of a very specialized radical development of knowledge (Briers & Chua, 2001). In a radical activation of knowledge objects by creative competencies at level 5 in the system, a double loop application (C. Argyris, 2004a), knowledge objects are adapted in new settings and relate to contexts other than its original birth location. The practical answer is frequent processes of update, where new specialized knowledge objects are noted in new sub-folders of ICMCS, which are connected and related to their original circulating mobiles.

The practical consequences in the ambiguity of the notions, in the objects and the system's potential, temporary leaks are therefore not considered to be able to outdo the advantages in the management of individual knowledge and competence assets in operations.

The proposed accounting numbers in TIC represent values in IC, just as financial accounting numbers represent the financial capital in non-human actors, metrics and prices, and are displayed in balances, totals, and budgets. The analyses seem to not to decline the view that the design of TIC, in ANT seen as translations of the world into strong IC inscriptions, allows the value representations to act as immutable mobiles (B. Latour, 1986; J. Law & Hassard, 1999) and, as in financially based control systems, the system technology generates the representations of HC/IC values in operations. Value representations are produced when TIC is activated in operations showing which IC values are operated when and to what extent, to operate what and by whom.

Transaction-based performance measurement literature identifies design elements as (1) measurements; and (2) standards (A. Hansen, 2009/2010). Re point one; choices are defined between “one/multi-dimensional measurements,” “individual/collective measurements,” “objective/subjective measurement,” and “absolute/relative measurement”; and re point two; elements like “objective/subjective,” “standard/factual,” and “absolute/relative” are electives as well. These choices define and influence design criteria like “distortion, risk, manipulation, and transaction costs” and outline objective elements of design (ibid.). Measurements and standards are based on the financial paradigm and on events, strategies and calculations. Measurements are often multifunctional, accrued, and fueled by ex post processes in parts of an organization. The N-F figures do not aim to describe the state of a total capital in order to manage values corporately, but rather effectively manage parts of the processes in situ, which are often

considered as HR or KM processes in a theoretically merged transaction cost/psychological view. The theory is situated, but the characteristics defining the measurements appear as general descriptions and are re-used to identify TICs;

The model of ICMCS and TIC aim to produce one-dimensional, absolute, objective values of individual knowledge in standardized processes to account ex ante, in-the-making and ex post for stocks, flows and balances in the corporate capital, and to provide shared performativity across boundaries to optimize the total IC in operations. This describes the ostensive stocks and disclosures. But, as showed, when operations become concrete and developing, overflows happen in multi-functionalism and situatedness. However, the ICA model is neither partial nor situated.

By adding a second rationale of control to operations providing parallel N-F devices as value representations, the invisible underlying values in financial control, named the intangibles, becomes visible and negotiable in a rational, shared way on the basis of the additive N-F control system's outputs for projects, departments or regions. For every organizational process, the prerequisites are profiles of TICs taking individual HC values into operability by offering tools for timely managerial interventions at a distance at the individual level by connecting and adjusting the optimal HC to the task. TIC produces fact-based (not interpretation-based) representations of the underlying resources in IC, HC, that document IC accounts and offers shared foundations for evaluations. Shared planning processes for IC budgets may then represent new planning arenas, which add aspects of pre-vision not taken care of in the FM.

The conception of ICMCS, therefore includes performative outputs to operations of high frequency installing mentally based calculating spaces, processes, and routines (Quattrone & Hopper, 2005). The concept aims to address, bridge, and operate both ostensive and performative perspectives of knowledge by supporting new developments and extending the knowledge bank as an effect of operations, which identify new objects of knowledge. The devices are, therefore, expected to reduce the valuable effects of heterogeneity in operations less than the value of the optimized management of IC. Or, in other words, overflows are not supposed to hamper TIC based operations to a level, where the not yet deployed system was preferable.

9.8 Thesis Conclusion

The design, production and management of TIC and the system, ICMCS is proposed to contain the answer to the RQ: "How can individual knowledge become operable in dispersed, global contexts to support knowledge-based management decisions at a distance?"

The question has been addressed pragmatically in order to provide practical answers and tools for IC management through HC allocations to work in industry. In research, IC has been moved from being firm-centered and disclosure oriented to become a global managerial tool and its predictability may add data based rational decisions to the financially based decisions, which suffers from being unable to handle IC flow constrains. The solutions result in generalizable recommendations for the class of problems, HC allocation in and between companies.

An effect of the unavailable practices of HC allocation is for instance the emergence of bottlenecks in and between companies. Bottlenecks, being contra productive to competitive capacity in firms, regions and countries may be prevented by the management of IC in time. Informed by TICs and value representations in N-F budgets distributed by ICMCS management is recommended to hamper the emergence of bottlenecks by managerial actions identifying the future, detailed lack of knowledge objects, their characteristics in terms of what kind of knowledge, at which levels, which kind of competences, where and to what extent. Depending on the level of analyses and level of intervention the manager(s), public/private, may build adequate organizational support and actions to avoid the bottlenecks informed by the concrete IC capacities and the future demand for IC supply. The conclusion is that TICs as calculative devices are able to make managers calculate between individual knowledge and competences values at a distance, and choose and act on the decision. HC decisions based on TICs may probably coordinate HC - at a distance, too. This is not happening to-day. TIC's value representations in ICMCS document the flows and the stocks in HC showing the dynamic value representations in operations and connecting manager's HC decisions to the ICA result, which is represented in the updated stocks.

However, there are limits to business volatility in the processes of implementing, which impeded this concrete deployment as documented in chapter 9, because the interventional actions were illegitimated by exogenous contextual events. However, it is cautiously argued that more stabilized business contexts may allow for an implementation of ICMCS and the conclusion therefore tend to keep an open window for another implementation before discarding the N-F accounting system.

The endeavour to contribute to the emergence of the 4th wave in IC research is outlined in this subsection's next 10 points comparing the results to the IC review. The 1st wave showed in the IC review (chapters 2.1, 2.2) that HC is viewed as the most important element in IC. The wave does not offer elements for comparable instrumentality, but demonstrates an array of partly, event-driven, mean, backward-looking indicators. Knowledge is hidden in employees and the view is firm-centric. The 2nd wave confirms the theorizing of knowledge as organizational knowledge, but only 1-1.7% of the articles in IC are about governance, accountability and auditing. There is an unwillingness to put knowledge into numbers, but it happens in situated ways. The SECI model claiming to have universal validity in explicating tacit knowledge gets criticized for being time and space dependent and the outcome interpreted. No elements in IC are found to enter into coordinating mechanisms in the still firm-centric view. The notions of ostensive/performative situations are introduced in the field. The 3rd wave doubts the predominantly ostensive views on IC disclosures as helpful and the disclosures are criticized as useless. The results are still not generalizable; the views are kept within the firm, there are no generally accepted definitions of intangible categorizations or valuing standards. There are tendencies moving the focus toward individual knowledge, toward accountancy, and numbers that will make homo economicus act. The biological view conceptualizes individual knowledge as sub units to aggregated organizational knowledge. Quotes argue for causal relations between allocation of individual knowledge and the economic outcome. There are calls for a 4th wave

taking the focus from within the company to include its nearest context, the stakeholders in an ecological view, which is shown below.

The gap effected developments in various dimensions:

Characteristics for the 3 rd wave	Characteristics for the 4 th wave
closed system →	open system
firm-centric view →	generic view (incl. stakeholders)
situated →	objective
co-present →	present at a distance
organizational knowledge →	individual knowledge
knowledge inside individuals →	knowledge and competence objects
disclosures →	flows and stocks, auditable reports of accounting
ostensive view on knowledge as an output	performative view on knowledge as an input ex ante
mean metrics →	individual, absolute metrics

To answer the research question the following

1. In order to be able to take knowledge-constructed and proposed to control and manage individual knowledge and competence viewed as potential global assets in daily operations in logics of accounting. The context contains knowledge owned by stakeholders as well as unconnected individuals in the world. The result proposes two artefacts, the measurement unit, TIC and the N-F accounting system, ICMCS, which through objectification of the immaterial phenomenon knowledge are conceptualized to visualize how requirements, conditions and properties between managerial devices and the context determine coordination and distribution of assets. System outputs ex ante and ex post are represented in metrics of N-F values.

2. The separation and objectification of knowledge and competence is conducted in global contexts and its accountability has been subject to two perspectives; the accounting of knowledge within structured units (firm-centric view) with legal/economic boundaries (situation 1) and accounting of knowledge between the structured units (global view) (situation 2). Added value via liaisons is equally expressed and accounted for in situation 1 and 2, enabling practices of accounting independently of the existence of financial bottom-lines. In the firm centric-view the context of financial bottom-lines and strategic impetus delivers conditions defining “useful” operations and disclosures by giving sense to “the more satisfying match” between supply and demand for HC; HC/IC is framed so that the management of individual IC capacity can happen and allocations over distances may be optimized. ICA reports represent the result of the daily managerial decisions’ impact on movements in the capital and are auditable and may be able to impact financial markets. Thereby decision-making in allocative processes is linked to the financial result gluing control of HC flow and stocks together, tending to make disclosures globally useful.

3. Assets are visualized so that management and self-management globally can rely on the measurement unit, because the TIC’s data is designed to carry the truth. At the same time the

thesis has explained, why existing KM/ HR methods do not. The concept allows for authorized actors to enter and access individually registered HC/IC assets from any location addressing three basic concerns: to identify, display and make operable “who knows what, where.” Valued and visualized objective representations of tacit, explicit and company specific individual knowledge and competence are visualized as accessible system devices, which are operable in web technology enabled networks. Every click in the software represents decision about individual knowledge and competence in operations, which in accrued representations show the flow of the assets and the result of the flows in stocks.

4. The conclusion is based on 4 tests, a technical and a social validation of each of the artefacts; Technically, TICs will act as core components in ICMCS and socially, surveys show that they will connect to human actors becoming calculating selves, who as an effect, in self-interest in order to optimize their own work, will coordinate and distribute individual knowledge and competence across boundaries.

Technically, ICMCS will produce value representations of individual knowledge and competence at different levels of intervention, be globally accessible, be globally searchable and represent existing and future scenarios and budgets for operations as well as accrued accounts in TICs. The software offers allocative functions coordinating and distributing HC noted in the centralized knowledge bank, if managers click and operate the system.

Socially, the ICMCS received the case-based customization and co-development for 18 months before the case was dismissed. That ICMCS works can therefore only be partly proven in this case. Global economic turbulence and other extraordinary business issues in the context may have contributed. It is therefore concluded, that ICMCS still may work in less volatile contexts. In the case, the company project manager feared that the financial KPIs would tell the short-term story about unreached goals, but not the story about increased quality and innovation, speed, captured possibilities, and optimized, knowledge-driven, self-managed teams collaborating across borders, undermining the department’s capacity. The manager developed a multi-identity attitude, and preferred to fight self-managed collaboration by preventing the deployment of Module II —the team module (flow) —because “the organization is not ready for this tool.”

5. Furthermore, the analysis of the longitudinal study documented how obstacles crystallized during the implementation processes prevented the distribution of IC. In spite of respondents’ positive attitude to the deployment of the ICMCS, the project was prematurely closed down through force of circumstance by financially based decisions that transformed investments into costs.

6. The case showed that the financial network acted as a verb by refiguring value representations in its own logic in every process, event, and actor, incisively, in a never-ending reconfiguration of the world, while the ICMCS network did not have the power to do so. In the ANT methodological context, this refusal produced a failed actor, a hidden actor. Therefore, the intersement phase should never be considered a terminated phase but an ongoing parallel

phase during the phases of enrolment and mobilization where identities are actively maintained in relevant frequencies to avoid a broken network (Luciana, 2008).

7. When starting the case decisions with uncalculated risks were taken, such as the one to engage in a project of the development of an N-F management control system. The company was vision-driven, not demand driven, communicated by “The corporate value-chain”. When the case was finish, the value-chain had been reconfigured placing “customers” before “innovation” in the chain.

8. Being a conceptualizing, interventional thesis some assumed implications are to be mentioned in the conclusion: ICA reports like ICMCS are supposed to constitute an additive source of management information to financial reporting about corporate values. It’s outlined predictive value representations are furthermore expected to vary managerial processes of decisions enhancing the organizational level of heterogeneity and diversity without making the processes more complicated.

Financial accounting figures may depend upon context, time, and space, as shown in the case, the metrics are interpretable. This instability adds another reason for the proposal to institute a parallel, N-F, auditable accounting arena (IC) as a potential additive factor of control by the framing of the underlying resources independently of time and space. Moreover, the circulation of globally useful (predictive) disclosures may stabilize economy by extending strategic and tactic planning of HC and reduce risks.

9. Finally, the concept of ICMCS technically able, through forecasts in TICs, to identify the future demand for individual knowledge and competence in operations. Decisions based upon TICs will, therefore, probably qualify future demand for the best IC capacity, describe the demand in figures and thus enable optimized, global quantitative and qualitative operations and the development of IC.

10. Applying the referred ecological system view at the proposals, chosen stakeholders are technologically notable in Module III, by their objectives and supply of individual knowledge and competence. The wired value representation may unite specific stakeholders’ HC to the firm’s bank of knowledge in specific processes of collaboration (tenders, offers etc.) in seamless controlled transactions enhancing the HC stocks. Module III enables action- and reaction-based relations and represents the value of Relational Capital in knowledge and competence-based accounts, which can be directly acted upon.

The generalizability of TIC is based on the modest field-proven global methods of design. The hypotheses represented concise statements about what was expected to happen (Boer et al., 2015). ICMCS, by contrast, remains partly unproven and is referred to further testing. Practice and further research may verify and test whether the management of IC based on TICs and ICMCS offers deciding generalized parameters for productivity, competition, and growth.

It is concluded that the proposed tools for global HC practices of allocation are generalizable and is able to constitute the global framing the underlying resources in economy. The artefacts

may enable provident management of individual knowledge and competence in dispersed settings based on outputs from IC calculations expressed in TICs.

9.9 Contributions to Theory and Practice

The following contributions address theory. Subsequently, propositions to practice are presented next. For more aspects of generalizability, please consult the last paragraph in this chapter, “Limitations and Further Research.”

Contributions are proposed in the theories of IC, Accounting, KM, and OM, operations management.

In *IC Theory* allocation of individual HC at a distance can happen; the proposal is generic methods to construct calculative devices in the capital, which act as global, generic measurement units for individual knowledge and competence in order to visualize values in the assets making them accessible and accounted for in distributed organizational contexts. The measurement unit, TICs, The Intangible Currency, contains embedded generic features to make IC operations ex ante possible in the capital through mechanisms of control, which create visible and controllable flows of HC in the capital. TICs enable value comparisons and benchmarks in HC stocks in the capital across borders to allocate satisfying resources independently of time and space.

This constitutes the proposal of useful IC value representations in recognizable notions of auditable reporting.

In *Accounting*, HC has been framed as an accountable capital represented in flows and stocks. The conceptualization of N-F logics of accountancy is presented in figure-based ICA. The framing enables ICA input and output to be developed and managed as global, objective, comparable and auditable data.

In *Knowledge Management* the IC perspective on KM identified the domain’s situated view and its apply of subjective knowledge. It demonstrated how KM often manages knowledge in mean figures at an organizational level. The artefactual notion of knowledge allows for the separation into two phenomena: knowledge and competence enabling the construction of manageable, context free, objective objects, which are able to travel. Thereby KM in global contexts can become enabled. KM decisions based on ex ante, in-the-making (real time) and ex post qualitative control of individual HC input, and the coordination and distribution of individual knowledge and competence have been made possible in operations through calculative management of TICs.

In *Operations Management* the thesis proposes tools for shared predictability in management and development of HC capacity; Conditions for the creation of precise and earlier planning processes of allocation of remote individual knowledge and competence based on access to and calculative practices in the total corporate IC in and between business units have been created. Management of and through individual knowledge and competence values in dispersed companies like HC planning, control, and evaluation of IC figures across units may be enacted

in TICs, in global supply chains, for example, adding an IC accounting control to the financial systems of control.

Applicability

The study provided some novel potential insight in the black boxes of HR and KM as presented in theories and technologies by identifying, separating, visualizing, and measuring individual knowledge and competence. Further research will probably study effects like planned increased diversity, HC planned innovation, planned avoidance of bottlenecks and organizational flexibility. Data based studies of comparable ICA are possible in future research.

Contributions to Practice

Management of IC becomes predictive tools closely collaborating with financial tools of control and management. IC becomes managerial technologies in operations rather than disclosures.

To also address the requirements for innovation and growth in the Industrial PhD's legislative framing, the contributions are, to some extent, repeated in superordinate goals, as TIC and the proposed ICMCS tool are designed to manage HC in global settings and create growth by enabling systematized distribution and coordination of HC values across boundaries.

TIC

The measurement unit, TIC, allows free agents and combinations of agents (public/private organizations) to supply and demand for HC in emerging markets independently of time and space, and conserves, in the power of distributed individuals, the unconstrained initiative to innovatively combine, access, and collaborate with numberless objects of knowledge and competence, concretized and connected to individuals. This flexibility means for instance fast, decentralized access to open innovation and/or the addition of fast, designed and controlled supply of HC into existing processes. It means awareness of strategic knowledge, competitive HC advantages and the data may influence decisions of recruitment or layoffs.

ICA

The measurement unit, TIC, enables global companies and networks to coordinate and distribute individual knowledge in unknown contexts in open systems in fast and flexible ways, controlling and accounting for the movements in IC.

Traditional and new HRM technologies for recruitment, talent management, retention, etc., may become interfaced and represented in TICs making the output from these technologies controllable.

ICA is proposed as a technology of control to share and manage individual knowledge and competence at a global scale in order to increase effectiveness and efficiency through qualitative HC properties in practices of HC allocation, recruitment, organizational flexibility, innovation, and self-management.

In microeconomics, IC data can be shared on transparency, accessibility, planning, development, collaboration and capacity. In teams real-time BI about movements in the IC¹⁵² are available and they generate the timely management information of processes that are currently unmanaged. Annual reports of ICA supplementing financial annual reports¹⁵³ are automated and can be disclosed to provide “*availability of relevant information to managers and stakeholders ... to provide more useful accounting information*” (Andon et al., 2015).

Global Search Machines

In global search machines, TIC may constitute an “Internet of knowledge” taking remote verification of matches between the demand and supply of knowledge and competence from the existing third party endorsements found for instance in LinkedIn to global, absolute, objective metrics.

Having now finish the sub-section about proposals, contributions and possible practical visions, the chapter is finished by few reflections on the given research format, limitations, and further research.

9.9.1 Limitations and Further Research

The discussion dealt comprehensively with theoretical reflections on overflows, which identified limitations in notions of ostensivity and performativity in the labeled dichotomies. As notions of research, the constructs were helpful to the design processes of accounting by pointing out the need to handle different states of knowledge simultaneously in systems of accounting. When conceptualizing individual knowledge and competence for accounting purposes, both notions were at stake, because knowledge had to be globally recognizable when visualized and to be applicable and developed at the same time. Therefore, knowledge oscillates between the constructs in operations when accounted for. This is interesting, because it allows for measurements of changes in knowledge stocks while at the same time keeping the objects passive and recognizable. This theoretical view has been limited in this thesis by referring to other relevant research supporting the view (merged) and may be submitted to further research in mobilized control system to explore these relationships more fully. Conditions to explore the “space and time of change” (Busco et al., 2007) in IC accounting may, through the deployment of ICMCS, occur in operations, because movements in the capital are then explicated and accounted for.

Further research is interesting in order to measure the effects of potential predictive relations between ICM, competitiveness and growth.

¹⁵² Management of knowledge is expected to make a positive contribution to the financial bottom-line through innumerable ways: It becomes faster and easier to scale up and down, and supply chains can be improved, which are the two major reasons for Apple to outsource 700,000 jobs to Asia and other regions (Charles Duhigg & Keith Bradsher: Apple, America and a Squeezed Middle Class, N.Y. Times 21012012). In macroeconomics, the total outsourcing degree in a country influences policies in many areas of society; that is, unemployment. One of the keys to keep jobs locally could be ICM.

¹⁵³ IIRC, a global coalition of regulators, investors, companies, standards setters, the accounting profession and non-governmental organizations, has actively operated to redesign the landscape of corporate reporting .

Technologies are known to have unintended consequences. In transaction-based performance measurements unintended consequences have been identified through studies of practices deploying these technologies in the management of processes. They take the shape of demotivation or even inappropriate behavior, such as lying, restraining timely information, or exerting bad citizenship and lousy collaboration (A. Hansen, 2009/2010; Neely, 2005). Identical or similar effects may be produced deploying the proposed IC technology, which call for further exploration due to the measurement features and their future operational deployment.

Finally, the conducted research is limited to conceptual and case-based work. It excluded related research, such as psychology-based literature on personal qualities, Science and Technology Studies on management control systems (Zeiss & Groenewegen, 2009), and transaction-based performance management, which is attractive fields—especially when studying processes of allocation—and it opens up vast areas of research on the effects from deployed ICA on management, competition, productivity, and yield.

9.9.2 Reflections on Institutional Framing

Research within an Industrial PhD framing is conducted between contrasting values and objectives; that is, those of the state and the university, as well as the pragmatic operations of the GCC.

The work mirrors as shown in Figure 49 below the paradigmatic suspense between these poles:

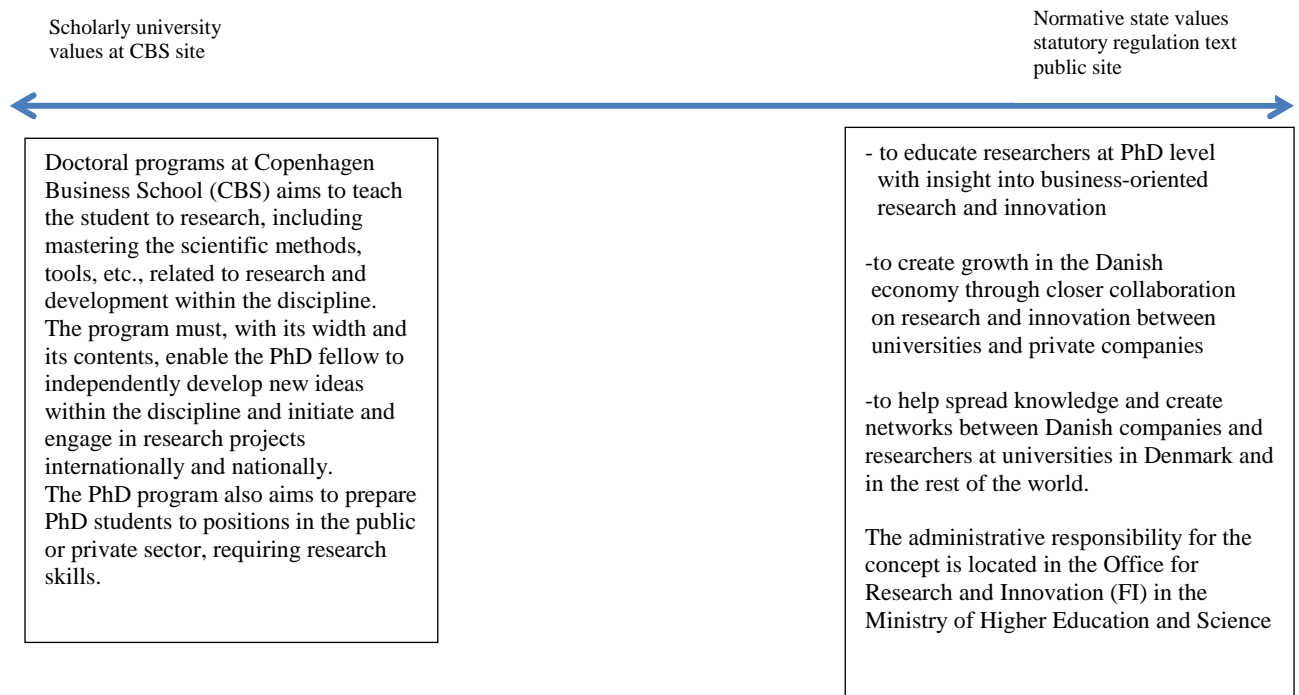


Figure 49 Values, by author

The missions differ, which becomes visible in the various phrasings in Figure 49. In article 2 in the CBS’ program text: § 2 “The PhD program is implemented mainly by the pursuit of research under the guidance” and the Ministry of Higher Education and Science’s statutory regulation text says: “As a starting point, the Industrial PhD candidate allocates her time equally between

the company and the university.” Methodological contradictions are called forth to visualize differences in values. In the figure, to the right the “knowledgeable” with whom most time is spent is the GCC (50%), and to the left it is mainly the university’s guidance through teaching and supervisor guidance.

The public framing of research in an Industrial PhD also includes a research objective of how to “create growth in Denmark.”

In this thesis, the growth objective is an underlying aim that is indirectly addressed by the research question and approached by the development of the generic IC control system. This inclination to interventional at the expense of the theory confirming thesis seems supported in the below quote;

“The researcher’s preunderstanding, including his or her academic framework(s), may be used as a tool that opens up a dialogue with the empirical material ... We do not just encounter empirical material and see where it leads us. Rather, we are always doing something with it—framing and constructing it.” (M. Alvesson & Kärreman, 2007, p. 1269)

Contradictory paradigms influence the scholar when arguing for deductive choices and framing data, as explicated by Alvesson (M. Alvesson & Sandberg, 2011). When engaged in this critical research, the research question is suspended between two poles: (1) rooted in a concern for optimizing resources in companies and contributing to a “how-out there”; and (2) the scholarly passion to know “why.” This bipolar stance has entailed a broad scope of three focus areas: global concepts for the visualization and valuing of individual knowledge and competence, control through an accounting concept for distributed value representations of IC in global contexts, and exposure of the concepts in interventional cases in the GCC. Having produced the mentioned limitations, the data also delivers potential new areas of testing and research.

9.9.3 Generalizability

Proposing solutions to a class of problems when using DSR implies certain attitudes to generalizability, because “The researcher must disregard particular details of the company and define general requirements—design propositions—for a given class of problems”. (Dresch et al., 2015, p. 81). Having operated this way, ”This generalization will enable the creation of knowledge in a particular situation to be subsequently applied to similar situations experienced by various organizations” (van Aken 2004, 2005; van Aken et al. 2012, p. 80). It is argued that “underlying resources” viewed as assets can be visualized and valued in TICs and distributed by ICMCS globally and that the solutions being independent of time and place are generalizable.

However, other aspects of limitations are the generalizability of the case-based results, because analyses viewed the outcome from the applied DSR theory as having properties of “relative universality” (B. Latour, 1999) embedded in TIC. The circulating reference’s “relative universality” indicates the reductions of generalizability in the notion of “universality,” so further research may explore whether this “relativity” harms the “universality” by following the

mobilized TICs in case-based explorations of TIC. This was discussed for the TIC element, knowledge, previously¹⁵⁴.

The conception of TIC thus represents a “relative universal” result. The “circulating reference” translates parts of nature, which will, for a moment of time, still exist after the processes of design have ended (A. Hansen, 2011)—in an ostensive expression. This nature is then “real,” but detached from time and space. Therefore, it can be argued that TIC and its model of control are generalizable results in the way that they are applicable to the accounting of knowledge and competence independently of time and space.

Whether the qualitative case-based results are generalizable is less obvious, and it represents interesting limits in the testing of the concepts, because the qualitative method incorporates context-dependent elements. These, as “share value,” “financial representations,” and management’s attitude to “self-management” are time- and space-dependent elements influencing the method and the results. Competing agendas are not uncommon and can be found in most development and deployment processes, but the results are not reproducible, because different contexts, distances and frequencies are involved. These limits represent exploratory opportunities, which may inform further research to verify the performativity of the results and test the financial effects of knowledge accounting.

Finally, the quantitative case-based results are generalizable as a first modest test of a new theory, including no time- and space-dependent elements, as above. They show that TIC may act as an immutable mobile and keep (remote) networks together although knowledge itself and the system are performative. This means that the generalizing phrases used in the proposals/contributions are justified, and that the abducted results from the qualitative case results may make sense in further case-based research.

9.9 4 Further Research

The features of expected applicability mentioned above add to examples for future research. Nuances of that seem expressed in the quote below:

“The literature concerned with countability suggests that the properties of accounting are characterized as numbers (and financial numbers at that). The focus of this research is to find perpetual properties of accounting. When these properties are in place – accounting is in place.”
(merged, p. 1016)

Having left the situated notion of knowledge behind and proposed an objectification of individual knowledge and competence, perpetual, but dynamic properties for global IC measurement units may be approached – not in financial numbers, but in N-F metrics. When the account is present and accepted, it may be the starting point for demanding and giving managerial answers. The familiar neighborhood to performance management and other management control systems and their potential relations to ICA pose tempting opportunities for further research, when the effects of ICMCS on competitiveness and growth are thoroughly documented.

¹⁵⁴ Chapter 8.4: Critical, Reflective Comments.

Firstly, however, the articulated need for an empirically based evidence of managerial effects of the management of and through individual knowledge and competence by the deployment of an ICMCS is present. Future case-based research may focus on the anticipated effects in growth and risk avoidance: (1) diminished search time for knowledge; (2) faster inclusion and faster use of new knowledge; (3) reduced losses and failures; (4) more employee satisfaction; (5) reduced cost of earning/courses/development; (6) shorter time-to-market; (7) increased success in digital/external collaboration (reduced time to function, fewer conflicts, faster transactions of establishment, optimized allocation of resources); (8) higher and faster hit rate in recruitment; (9) more organizational flexibility; (10) more innovation; (11) increased diversity; (12) reduced travel costs; and (13) a higher speed of operations in a fully implemented ICMCS. The general explorations in this future research will look at TICs impact on higher quality in corporate outputs and the relations between transaction speed, optimized allocation of resources and innovation and for enhanced competitive power through the management of IC. The financial impact of these knowledge-based processes of IC management may become studied to document whether the accounting paradigm of N-F value representations add more financial value than management based exclusively on the economic paradigm.

9.9.5 Final Remark

The thesis may reduce the superfluity of labels in IC literature that impede decisions' usefulness in accounting and add to the forth wave in IC literature by proposing accounting tools for the capital and making them available for practice. With the objective to enable dynamic management of individual knowledge and competence over distances and to inform stakeholders in useful, auditable accounts, the hope is to bring IC to play in firms, networks, and financial markets and, thereby, create increased competitive power and growth.

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Annex

A1 Definitions of Knowledge

Epistemological view	Analytical focus
<p>Definitions of knowledge</p> <p>A Artefact oriented perspective</p>	<p>1. How is knowledge created and defined? 2. In which forms are knowledge to be found? 3. Where?</p> <p>Ad 1. An objective object which individuals can acquire and use everywhere and every time – detached from time and space</p> <p>Ad 2. Mature & immature knowledge (R. Bohn, 1994)</p> <p>Ad 3. In frozen, solid form embedded in materiality and liquid & airy forms in human beings (Polanyi, 1974 (1962))</p>
<p>B Process oriented perspective</p>	<p>1. Knowledge is created in social relations, context dependent and mixed with competence (Konno & Nonaka, 1998; I. Nonaka & Takeuchi, 1997)</p> <p>2. Related to companies, situations, processes, linked to time and space</p> <p>3. Knowledge is personal</p>
Perspective	Analytical focus
<p>Organizational perspectives in knowledge definition A</p> <p>Knowledge definition B</p>	<p>The organization is seen as a coordinating mechanism for distribution (1), development (2) and application (3) of knowledge</p> <p>Do organizations see knowledge as a prerequisite for work?</p> <p>How does organization define boundaries for knowledge (4) and how are they produced (5)?</p> <p>The organization is seen as a coordinating mechanism for distribution (1), development (2) and application (3) of knowledge</p> <p>Do organizations see Knowledge as a prerequisite for work?</p> <p>How does organization define boundaries for knowledge (4) and how are they produced (5)?</p>
<p>Strategic perspective</p> <p>Knowledge definition A</p>	<p>1. Heterogeneous resources and capabilities are identified</p>

Knowledge definition B	<p>2. Resources hard to copy are identified</p> <p>3. Creation of low mobility in staff with company specific capacity</p> <p>4. Knowledge is identified earlier than in competitive companies</p>
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Figure 50 Definitions of Knowledge, Source (Christensen, 2000, p. 53) & (P. N. Bukh et al., 2003) –merged & further developed by author

A1.1 Review of Coordinating Mechanisms in IC literature

Concept-centric IC Literature Review			
The state of art of “coordinating mechanisms”			
	Literary Quotes	Implications for the research context	Possible Implications for the elements of design
<p>1. Level of analyses: Organizational knowledge <> Individual knowledge</p> <p>2. Coordinating devices</p> <p>3. Company specific context <> unstructured context</p> <p>4. Control of relations between managerial KM decisions and disclosures</p>			
1. Wave			
“Striving to communicate the importance of IC for adding value to companies”			
Examples	<p>(Petty & Guthrie, 2000, p. 158)</p> <p><i>.. which describes intellectual capital as `the economic value of two categories of intangible assets</i></p>	<p>Objectification happens at an unspecified level as a “capital”, and Human Capital is viewed as the most important element in the</p>	<p>As managerial element organizational Human Capital does not offer elements for comparable instrumentality addressing the</p>

	<p><i>of a company:</i></p> <p>(1) <i>organizational (“structural”) capital; and</i></p> <p>(2) <i>human capital. (OECD, 1999)</i></p> <p><i>Knowledge management, as a function, describes the act of managing the object, intellectual capital (Petty and Guthrie, 2000; Guthrie and Petty, 1999, p. 159)</i></p> <p><i>In the various categories of intellectual capital, “human capital is regarded as the most valuable asset” (Bachhuijs et al., 1999; Johanson et al., 1999b; Miller et al., 1999)(Brennan & Connell, 2000, p. 213)</i></p> <p><i>Numerous intellectual capital indicators were identified (Guthrie et al., 1999; Brennan et al., 1999; Miller et al., 1999), as also almost all of the research teams promulgated different theories of intellectual capital and evaluated organizations against it. (p. 165) The plethora of theories, models, and methods advanced for understanding and measuring IC suggests that there is no generally accepted theoretical model for understanding IC.(Petty & Guthrie, 2000, p. 159)</i></p> <p>(K. Kreiner & Mouritsen, 2003):</p> <p><i>“... knowledge, to become a manageable resource, it must be made controllable and intentionally useable ...”p.3</i></p> <p><i>“... it is a problem in this connection that knowledge is</i></p>	<p>capital</p> <p>The perspective is organizational, not individual knowledge</p> <p>Knowledge and competence is mixed notions</p> <p>Controls are partly, event driven, repetitive</p> <p>Indicators may intend to coordinate work, but having no shared standards, the effects stay local</p> <p>Knowledge seen as an intentional input that needs control</p> <p>Socrates’ context is co-present and knowledge is identic to the owner, shoemakers make shoes and knowledge is</p>	<p>management of individuals</p> <p>The objectification of knowledge require its separation from individuals and its transfer into generically comparable digits</p> <p>Knowledge and competence has to be disentangled</p> <p>Employees are mediators of knowledge and contexts</p> <p>Indicators are backward looking, partial documentation. They are situated, chosen, interpreted, incomparable and not auditable</p> <p>Measuring standards in the IC paradigm are non- existent and called for</p> <p>The 1st wave did not develop coordinating mechanisms, but reflected on requirements for management of IC suggesting “controllability and</p>
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	<i>elusive and abstract...(extract by author). Socrates pointed out that knowledge may only be spoken about in terms of its effects”p.3</i>	recognized as an effect	usability” as possible design objectives																								
2. Wave																											
Added consolidation to the IC domain as a legitimate research field by gathering evidence for its further development																											
<p>1. Level of analyses: Organizational knowledge>> Individual knowledge</p> <p>2. coordinating devices</p> <p>3. Company specific context>> unstructured context</p> <p>4. Control of relations between managerial KM decisions and disclosures</p>	Literary Quotes	Implications for the research context	Possible Implications for the elements of design																								
Examples	<table border="1"> <thead> <tr> <th>Focus of ICA literature</th> <th>Total</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>D1. External</td> <td>132</td> <td>31.2%</td> </tr> <tr> <td>D2. Auditing</td> <td>1</td> <td>0.2%</td> </tr> <tr> <td>D3.</td> <td>7</td> <td>1.7%</td> </tr> <tr> <td>D4.</td> <td>160</td> <td>37.8%</td> </tr> <tr> <td>D5.</td> <td>77</td> <td>18.2%</td> </tr> <tr> <td>D6. Other (conclusion)</td> <td>46</td> <td>10.9%</td> </tr> <tr> <td>Grand total</td> <td>423</td> <td>100%</td> </tr> </tbody> </table> <p>(Guthrie et al., 2012, p. 75)</p> <p><i>“... Intellectual capital (elements, red) are weak and fragile. They do not have immutable referents</i></p>	Focus of ICA literature	Total	%	D1. External	132	31.2%	D2. Auditing	1	0.2%	D3.	7	1.7%	D4.	160	37.8%	D5.	77	18.2%	D6. Other (conclusion)	46	10.9%	Grand total	423	100%	<p>Only 1% of the examined papers of research is about auditing, 1.7% is about accountability and governance</p> <p>In the 2nd wave “management control/strategy” (160 papers) and “external reporting, ICD, (132</p>	<p>The IC literature in the second wave consolidated the field but did not offer many elements of design for management of the capital as input of HC in daily operations</p>
Focus of ICA literature	Total	%																									
D1. External	132	31.2%																									
D2. Auditing	1	0.2%																									
D3.	7	1.7%																									
D4.	160	37.8%																									
D5.	77	18.2%																									
D6. Other (conclusion)	46	10.9%																									
Grand total	423	100%																									

	<p>...” (p. 831)</p> <p>“... but there is a problem about external validity. Quantification cannot hold all things together as claimed by IC1, but quantification can be its own realm of activity, as IC2 says, which means that the rules for classifying variables and transactions are loosely coupled with efforts to develop the narrative of achievement.</p> <p>IC1 and IC2 are both occupied with creating financial value, but the path to financial value is conceptualized differently. For IC1 this path is a short-cut that finds the past and makes it the future, while for IC2 the concern is to deal with the flux that complex markets or situations create. This is an inherently ambiguous or uncertain endeavor, because it always attends to the new ways and new potentialities of knowledge and capability that have to be mobilized anew to such flux.”</p> <p>(J. Mouritsen, 2006, p. 834)</p> <p>“Measurement of intellectual capital is doomed because it is not possible to copy its properties in a number. (extract by author)</p> <p>This discomfoting conclusion¹⁵⁵ does not mean that measurement lack relevance and importance though, because localized personal knowledge is never able to be more than sentiments and does not create a strong account in a collective setting. Measurements, however, do.”</p> <p>(J. Mouritsen, 2009, p.161)</p>	<p>papers) attract research power</p> <p>Seminal papers struggle with what knowledge is and does.</p> <p>Knowledge is mainly theorized as organizational knowledge in IC.</p> <p>JM introduces the distinctions IC1 and IC2 in IC research as ostensive/performative views</p> <p>It invites to associate IC1 with properties of stocks and IC2 with properties of flows</p> <p>JM applies the subjective knowledge ontology at the individual level</p> <p>Reflections seem linked the conceptualization of “organizational knowledge”, the notion of subjective knowledge, the mixture</p>	<p>Individual knowledge is manageable in direct supervision, not organizational knowledge, because managers manage individuals in parts of organizations, not organizations</p>
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3 The quote is further discussed in 2.2

	<p><i>“Making sense of intellectual capital, designing a method for the valuation of intangibles”</i></p> <p>(Andriessen, 2004b)</p> <p>:<i>“Glocalizing Nonaka’s knowledge creation model: Issues and challenges”</i></p> <p><i>“Although Nonaka and colleagues seek to establish universal validity of their knowledge theories, it appears that the ability of Japanese firms on Japanese soil to mobilize all members to participate in the SECI processes can be explained by the subtle influences of Japanese cultural values. But turning the universal SECI processes into local use would hinge upon how the local actors could simultaneously apply the universal elements of the conceptual framework while addressing the contextual variations during the process of local knowledge translation.... It is necessary to adopt a knowledge translation perspective”</i></p> <p>(Czarniawska and Sevón, 1996)</p> <p>(Hong, 2012) p201</p> <p><i>“Nonaka and his colleagues have redefined knowledge to mean ‘justified belief’. This is more than simply a contraction of the traditional (western) epistemological definition of knowledge, since it refers specifically to managers’ beliefs, justified with respect to prior strategic decisions and to</i></p>	<p>of knowledge and competence and an unwillingness toward putting IC into numbers</p> <p>Andriessen analyses the various ways to measure IC and shows the ways to establish measurements which cannot be audited</p> <p>Hong explain time and space dependent elements as prohibitive to the universal validity of Nonaka’s knowledge theories</p> <p>The knowledge ontology in the processes is inconsistent to the concept:</p> <p>The SECI process is argued to have universal validity, but is shown to be time and space dependent due to underlying cultural patterns of (re)cognition, but the notion of knowledge remains situated. Tacit knowledge is not shared at a distance.</p>	<p>Another ontological understanding of knowledge may be helpful</p> <p>Applying an artefact based knowledge ontology, knowledge changes from being a sentiment to become a fact. Knowledge separated from individuals allows for an approach that makes knowledge translatable into objective objects</p> <p>By avoiding the properties of IC measurements described by Andriessen an array of elements of design emerges</p> <p>Hong seems to underline and confirm independent elements of design of knowledge objects as relevant in unstructured contexts</p> <p>Objective objects of</p>
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	<p><i>forecasts”</i></p> <p>(Gourlay, 2006, p. 1430)</p>	<p>Gourlay points out differences : The subjective interpreted features in the notion of knowledge leaving out the word “true” from the definition provides knowledge with an exemption from being passed through institutionalized, global processes of peer reviewed and globalized actions</p>	<p>knowledge are in findings and proposals in global scientific processes acknowledged or rejected as “justified, true beliefs”- generalizable or not.</p> <p>No elements are found to be coordinating mechanisms, because value representations are subjective, estimated, interpreted, and partial.</p>
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3. Wave

Strengthened IC practices inside organizations by case based studies of IC practices in operations

	Literary Quotes	Implications for the research context	Possible Implications for the elements of design
<p>1. Level of analyses: Organizational knowledge>< Individual knowledge</p> <p>2. coordinating devices</p> <p>3. Company specific</p>			

<p>context>< unstructured context</p> <p>4. Control of relations between managerial KM decisions and disclosures</p>			
<p>Examples:</p>	<p><i>This paper argues that there is an increasing performative research agenda however (...) researchers' approach to ICR remains stuck in an ostensive approach (see Mouritsen) that characterizes second stage ICR (see Petty and Guthrie). (...) Dumay and Rooney (2011, p. 334) conclude "it is possible to effectively implement IC practices without necessarily needing concrete IC measures.</i></p> <p><i>Thus, an "account" of IC practices can be delivered rather than IC measures. It is practice that helps researchers and practitioners to internalize what works (and what does not) inside a specific organization .</i></p> <p>(Dumay & Chiucchi, 2013)</p> <p><i>"IC Research review approaches in management studies in the last 10–15 years deal directly or indirectly with intangibles, such as:</i></p> <ul style="list-style-type: none"> <i>•Leadership and Human Resource Management.</i> <i>•Knowledge Management.</i> <i>•Resource-based view of the firm (competencies, skills, capabilities).</i> <i>•Quality management.</i> 	<p>Dumay dismisses the predominantly ostensive perspective in IC research calling for local practices.</p> <p>Consequently he limits IC research to be conducted within companies and stays self-referencing, downplaying the aspect of disclosures to be useful to financial communities.</p> <p>"An account" is not "accounting".</p> <p>This IC review contains no future directions, only states that theoretical progress have been slow and few</p>	<p>The studied mechanisms or coordination are time and space dependent, because research in the 3rd wave predominantly is found to be company-centric.</p> <p>HC between firms is individually owned by potential contributors, in for instance processes of Open Innovation, which when identified and allocated may be part of the firms IC</p> <p>The market and market characteristics/properties for immaterial resources seems unfamiliar elements to the IC research</p> <p>The accounts are made in ordered, strategized contexts – ungeneralizable, but internalized in new processes of awareness toward the invisible IC</p>

	<ul style="list-style-type: none"> •<i>Management of Innovation (R&D, patents).</i> •<i>Transfer pricing of knowledge-related services and assets.</i> •<i>Networks and alliances.</i> •<i>Brand and customer value.</i> •<i>Corporate reputation and image.</i> •<i>Corporate Social Responsibility and Sustainability</i> <p><i>Progress on definitions and accepted language has been slow, if any. Yet, no generally accepted definitions of intangibles categorization can be said to exist”</i></p> <p>(Zambon, 2016) Journal of Intellectual Capital, Vol. 17 Iss: 1, p. 5</p> <p><i>“The concept of Intellectual Capital elements in this paper has concentrated on the stock of intangible assets that give value to the elements. However, the flow and interactions of these assets are probably more important in the creation of real wealth for the firm.”</i></p> <p>(Johnson, 1999, p. 572)</p>	<p>“No generally accepted definitions of intangibles categorization can be said to exist”</p> <p>Intellectual Capital is defined as the collection of elements of intangible assets that consist of or utilize human intellect and innovative competences to create wealth. In 1999 Johnson insists on relations between the management of IC and the market value of firms considering</p>	<p>Identifying indicators of stocks for the capitals and exemplifying these by concrete references to software technology. Johnson presents a model for the flow of IC assigning agency to leadership and culture, but without breaking down the capitals into elements. These are still black boxed.</p> <p>Stocks and flows are represented by financial and non-financial indicators, inspired by BSc (Kaplan & Norton,</p>
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	<p><i>“Knowhow enriched INFORMATION is the revenue of the knowhow company.</i></p> <p><i>KNOWHOW on the invisible balance-sheet is the same as fixed assets on the traditional balance-sheet.</i></p> <p><i>EDUCATION is for human beings, what maintenance is for machines.</i></p> <p><i>RECRUITMENT is the counterpart of investment</i></p> <p><i>and most important of all, TIME is the rawknowhow of the company.</i></p> <p><i>The HUMAN BEING is the knowhow machine.”</i></p> <p>(Sveiby & Lloyd, 1987)p1</p>	<p>intangible assets for vital in the construction of Human Capital (“The generator of all nascent value ...defined as the force behind the human intellect and innovation of the firm”), Relational Capital and Structural Capital</p> <p>K. Sveiby makes up with the financial paradigm in 1986, where he in Swedish reflect over the complexity and difficulties to value knowledge (Knowhow)</p> <p>(Sveiby, 1986)</p> <p>The redefining of IC and the development of models to manage IC and indicators to predict developments are issues of interest which</p>	<p>1996)</p> <p>The stock and flow causality is explored and reflected on pointing out many useful problems in the operationalization of the capital</p>
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	Human Resources	Intellectual Assets
Definition	Knowledge and know-how that can be converted to value	Specific knowledge to which ownership can be asserted
Examples	<ul style="list-style-type: none"> ◆ Experience ◆ General Know-how ◆ Skills ◆ Creativity 	<ul style="list-style-type: none"> ◆ Technologies ◆ Inventions ◆ Processes ◆ Data ◆ Publications ◆ Computer Programs
Repository	◆ People and organizational routines & procedures	◆ Tangible Form (e.g. documents, CD ROM, etc.)
Protection Methods	<ul style="list-style-type: none"> ◆ Umbrella agreements between employer and employee ◆ Contracts 	<ul style="list-style-type: none"> ◆ Patents ◆ Copyrights ◆ Trade secret laws ◆ Semiconductor masks

Figure 2 Two Components of Intellectual Capital

(Edvinsson & Sullivan, 1996, p. 359)

“The legitimacy the IC discourse may gain does not come from its short history. Rather, it comes from the credibility of accounting. However, the fixation about a true and fair view seems to be the other side of the coin. In addition, most efforts to theorize on the role of indicators rest on the adage ‘what gets measured gets managed.’

The rationale is that numbers will make homo economicus act.”(Catasús & Gröjer, 2006, p. 199)

“..the inherent difficulties of understanding the interdependencies of intellectual capital across different levels of

situated and within firms

The accounting perspective seems supported although it is problematized how credibility, true and fair views are established

“The rationale is that numbers will make

	<p><i>an organization can be traced to a lack of understanding of the differences between synergetic effects, causal relationships and emergent properties... “p. 6</i></p> <p><i>” it can be argued that the organization of individual knowledge results in an emergence of collective intellectual capital which is different from the sum of individual knowledge.(.)..p.24</i></p> <p><i>“At the individual level, we have a multitude of individuals, each with his/her own individual knowledge, who may interact with each other and collaborate. In this context, collaboration is understood as the tendency to work together in groups. It is thus the collaboration of skills that constitutes the mechanism in the process transforming individual knowledge to higher level emergent properties. The collaborative communication involving the exchange of work-related information and ideas is part of the mechanism transforming individual knowledge into an integral part of the organizational knowledge base.”p. 19</i></p> <p>(Nielsen & Dane-Nielsen, 2010, p. 6-19)</p>	<p>homo economicus act.”</p> <p>(Catasús & Gröjer, 2006)</p> <p>The biological view conceptualizes individual knowledge as subunits to aggregated levels as organizational knowledge.</p> <p>The paper applies the biological perspective of emergent properties.</p> <p>The quotes allow for the thought of causal effects between decisions of input of individual knowledge to operations and the output by describing relations between flow and stock</p>	<p>The findings and the arguments for emerging properties in the capital support the conceptualization of measurements for individual knowledge and competence and for causal relations between value representation of stocks and flows and for causal relations between allocation of individual knowledge and competence in operations and the economic outcome.</p> <p><i>The forth wave will tend to take the research from “within” companies including the “between companies “ by bringing the unstructured context into the research</i></p>
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			<p>requiring other elements of design, not only to surpass the limits of the hitherto conducted research, but also to stay with the principles of financial accounting - in order to keep the outcome form management of the capital auditable and thereby useful to the financial paradigm</p> <p>The rationale is that numbers will make homo economicus act by non-financial means</p>
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Figure 51 IC Literature Review of Coordinating Mechanisms in IC literature

A1.2 Logically Possible Organization Theories of Coordination and Distribution applied to Individual Knowledge in and between Companies

Logically Possible Organization Theories of Coordination and Distribution applied to Individual Knowledge in and between Companies			
1			
Identification of possible elements of design in the theorizing of organizational mechanisms of coordination			
Possible elements conditioning IC operability in dispersed contexts - coordination - distribution	Literature	IC Context 2 Global context Knowledge between the	IC Context 1 Organizational context Knowledge in entities with

		structured entities (with legal/ economic boundaries)	legal/ economic boundaries
<p>Mechanisms of coordination conditioning design elements:</p> <p>1 Direct supervision,</p> <p>2 Standardization of work processes</p> <p>3 Standardized outputs.</p> <p>4 Standardization of knowledge related to jobs</p> <p>5 Individual communication</p> <p>6 Job specialization, policy manuals, job descriptions, indoctrination standardizing skills Unit sizes, the span of control</p> <p>7 Planning and control systems constitute the design elements required to generate output, often as forward looking (budgets) or backward</p>	<p><i>“The liaison devices are the means by which the organization encourages mutual adjustment across units ...these can be placed along a rough continuum of increasing elaboration and formality, from liaison positions and then task forces and standing committees ...across units, ..structures which sacrifice the classical principle of unity of command in favor of the joint responsibility of two or more managers or units over the making of certain decisions.”</i></p> <p>(Mintzberg, 1980, p. 326)</p>	<p>Ad 1-4</p> <p>mechanisms 1-4 are not helpful, because co-presence, proximity and strategic apex condition the elements. This context is unstructured and between firms</p> <p>Ad 5</p> <p>Individual communication in order to coordinate and distribute knowledge makes sense when the outcome is comparable conditioning shared non-financial elements for comparisons across boundaries of supply and demand</p> <p>The format of the unit of communication about knowledge has to be identical</p> <p>Ad6</p> <p>Are elements relevant in context 1, not here</p> <p>Ad7</p> <p>Applies in the context when digital formats able to visualize and value individual knowledge in and between firms are</p>	<p>Ad1</p> <p>For direct supervision to happen remotely in dispersed firms, comparable outputs from processes applying, matching, developing and using individual knowledge has to be accessible at a distance-distributed</p> <p>Ad2</p> <p>Standardization of work expressed in non-financial terms</p> <p>Ad3</p> <p>Outputs in non-financial terms</p> <p>Ad4</p> <p>The notion of” jobs” as a coordinating factor restrains coordination and distribution of individual knowledge. Agility and innovation is hampered. (Breu, Hemingway, Strathern, & Bridger, 2002; Mao, Liu, & Zhang, 2014)</p> <p>Ad5</p> <p>As in context 2</p>

looking accounts		identical and accessible	Ad6 Devices state explicitly the values required for the elements in classifications Ad7 Applies in the context when digital formats able to visualize and value individual knowledge in and between firms are accessible in accounting systems transferred to web technology enabling distribution between units
2 Possible design elements in mechanisms of distribution in materiality conditioning IC operability in dispersed contexts			
Possible elements conditioning IC operability in dispersed contexts - coordination - distribution	Literature	IC Context 2 Global context Knowledge between the structured entities	IC Context 1 Organizational context Knowledge in entities with legal/ economic boundaries
1 The situated view of companies/ of knowledge 2 Liaison devices (such as integrating managers, teams, task forces). Elements of design	<i>“Due to its social origins, knowledge moves differently within communities than it does between them. Within communities, knowledge is continuously embedded in practice and thus circulates easily. Members of a community implicitly share a sense of what practice is and what the standards for</i>	Ad1 Context 2 induces an open system approach including knowledge variables outside the firm affecting the structure (J. S. Brown & Duguid, 1998; Donaldson, 1997) The situated view of knowledge is inapplicable	Ad1 Context 1 is company-centered and the theoretical view inapplicable Ad2 Devices connecting contexts work in both

<p>transferring individual knowledge from HC to Structural Capital connecting business entities and contexts</p> <p>3 Representation of knowledge</p> <p>-organizational/individual</p> <p>-explicit/tacit</p> <p>-subjective/ objective</p> <p>-general/ specific</p> <p>-absolute/ relative</p>	<p><i>judgment are, and this supports the spread of knowledge. Without this sharing, the community disintegrates. Between communities, however, where by definition practice is no longer shared, the know-how, know-what, and warrants embedded in practice must separate out for knowledge to circulate. These divisions become prominent and problematic. Different communities of practice have different standards, different ideas of what is significant, different priorities, and different evaluating criteria. What looks like a best practice in California may not turn out to be the best practice in Singapore (as HP found out)". (J. S. Brown & Duguid, 1998, pp. 100-101)</i></p> <p><i>"...more fruitful approach for organization studies is through pursuing the positivist approach. In this approach, relationships are sought between a few macroscopic variables, such as organizational diversification and structure. Action-level variables are added only where the macroscopic variables provide a less than complete explanation of each other. If further action-level accounts are felt to be needed then they can</i></p>	<p>in this context</p> <p>Ad2</p> <p>Mechanisms conditioning elements of transfer of HC/IC to technology for liaisons between entities to happen have global spans.</p> <p>Accounts of knowledge ex ante for the liaisons to be exchangeable between context 1 and 2 are ostensive without the existence of shared practices, communities, know how.</p> <p>Ad3</p> <p>-Liaisons are individuals or groups of individuals determining the individual level</p> <p>-Both explicit and tacit knowledge resides in individuals</p> <p>- The subjective view (Nonaka et al., 2008) prevent knowledge from being recognized in unstructured contexts at a distance (Augier et al., 2001)</p> <p>- The objective view reuses knowledge in times and spaces (R. Bohn, 1994)</p> <p>- Both general and specific knowledge circulate globally (Harvard Business Review Press, 2011; Kao, 2009)</p>	<p>contexts. Visualized knowledge devices flow from one context to the other denominating ex ante /ex post the knowledge exchange</p> <p>Ad3</p> <p>The representation of knowledge designed for context 2 is applicable in context 1, because context 1 is part quantity of context 2.</p>
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	<p><i>proceed by explaining the actions that underlie the macroscopic regularities”</i></p> <p>(Donaldson, 1997, p. 78, p. 90)</p>	<p>- Relative expressions for representation of knowledge are as a principle of design impossible in context 2 having no comparative entities, but the absolute form understood as having no variables is viewed as a possible element of design</p>	
<p>4 The semi permeable boundaries between context 1 and 2 through liaisons condition the design elements of valuation of devices to calculate and compare</p>	<p><i>“The device is viewed as a “boundary object” containing properties able to travel unchanged, thereby transporting the truth through different contexts”</i> (Star & Griesemer, 1989, p. 411)</p>	<p>Ad4</p> <p>For mechanisms of liaisons designed as IC devices to add value in operations they must transcend the boundaries between context 1 and 2 with properties as boundary objects</p>	
	<p><i>“We can define the criterion of value in monetary terms, in which case the method to determine value is a financial valuation method.</i></p>	<p>Ad 5</p> <p>The measurement method produces value representation including no criterion for values, only metrical scales that relate to observable phenomena</p>	
<p>5 Value representation as measurements of individual knowledge</p>	<p><i>- We can use a non-monetary criterion and translate it into observable phenomena, in which case the method is a value measurement method.</i></p>	<p>Ad 6</p> <p>The unstructured context has no business model but offers spaces for supply and demand for individual knowledge which in the socio/technical interface with companies inform about individual knowledge</p>	<p>Ad 6</p> <p>Elements conditioning calculative devices representing the nature and value of individual knowledge at a distance bring more added value to decision making in operations than the effort to operate it represents. These elements are inspired by the IC guidelines in IFRS</p>
<p>6 Calculative devices/ calculating selves/</p>	<p><i>- If the criterion cannot be translated into observable phenomena but instead depends on personal judgment by the evaluator, then the method is a value assessment method.</i></p> <p><i>- If the framework does not include a criterion for value but does involve a metrical</i></p>	<p>in devices able to enter contexts 1 as calculative devices in systems of control</p> <p>Design elements therefore are conditioned by no 5 as well as technological formats</p>	<p>and theoretical findings, see below</p>

	<p><i>scale that relates to an observable phenomenon, then the method is a measurement method (... p. 238)</i></p> <p><i>Existing methods vary with respect to their approach. The language used is often not very consistent. This article shows that a distinction can be made between financial valuation methods, value measurement methods, value assessment methods and measurement methods. (Andriessen, 2004a, p. 240)</i></p>		
<p>3 Possible design elements in mechanisms of accounting logics conditioning design of objective IC objects as calculating devices</p>			
<p>Possible elements conditioning IC operability in dispersed contexts</p> <ul style="list-style-type: none"> - coordination - distribution 	Literature	<p>IC Context 2</p> <p>Global context</p> <p>Knowledge between the structured entities</p>	<p>IC Context 1</p> <p>Organizational context</p> <p>Knowledge in entities with legal/ economic boundaries</p>
<p>Control systems make part of the coordinating mechanisms in operations</p> <p>Auditability conditions design elements in logics of accounting</p> <p>Accounting employ ostensive and performative</p>	<p><i>“The calculative practices of accounting thus help to create the calculating self as a resource and an end to be striven for. No longer an abstract entity entrapped within economic theory, the rationally calculating self is made operable by the mundane routines and practices of management accounting”.</i> (Miller, 2001, p. 381)</p>	<p>Ad 1</p> <p>In unstructured contexts calculating selves may connect to visible IC devices in self-interest, if they can take decisions within the paradigm having access to:</p> <p>1. A list of the possible states of the world</p>	<p>Ad 1</p> <p>For IC devices to connect to calculating selves in practices of management of IC accounting they have properties of calculating devices</p> <p>Calculative devices as boundary objects may ex ante mediate distinguished processes as recruitment and retention transcending the boundaries in context 1-</p>

forms		2. Ranking of these states of the world	2, if the properties in the units satisfy objectified representations of knowledge in an un-situated view
1 Measurement units for individual knowledge and competence	<i>“In an accounting view intangible assets may be accountable provided they adhere to the guidelines about systemic quality characteristics</i>	3. Identification and descriptions of the actions that allow for the production of each of the possible states of the world	Ad 2 Inputs and outputs configured by calculating devices respecting accounting logics designed to create rooms for mundane routines
2 Visible, controllable relations between IC input/IC output in processes through IC representations	<i>1 Relevance (predictive or confirmative) and 2 Materiality 3 Faithful representation (complete, neutral, free from error) 4 Usefulness (comparability, verifiability, timeliness)</i>	4. Compare costs. Ad 2 Relevant as comparable disclosures in the context	Ad 3 Measured outcome from IC motivated decisions link managerial decisions to actions of added value in operations
3 Visible and logic relations between managers’ decisions and IC motivated actions and the output from decisions	<i>5 Form and substance 6 Reliability 7 Freedom from bias 8 Comparability 9 Consistency</i>	Ad 3 Relevant as comparable disclosures in the context Ad 4	Managers’ talent to add value through coordination and distribution of IC becomes measurable
4 Traceable digital footprints from movements in the IC as between stock/flow, shown as managerial effects changing the knowledge values in stock/ flow representations	<i>10 Understandability 11 Cost An intangible asset is defined: “an identifiable non-monetary asset without physical substance, which is separable, i.e. capable of being separated or divided from the entity and sold, transferred, licensed, rented or exchanged, either individually or together with a related contract, identifiable asset or liability, regardless of whether the entity intends</i>	The called for consistence (Fløstrand, 2006) between IC operations and accounting as methods of the value reporting of balances and movements in the underlying resources is established Ad5 Design elements for the socio/technical interface in unstructured contexts to connect rest on the individual drivers of self-interest and the properties	Ad 4 Traceable accounting based footprints document operations as representation of IC values in and between flow and stocks Ad5 Design elements for the socio/technical interface to connect rest on the individual drivers of self-interest, the properties in the calculating devices and
5 Connectivity in the			

socio/technical interface	<p><i>to do so or arises from contractual or other legal rights, regardless of whether those rights are transferable or separable from the entity or from other rights and obligations”</i></p> <p><i>“a resource controlled by an entity as a result of past events from which future economic benefits are expected to flow to the entity” (Ernst & Young, 2012)</i></p>	<p>in the calculating device</p> <p>Further connectivity is envisaged through mechanisms of punctualised networks.</p>	<p>the</p> <p>mundane routines and practices of management accounting</p>
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Figure 52 Logically Possible Organization Theories of Coordination and Distribution applied to Individual Knowledge in and between Companies, by author

A1.3 How do ontology and the epistemological take in IC (and KM) address knowledge per se and knowledge owned by individuals?

How do ontology and the epistemological take in IC (and KM) address knowledge per se and knowledge owned by individuals?			
Issue	Ontology	Epistemology	Conceptual Implications
Explicit knowledge in KM	<p>Knowledge is subjective</p> <p>It is not an asset</p> <p>Knowledge is represented by employees</p>	<p>Knowledge is employees often viewed in unspecified groups as Human Resources and as bunches of capabilities</p> <p>Competitive Capacity, scarce resources and absorptive capacity are theoretical notions in the paradigm of KM, which are assumed to impact the organization</p> <p>The constructs have not been decomposed. The company visualizes explicit knowledge as job</p>	<p>When knowledge is inseparable from humans and only can be shared through co-presence the ontology/epistemology is unworkable in this conceptual context</p> <p>Furthermore, because knowledge and competence is intermingled and cannot become defined or valued as singular, objective objects, they are unworkable in this context</p> <p>The entangled knowledge and competence is linked</p>

		descriptions of tasks that the owner of the position can do	to time and space. Job descriptions explicit minor fractions of the total individual knowledge map and are incomplete
Tacit knowledge (BA) in KM	Tacit knowledge is represented through knowledgeable employees' actions	Residing in humans other co-present employees will explained in the SECI model learn the competences	The SECI model presupposes co-presence The ontological view prevents reuse of the knowledge
Communities of Practice	KM ontology	Experience-based knowledge is sought generalized on the basis of back-ward looking analyses of past processes	The ontological view linking the outcome to time and space problematizes the useful apply in changing conditions
Knowledge in IC	Knowledge is predominantly subjective, integrated with competence and the notions are interchangeably used Knowledge is considered an organizational asset	Classifications of IC elements sometimes place knowledge in the Human Capital as an organizational element The domain terminology associates knowledge with economic values, but leaves out how knowledge create value	Context dependent, the properties of knowledge being linked to time and space, entangled with competence and deposited in human resources offer no instrumentality and cannot be operated across boundaries (Abhayawansa & Guthrie, 2010)
Knowledge in companies	Situated, organizational, company specific	Knowledge is owned by humans, which are controlled by managers in departments Costs (of knowledge) are reduced by firing people	Strategic knowledge in operations seen as rare, expensive, inimitable – but still as organizational knowledge
Knowledge between companies	In recruiting processes defined as situated knowledge. Knowledge outside the boundaries of firms is “general knowledge”	The mechanisms of markets are not exerted. Knowledge is invisible	Knowledge free of context but recognizable in global classifications No markets Visible, valued objects of knowledge have to be contextualized and tested
Local/ Global knowledge	Literature focus on firm's knowledge. Knowledge is	The notion of global knowledge has not been	Local knowledge is defined as not only situated, but

	customized, situated and local knowledge.	found in the literature related to individuals	also co-located It thus differs in dispersed companies, but is still situated knowledge within the boundaries of the firm/ global knowledge is free of context
Individual knowledge 1. “Processual knowledge” 2. “Artefact-based knowledge”	1. Subjective, owned by individuals The intermingled notion with individual competences (Christensen, 2000) 2. Knowledge is reusable , separating knowledge from its individual human owner (R. Bohn, 1994). The artefact based view of knowledge objectifies it and allows it to travel. The same knowledge object is applicable in different locations by different human actors. The knowledge object may technically gain search ability when entering into an order, which structures objects independently of their locations.	Exercised by the individual competences , local, considered as employees, but grouped and equal to number of employees or number of jobs Global, objectified, objective, separated from the individual and from the competences The representation of available individual knowledge and competence represent the IC stock of a company or a network/ a project/	Individuals may own both local and global knowledge, when the ontology of knowledge is artefactual Knowledge may be ordered in global and local classifications When adding competence to knowledge in organizations it becomes active, concrete and situated A value representation indicating both the quality of knowledge and the quality of competence contains theoretically the inherent dynamic of individual knowledge, because the competences may develop and change the object of knowledge
Organizational knowledge	In IC the main notion of knowledge is found to be organizational knowledge	Companies have organizational knowledge in the Human Capital	If managers were to manage knowledge, tools had to address individuals, because to operate knowledge, managers exert management over individuals, not knowledge Therefore the analyze level changes from

			organizations to individuals
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Figure 53 How do ontology and the epistemological take in IC (and KM) address knowledge per se and knowledge owned by individuals?, by author

A1.4 The Intangible Currency (TIC) applied at Dentist's CV

Education Dentist	Curriculum	Competencies	Dentist is a Master's degree	Knowledge and competence measured in TIC, $\frac{\text{K}}{\text{I}}$ (In this example the dentist has filled out the competence questionnaire)
Academic knowledge from curriculum from education institution, address, year	Titles and authors of books and teaching material in the education	Training at the dental school for x years	The knowledge objects obtained in different disciplines are labelled with the figure 3	<p>Oral-biological basic subjects 3</p> <p>/anatomy [3,1,3] /biochemistry [3,4,5] /genetics [3,2,2] /physiology [3,5,1] /chemistry [3,2,4] /dental morphology [3,2,5]</p> <p>Community and behavioral 3</p> <p>/psychology [3,5,1] /pedagogy [3,3,3] /rets odontology [3,2,2] /statistics [3,4,1]</p> <p>Para Clinical subjects 3</p> <p>/general surgery [3,2,1] /pharmacology [3,5,3] /general medicine [3,5,5] /immunology [3,5,2] /microbiology [3,1,3] /dental materials [3,3,3] /pathologic anatomy [3,2,3]</p> <p>Clinical courses 3</p> <p>/Bidfunksionslære [3,3,3] /joint teaching [3,5,5] /gerodonti [3,1,1] /oral diagnosis [3,5,5] /maksillofacial surgery [3,5,5] /oral pathology & medicine [3,5,4] /orthodontics [3,3,3] /periodontics [3,2,4] /prosthetics [3,5,4]</p>

				<p>/pædodonti [3,1,1] /radiology [3,1,1] /dental illnesses [3,4,4] /technology [3,1,1]</p>
Experience knowledge from former positions	<p>-2 years practicing dentist in Poland - 1 year in sales in a dental depot in UK - 2 years as a teacher at the dental high school in Baden Baden - 3 years as a student in dental surgery in the same institution - 3 years as scientific researcher in NY, PhD</p>	<p>Ability to activate the curriculum knowledge into dentist work Ability to activate the curriculum knowledge into sales work Ability to activate the curriculum knowledge into teaching work Ability to activate the curriculum knowledge into research activities May be combining the experience based knowledge from practice, sales, teaching into innovative new knowledge</p>	<p>The experience based knowledge obtained during 24 months in Poland will be labelled with a 2 The experience based knowledge obtained in sales during the 12 months in UK will be labelled with a 1 The experience based knowledge obtained in Germany as a teacher during the 24 months will be labelled with a 2 The scientific knowledge obtained during the 36 months in Germany as a PhD fellow will be labelled with a 5.</p>	<p>/general dentist practice [2,4,5] /knowledge about dental products [2,3,5] /knowledge about dental sales [1,3,4] /training & learning knowledge [2,4,3] /specialist in dental surgery[4,3,3] /PhD [5,5,3]</p>
Languages	<p>Polish, German, English</p>	<p>Having no scientific knowledge about the languages but obtained competencies to talk the languages</p>	<p>Knowledge about the languages is labelled with a 2</p>	<p>Polish [2,1,5] German [1,1,3] English [2,2,5]</p>

Figure 54. The table demonstrates The Intangible Currency (TIC) applied at Dentist's CV, by the author.

A1.5 Table of existing technologies and their interrelationships in the GCC

Human resource management technologies	Process objective and description	Registered Common variables	Affect suddenly, occasionally, negligibly,	Intellectual capital management	Loosely coupled with
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			indirectly, eventually	relevant data	
1 People in SAP	Global staff administration to handle wages, identities, leave, replacements, promotions, rewards	Names, age, origin, position, location, gender, address	Almost all technologies may connect to SAP	Job dependent figures on competence. The figure-based competence data are mixed knowledge and competence data. No or few knowledge data; if data, it is text-based	2, 3, 4, 5, 7, 9, 10
2 Talent management	To secure future relevant resources in the firm. Administration of special training programs	Names, age, origin, position, location, gender, address	Yes	none	1
3 Top 300	To secure global coordination at top management level and create a global physical arena to manage	Names, age, origin, position, location, gender, address	Yes	none	1
4 Retention	Identify and motivate key staff to stay on	Names, age, origin, position, location, gender, address	Yes	none	1
5 Recruitment	Search and get the right people on board for the identified positions	Names, age, origin, position, location, gender, address	Yes	none	1
6 Academy	Global frame for improving the level of intellectual capital				7, 8, 9
7 Courses	Identification of need for intellectual capital and execution of its transport to staff	Names, age, origin, position, location, gender, address	Yes	none	1, 6, 8
8 E-learning	Cost saving method to transport intellectual capital to staff that collapses distances of time and space				6, 7
9 Financial accounts	To maintain the financial narrative through frequent value	Names, age, origin, position, location, gender, address	Yes		Financial management is integrated

	representations ex post and ex ante				in all rows
10 Personal review/ organizational review processes/ personal development process	To coordinate & distribute personal management of staff; to coordinate & distribute top management's management of sections & departments across silos	Names, ages, origins, positions, locations, genders, addresses	Yes	Accumulated cross assessed situate, mixed performance metrics from actual nearest managers/highly accumulated performance representations on org. level	1
11 Annual work satisfaction survey	To establish a shared understanding of the perceived state of art in the staff				
12 Analyses	To extract fact-based KPI's and statements to support management		Combine occasionally selected data	X, but no separation between knowledge and competence	
13 Diversity, inclusiveness, from good to great, competence mapping	Avoidance strategy: management focus to proactively manage culture across internal business boundaries to remove conflicts. Induce an innovative context		Not rooted in structures	None	
14 Text-based knowledge technologies: intranet, repositories, yellow pages, doc archives	To share knowledge as a an individual pull function in situated or slightly classified contexts	Variables as typed in words to search, but no common variables		Unordered, non-assessed data	
15 People-based technologies Communities of practice, experience- groups, project sites	To share situated knowledge in groups	Common docs and words Occasionally situated structures No common variables		Unordered, non-assessed data	

Figure 55. Table of existing technologies and their interrelationships in the GCC, by author.

A1.6 Comparison of Financial and Designed N-F Accounting Output from ICMCS in TICs

Comparison of Financial and Designed N-F Accounting Output from ICMCS in TICs					
A: System expression	B: Management level 3 levels of management	C: Function	D: Financial management	E: Global IC management	F: Potential practical implications
<p>Output</p> <p><i>Forward-looking information:</i></p> <p>Budgets Scenarios Forecasts</p>	Top management	Strategy	FM's output, budgets, may represent empirical projections of last year's budget or become constructed based on estimations of time/ price considerations	HC/IC budgets express in metrics the future quality and quantity in the selected HC, identified, named and valued in TICs to execute the strategy in HC	The risks in IC can be handled by shared, metric-based strategies of expansion or avoidance at an early stage securing alignments which adjust financial investments and the right HC
		Growth/reduction	Economic figures represent decisions producing effects like selling out, reductions, purchases, etc.	Predictive: Metrics in HC/IC scenarios predict future effects in the demand for HC/IC, when changing strategic objectives	The right, timely HC capacity is documented in details; projects with shaky finance or shaky HC/IC profiles are explored
		New initiatives	Financial figures representing new activities like product development, promotions, inclusion of new markets, globalizing investments	HC/IC scenarios predict effects of completions in IC metrics at short and long terms creating shared awareness of investments in new knowledge and competence, or design an avoidance agenda for IC	Scenarios will in few seconds in-the-making deliver shared information about the realism and robustness of existing HC/IC in proposals and sketch the gaps in HC
	Middle management	Execution	Financial figures framing activities	4. Departmental HC/IC budgets and scenarios create provident IC figures in various choices adding HC and knowledge dimensions to decisions. The IC calculability is assumed to reduce future risks of gaps in IC	It is the Middle Management's responsibility to secure the right quality and quantity of HC/IC which is documented in metrics Short and long term planning of the IC is executed based on TICs which concretize objectives and results in shared representations
		Resources, tools, devices	Expand/reduce/change staff, organization, production, geography, stocks, etc.	5. IC metrics from the conduction of teams/projects make HC/IC accountable for	The use or misuse of HC in teams/projects is surveilled and timely interventions are made

				decisions at the next level	adding/subtracting HC from dysfunctional units Failures are evaluated in a knowledge view
		Operations	Design and deployment of financial value representations in concurrent controls in the hierarchy	6. Design of concurrent controls in the hierarchy The accountability in IC budgets open up for preemptory controls and interventions at a distance based on figure-based expectations of performance	Middle management is heading IC routines parallel to the financial control of forward and backward looking value representations and making interventional decisions
	Staff	Self-management	-	7. Individual knowledge and competence budgets provide devices for calculating selves, connect HC to strategy, and establish an overview of future individual knowledge and competence interests. Creates shared knowledge to choose optimal collaboration at a distance of time and space	Some cultures and some organizations enhance self-management to obtain higher degrees of innovative power, higher profit, higher flexibility or to solve actual problems This can happen without interfering the hierarchy for shorter or longer periods The IC transparency provided through ICMCS and TICs concretize objectives and results in metrics and percentages
		Level of engagement	-	8. Personal ambitions and personal decisions of HC development Shared IC figures create horizontal/vertical transparency: - who knows what, where, when, - to be applied for, - how many will own the same knowledge	IC transparency informs about the future strategical HC and motivates individual HC development HC budgets are individually created and applied for, IC KPIs handle pay and rewards
System output <i>Backward – looking information</i> Accounts for various accrued levels: Corporate Departmental	Top management	Strategy	Annual reports Financial reports create input to shape a shared perception of the past and shared expectations for the future	9. Annual reports IC reports document in % the degree to which HC/IC satisfy the present and future operational demand for strategical HC/IC Design of N-F	Comparisons of audited, annual IC reports offer useful information about intrinsic present and future values in companies to the financial markets

Employee Financial key figures N-F key figures Performance measurements Incentives expressed in financial key figures and N-F key figures				KPIs	
		Growth/reduction	The financial representation guide input for corrections	10. IC accounts add accountability to estimations of IC investments of short/long sight	Projects processed in the framing of open innovation can be realized without preparations conveying flexibility to firms
		New initiatives	Financial representations disclose recent effects from newly identified decisions	11. IC accounts add predictive/evaluating insight in the underlying resources explaining financial figures and future initiatives	Overviews of HC's preparedness to initiatives may influence the decision making ex ante
	Middle management	Execution	FM accounts create shared perceptions of the history of execution	12. IC accounts offer explanations to the economic narrative in FM	The predictive view in IC accounting may change the value chains to consider HC as important prerequisites for the chains
		Choice of tools, devices, resources	Input for financially based evaluation	13. Input for HC/IC adjustment initiatives of HC	The design of numbers of IC routines and IC controls are expected
		Operations	Control output and KPI evaluations and corrections	14. Shared real-time KPIs from team work (present or digital) simultaneously produce input for dispersed global interventions Design of IC-based incentives	Daily monitoring of teams and projects in knowledge views adds or substitutes knowledge and competence in co-presence or at a distance. Numberless interventions are enabled through ICMCS
	Staff	Self-management	Financial KPIs change performances	15. Individual knowledge and competence accounts IC KPIs change performance and perform self-management	ICMCS serves through metrics and easy, fast IT functionalities intrinsic motivation, desire and passion for work. Through overviews, comparisons, new information and choices the individual is empowered to act for it- self and for the common good
		Level of engagement	-Counterproductive KPIs when financial and N-F KPIs are not aligned	16. Longitudinal comparisons of personal IC accounts, budgets and capitals provide knowledge to the design of engagement like	Can be measured

				the acquisition of new knowledge and competence, and new ambitions	
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Figure 56. Comparison of financial and N-F accounting output, by the author.

A2 Industrial Manual for ICMCS

Manual - Knowledge Platform Brainii™

Annex 2 represents the manual, which is produced as part of the documents to guide the empirical test of ICMCS in the GCC.

The instructions for the pilot project falls in 4 parts reflecting the system parts, Module I-III in ICMCS and its reporting. For every module the sites are screen-dumped and it is explained, how to use the system from the site and which objectives and effects to obtain. It is explained how to create complex profiles of knowledge and competence, how to make scenarios to verify, whether the firm is ready for certain operations, or when it becomes ready, or how to allocate and make teams.

It is explained how to operate IC through and with ICMCS in daily operations, at the short and long sight – very much hands-on – to be sure always to have access to strategic assets of knowledge at the right time.

Annex 2 is part of the handed-in thesis, which is assessed by the assessment committee, but has been left out here for matters of disclosure.

A3 How to operate the proposed Intellectual Capital Management Control System, ICMCS

Description of ICM software

Management comprises “the problem of mobilization” (B. Latour, 1987), because “The things, you gathered and displaced (via immutable mobiles) have to be presentable all at once to those you want to convince and who did not go there” p. 66 - and therefore the model has been translated into an information technological solution based on the web technology to reflect requirements in dispersed settings. Both the coding mechanisms to transfer the model to an IT system and the deployment of the system in dispersed settings are viewed as equivalent to the printing press process, which is argued for by Latour naming it “a new way of accumulating time and space” (1990), referring to a process on paper. The mobilization process is called a way “to collapse time and space”, although now the medium has changed to electronics (Quattrone & Hopper, 2005). The accounting model is the device linking concept and operations, a social context that carries with it both a set of ideas that explain its physical operation, and a set of ideas that explain its social function. Operating the device (model transferred to IT system) managers rearranges knowledge and competence, assembles “things”, coordinate and distribute the resources at a distance according to strategies by letting actors design and enact remote interventions.

Dispersed unities that might constitute a firm or a network are viewed in a knowledge perspective and therefore, as previously developed, as a permeable construction, chapter 4.3. A registration practice of knowledge and competence is therefore not inevitably framed by hierarchy and the idea that the sum of roles/jobs/titles/chairs constitutes a true and fair picture of the firm/ the network. Independently of organizational charts and positions knowledge and competence of members inside or outside of entities are registered following the same methodology.

An effect is that instead of entering the degree of match between job demands phrased in a certain context, time and space – locking results to the actual context – as many KM systems do (SAP, Oracle, PeopleSoft) pointing out 5 or more entangled self-assessed competences – this methodology is not self-assessed and not linked to hierarchy nor jobs. The knowledge and competence owned by members of network is so vast and the future concerns of the network are not to be known. Therefore, to keep the highest embedded flexibility of future use and highest IC capacity in the combinations of knowledge and competence, it is noted apart in the TIC relating knowledge and competence to the classification in the knowledge-bank (database representing individual K&C in Module I).

Digital traces of operations in the IC Management Control System, ICMCS, are accounted for and operated in real time business intelligence (BI) and in reports documenting the re-entanglement of K&C in operations through the actions and movements in IC. Budgeting processes depict future IC capacity in TIC.

Annual IC reports accounting for the consumption of IC resources in development and daily operations, disclosing statuses for the value of total existing IC, total future IC and its strategic relevance for attaining the financial objectives in assessed trusted accounts might qualify the understanding of financial reporting. Further research into such ideas would be required to unfold the vision. For now a small first step is to describe ICMCS. The 4 modules are described in the following sections.

Annex 3.1 Application of “The Intangible Currency”, TIC, in ICMCS

Financial metrics inform as devices markets about values and install thereby an order of orientation between unrelated actors providing them with devices by which to compare incomparable things (M. Callon, 1998; M. Callon & Muniesa, 2005). Does this also count as job description for non-financial devices? In companies financial metrics are applied in financial control systems to manage companies, and as the method of valuation is global, management control exerts to dispersed entities. TIC is not established as a currency to exchange financial currencies, but to visualize underlying resources, the value of intangibles in a control system. According to previous research calls for N-F input models, knowledge and competence values are here entered at a personal level with the technical possibility to reach aggregated representations.

In Module I, individual knowledge and competence as input are noted by individuals in the module, which configures the stock. The individually owned knowledge and competence is thereby getting accessible by actors worldwide having access and using TICs. The input is exemplified in A1.4 related to a normal CV and the processes from click to click are shown in A2, Module I. The module I is able to produce various representations of values of knowledge and competence, which are described later.

In Module II managers operate the HC flow. Allocations are executed in the module, which gives access for managers to combine TICs in demand for IC capacity in metric based requirements for the three dimensions in TIC effecting coordination and distribution of HC, because remote more satisfying capacity is searched and allocated at a distance. The management of IC may optimize the balance between exploitation and exploration, because metrics of use and applied knowledge are visible and accessible a cross geographical distances and individually connected. The planning, application and documentation of HC values in allocative processes is enabled at any time from everywhere.

Module III operates future and strategic IC. Future demand for IC expressed in TIC is represented and distilled in shared processes of IC value representations like IC budgets. Outputs from IC budget processes are strategic company-budgets, department-budgets or project-budgets and regional budgets. The scope for budgets is open and locally designed.

Module IV provides reports like annual corporate IC accounts/budgets or annual departmental development movement in IC and special issues of IC. It comprises BI like representations of progress in IC measured in TIC based KPIs.

TICs are thus applied in the IC control system equal to the way financial figures applies in FMS to inform users to become calculative.

The next sections detail the description of operating TICs and the design's envisaged effects.

Annex 3.2. ICMCS - Module I- Stocks

Module I¹⁵⁶, "Existing Knowledge", represents knowledge and competence accounts in stocks, as input making individual knowledge and competence visible and accessible. It provides 5 sub functionalities hosting various possibilities: "Knowledge Bank", "Strategic Knowledge", "Persons", "Personal Account" and "Personal Budget".

The module receives input of knowledge and competence, orders the input and generates representations of accounts of IC that can be accessed by humans having web-based IT-devices anywhere and at any time - provided that the person has a password. A K¹⁵⁷-search function enables search for K within the mapping context of "Academic K", "Experience K", "Customized K/ Company K" and "Other K", which is defined as situated, local K. The search result is an aggregated representation of K showing the total amount of K within the searched K-objects. Clicking the K-object in the display pictured below lists of names owning the searched K-object and their registered values of knowledge and competence, are shown. Clicking a name makes a personal K-account visible. The search result indicates not only the quality of K but also with which C¹⁵⁸ the persons can activate the K-object. The 125 combinations within K, CC and PC¹⁵⁹ allows for detailed search arming the search with values for creativity and performance demands.

¹⁵⁶ A2, Module I

¹⁵⁷ K-search, knowledge search, K=knowledge

¹⁵⁸ C=competences

¹⁵⁹ Chapter 5

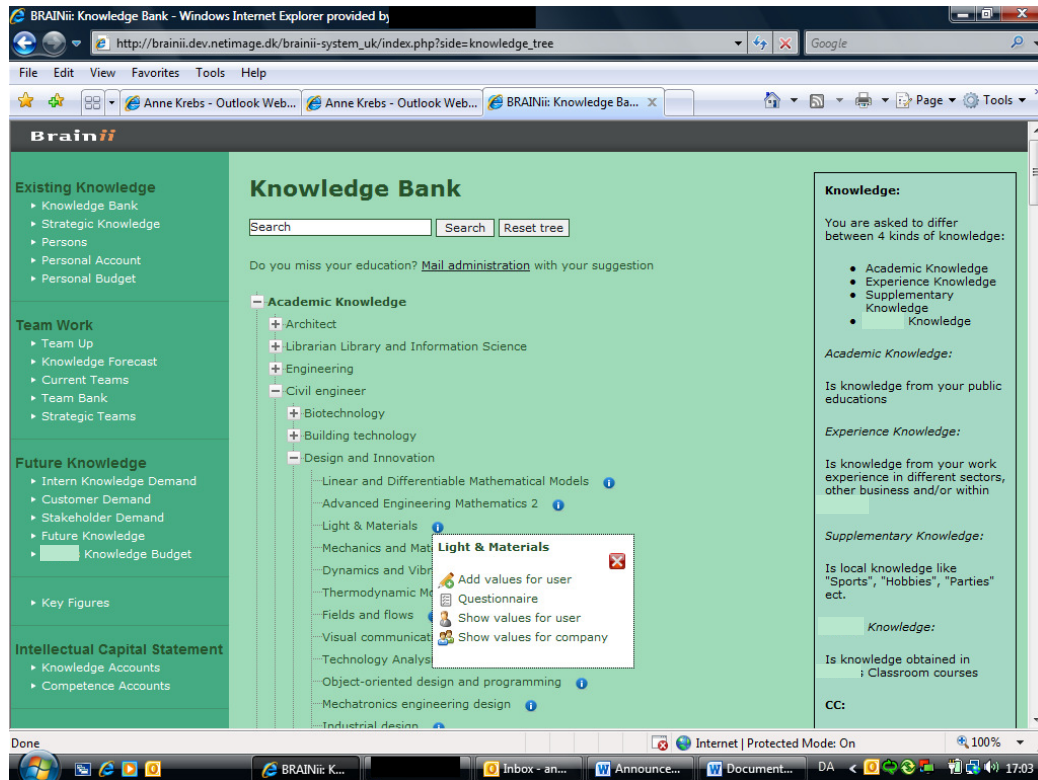


Figure 57 ICMCS Screen dump from Module I, Existing Knowledge, Knowledge Bank, by author

Having access to personal accounts comparisons of neighboring capacities is possible with a click. The K-searcher has found K about accessible knowledge and competence and its quality and position and may now calculate an action to connect to the optimized, calculated result of his/her own considerations.

Furthermore, Module I generates accessible data about colleagues, partners and intern /extern specialists about positions, educations, age, nationality, gender etc. – data, which informs management ex ante of composition of teams, wish for diversity, planned innovation and expectations and communication modes when managing and collaborating at a distance. TICs are supposed to mediate the many barriers in remote teams (M. Barrett et al., 2005; W. F. Boh, 2007a; Buckley & Carter, 1999; Cordery et al., 2010; C. Hardless, 2007b; Hofstede & Hofstede, 2006; Hofstede et al., 2010; London & Siva, 2011; Wilson et al., 2006) deriving from diversity, background, various disciplines, company cultures and nationalities. An empirical research remains to prove these assumptions.

However, the financial guidelines inspiring the concept, aims to inform “complete, neutral and free from error” about IC values and is thus expected to be able to mediate conflicts, which today represent uncertainties causing loss of time and money. Using TICs to scope collaboration at a distance by allocating an optimal, digital team across borders, will comprise collaboration with persons that are more experienced, holds higher degrees or proving other knowledge and competence related values relevant for your estimation of a team-member at a distance. The

TIC-born information about other team-members is supposed to impact your decisions to enhance conflict or agree about a path to collaborate. These kinds of perceptions/reactions and actions are to be explored in future research.

As K as an object is separate from the subject, 2 data bases are constructed, one with data (I) about the humans and one (II) with their registered knowledge and competence.

Data base, DB, I contains data on name, age, gender, photo, professional background: educations, courses, positions, (date for employment and name of nearest manager – if applied in an organizational context), country of origin, country of educations, workplaces/ country and positions.

DB II contains K-bank(s), personal knowledge and competence-accounts, personal knowledge and competence-budgets, representations of current strategic K, future strategic K, names of current strategic employees and future strategic employees.

Module I give access to personal K-budgets. In digital displays both accounts and budgets are visible.

The representation of future needs for knowledge and competence is expressed in TIC. The cross organizational insight offered at the individual level is assumed to provide a rare transparency that will impact decisions on personal investments in knowledge and competence. In a search for strategic knowledge and competence - objects the relation between the organizational goals and the demand for new knowledge and competence is disclosed. As such the individual planning of engagement expressed as knowledge and competence developing efforts can be estimated at long reach by “calculating selves” without disturbing anybody and informed by TICs. The personal wishes are moderated and mediated (C. Hardless, 2007a; R. Lindgren et al., 2004) with the organizational strategic need for development of IC and a centralized decision process defining central K-budgets are distributed to the individual decision maker for instance before the annual rounds of “nearest-manager-development-interviews”. IC devices structure IC development on a shared basis in dispersed settings and advance systematic planning of knowledge and competence locally and globally to remove uncertainties in gaps of IC and providing relevant IC in time.

Module I give access to accounts representing strategic K and strategic actors in the network, be they intern or extern actors. The processes structure the planning of underlying resources across borders.

Annex 3.3 ICMCS, Module II – Operations management - Flows

Module II¹⁶⁰, “Team Work”, gives access to forecasts, scenarios and allocation of teams. It provides project portfolio overviews and offers interventions for portfolio management in teams and scenarios. Module II has 5 sub functions: “Team up”, “Knowledge Forecast”, “Current

¹⁶⁰ Page 25-37 in ICMCS Manual

teams”, “Team Bank” and “Strategic Teams”, which operate the named areas. Descriptions of the functionalities are next.

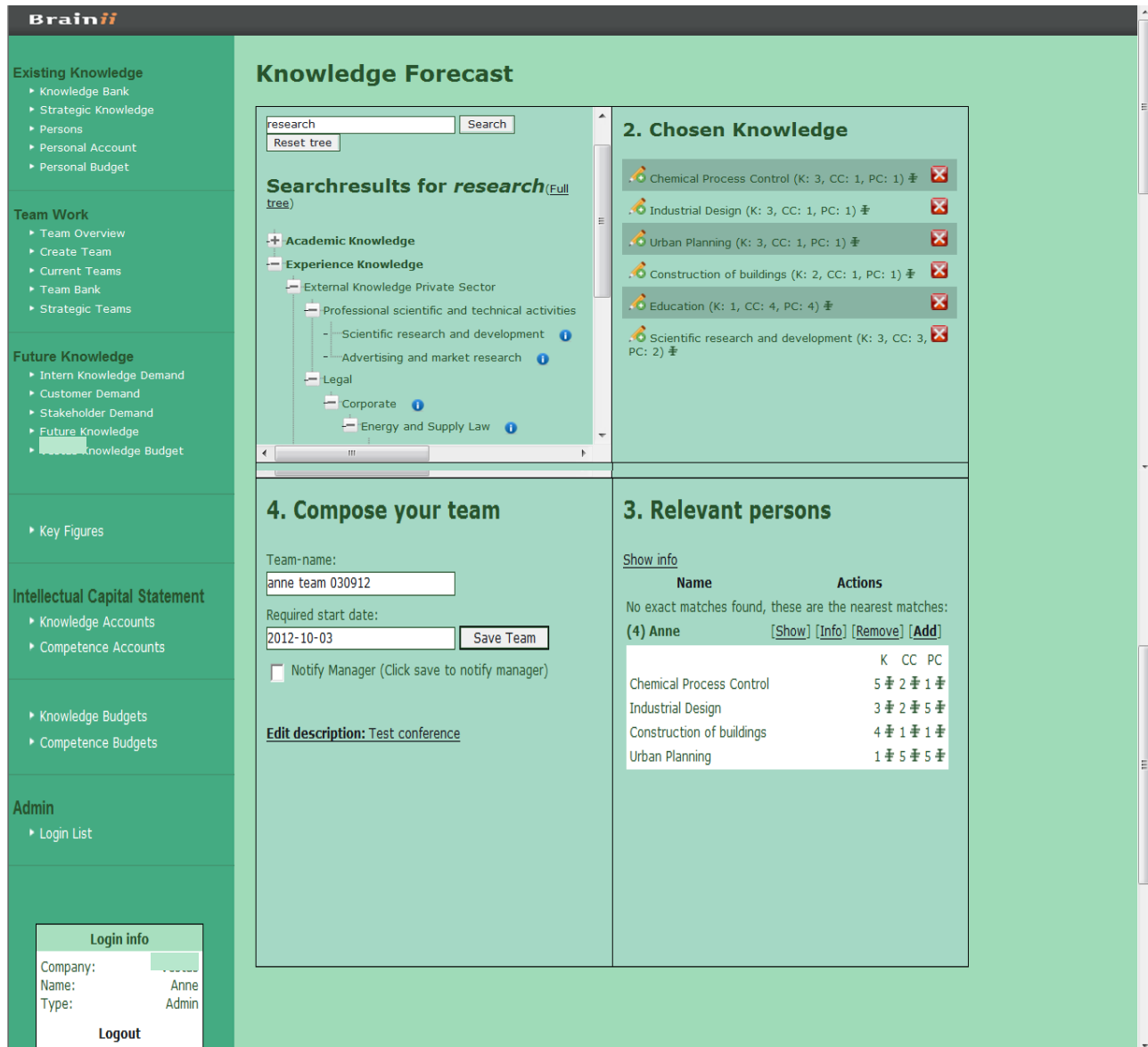


Figure 58 ICMCS screen dump form Module II, Team Work/ Knowledge Forecast, by author

“Team up” comprises functionalities to compose optimal teams for tasks independently of time, space and hierarchy and independently of prior knowledge about the proposed team members. Today task-owners have to express demand for knowledge and competence in future tasks in text, talk to colleagues and search bios to set up a team. Sometimes companies even reserve an employee to fill out this function, a resource coordinator as in GCC and coordination of K is then still linked to time and space. In ICMCS future knowledge and competence requirements for teams, expressed in TIC précising the need for HC will with one click show a prioritized list of persons owning to some extend the required knowledge and competence profile.

Investigations can be carried out looking into the proposed team member's personal K-accounts to estimate synergies or other considerations between future team members. When remotely decided the teams are saved and named at the site figure 59, and the team member's managers is asked by mail about their availability – or permission to activate the team. Therefore there is a notion of “approved teams” in the software system. The system accepting no borders, it is feasible to allocate persons a cross dispersed units, an action that might collide with hierarchy. (HOUSE & House, 1971; Mookherjee & Reichelstein, 1995; Penrose, 1995; THOMPSON & Thompson, 1965; THOMPSON & Thompson, 1971; M. Tushman, 2003) Also in rather self-managed settings a purely K-driven behavior colliding with managers might occur choosing team members only by the notion of knowledge and competence. Information is asymmetric between manager and employees and other considerations may be at stake. In the actual case company financial incentives and performance measurements did prohibit K-driven actions to be realized¹⁶¹.

“Knowledge Forecast” allows for HC scenarios, be it at company level or project level. A representation of demands for knowledge and competence is entered in TIC and the system generates at once a list of existing IC-objects in TIC and informs about, who owns the resources, where. This functionality informs dispersed decision making about future acting, for instance whether a new market/country/product is realistic from a IC capacity perspective –enlightens decisions where the IC weaknesses are and where the shortest way to fill in the gaps might be. The elaborated scenarios can be saved; they can be shared and acted upon cross-borders.

“Current Teams” is a personal display that can be aggregated. Teams are shown with names, various time stages, it can be indicated whether they are to run out of time, various data is automatically saved during their life time – the functionality offers team overview and a portfolio management option for running teams. Managers intervene to correct IC resources in time in malfunctioning teams by supplying knowledge and/or competence at a distance.

“Team Bank” stores completed and refused teams. The argued refusals are stored, because ideas are timely and might be regained and activated in teams. Team bank might be viewed as an idea bank for realized and unrealized projects. “Team Bank” documents with which underlying resources, a project has been realized.

“Strategic Teams” are current teams applying or creating strategic K. Strategic persons or have or are developing strategic K. Strategic K is defined, planned and operated in next subsection about Module III.

Annex 3.4 ICMCS, Module III, Future Knowledge

Module III, “Future Knowledge”, has 5 sub functionalities: “Intern Knowledge Demand”, “Customer Demand”, “Stakeholder Demand”, “Future Knowledge” and “Company Knowledge Budget”.

¹⁶¹ Chapter 7 System Development Process

The module gathers future demands for knowledge from various sources of dispersed input: organizational, customers and stakeholders requests for future knowledge and competence is noted in order for the firm to be prepared for nice or needed strategic actions. In systemized templates discontinuities are currently noted as new input about “technologies, competitors, regulatory events, significant changes in economic and political conditions, like deregulation of financial services or waves of mergers”(O Reilly, 2004).The noted events will, if decided to act upon, need knowledge and competence to be met in time. A forecast drawn in Module II will disclose which knowledge and competence the company lacks. The entailed TIC based estimations will define future strategic HC demands at short/long notice in order to enable the firm to execute shared global planning of HC.

Shared organizational processes rank and prioritizes the decentralized knowledge and competence inputs requiring future strategic K to align investments in global knowledge and competence development considering local IC power, geography and prevent local surplus production. The process runs as often as needed at short notice with no travel costs, at a shared platform with symmetric information. The output of the process is lists of knowledge and competence in TIC, which are agreed to be needed and lacking in IC. The lists represent negotiated knowledge and competence budgets for the organizational entity caring out the ranking process¹⁶². There are no horizontal or vertical restrictions to run the prioritizing process. Managers are designated in the accounting network to run the filtering processes decanting demand for knowledge and competence. Strategic knowledge and competence budgets are not linked to hierarchy, but can also be designed to follow hierarchy, for instance after regions, departments or sub departments.

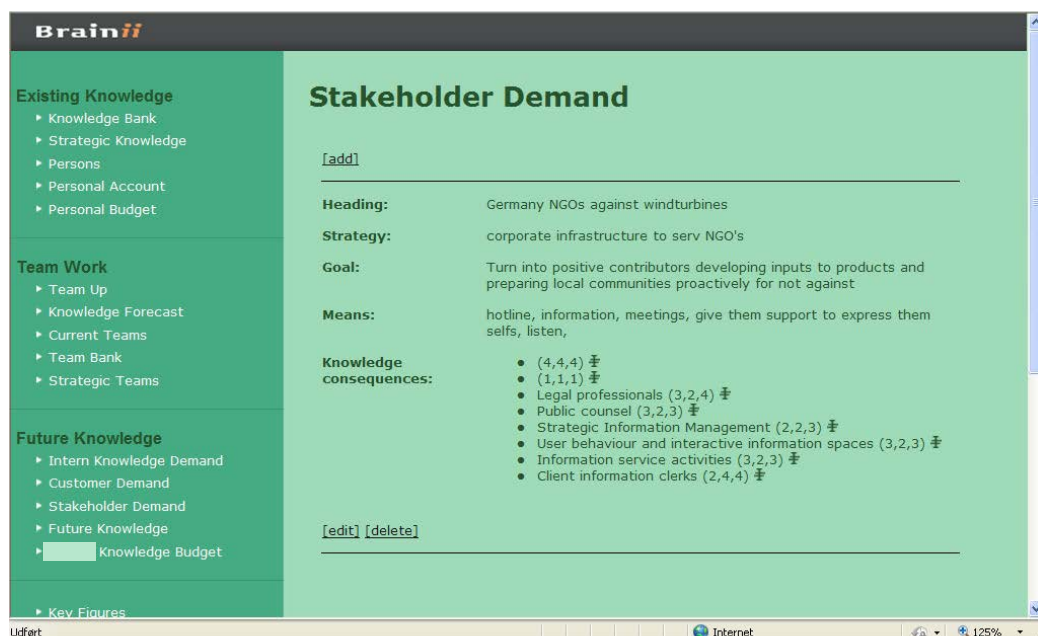


Figure 59 ICMCS screenshot demonstrates how a stakeholder driven event is translated TICs and provokes new demand for future HC, by author

¹⁶² A2, Module III, figure 61

The shared prioritizing function can be employed in other situations too – not only to create knowledge and competence budgets, but also in a project- based relation, for instance in a task-force solving urgent disruptions. The dispersed actors are asked to enter solutions to a thread – and note their request for knowledge and competence. This structured, dispersed process might add notions to definitions of problems and solutions not yet discovered by other actors in the network. A shared prioritizing decision process defining the future IC in the project is carried out by “Future Knowledge” – constituting a common understanding of the future project and its range of solutions in a dispersed assemblage before a collaborating process that might be at a distance – takes its beginning. In these budgeting processes expectations about future collaboration to be are indirectly managed by ideas, input and knowledge and competence requirements informing actors in the network about the input and the demands from every single actor.

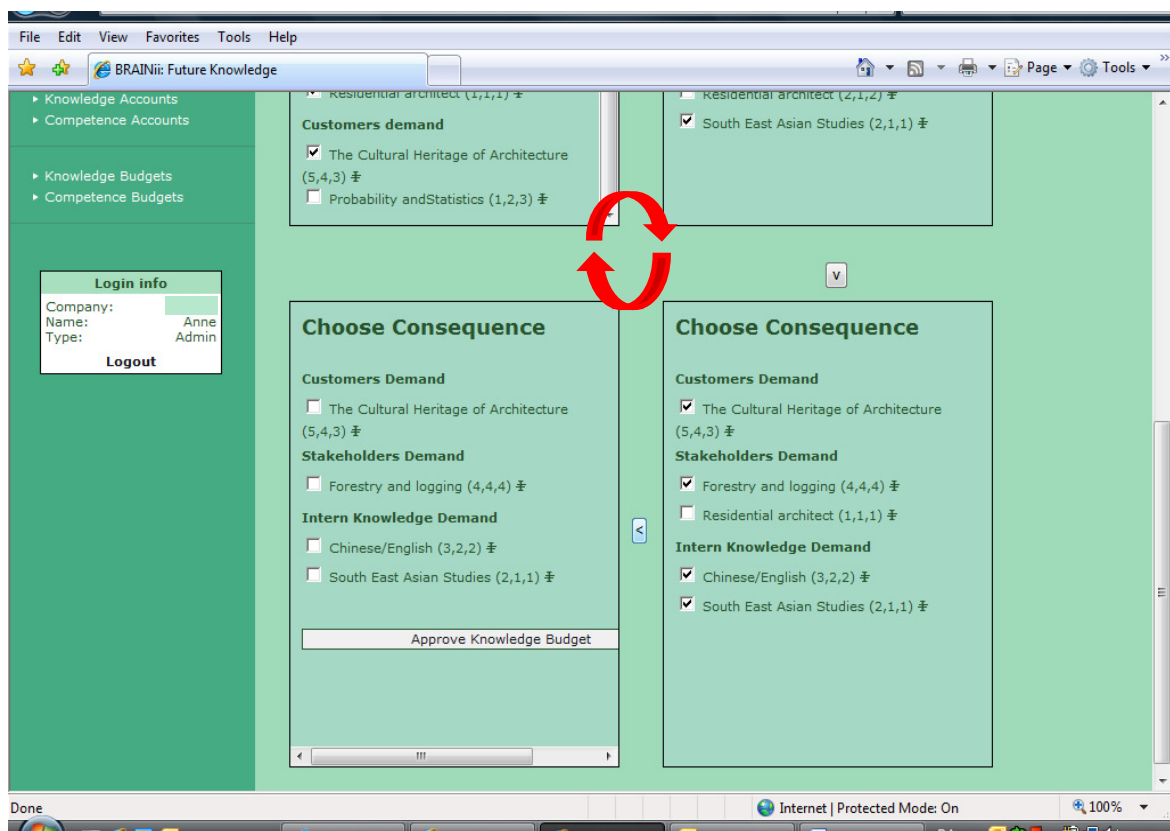


Figure 60 ICMCS screenshot from centralizing filter process of remote K&C demands to IC budget, by author

Figure 61 shows the ranking process starting in the upper left quadrant showing the total list generated from the summed displaced demand for HC thereby centralized in one overview in TICs. Dispersed managers rank or prioritize locally TICs at the list choosing a fixed number of objects as important to their part of the business. This action is conducted three times by various managers having access to decisions about investing in strategic development of HC. The process is accessed from the list in the upper right quadrant to the list in the lower left quadrant, which displays the result of the prioritizing process as a list of agreed TICs representing the strategic budget of knowledge in the operating unit. Each quadrant is operated by changing managers, maybe reflecting hierarchy.

TICs move and centralize concrete information about future HC demands and expectations from various stakeholders to the powers of decision and adjust the firm ex ante in order better to meet the market. The 3 groups of stakeholders are outlined next.

“Company Knowledge Budget” is an output of a terminated prioritizing process from “Future Knowledge” carried out at a corporate company level; budgets might get produced every year before the individual K-budget planning period. Taking a turn in the company deciding global strategies and their knowledge and competence consequences expressed in TIC, this knowledge and competence budget is constructed in closed networks until it is released to all actors in the network, appearing at their personal K-budget screenshot in Module I. The release frames at the same time new carrier opportunities, because the strategic backgrounds for future knowledge and competence demands are made transparent allowing a search for the templates fueling the demand for chosen objects of knowledge and competence. The strategic background for the development of knowledge and competence discloses top management decisions to conquer new markets or develop new products at the same time representing new carrier opportunities. The process exerts muted management of expectations at a distance and is shown to meet expectations in the new workforce (Breu et al., 2002; Hofstede et al., 2010; Shuck & Wollard, 2008). The personal career aspect is supposed to drive motivations to stay tuned and updated in the system.

“Intern Knowledge Demand”

The sub function’s templates are available for noting possible future events or decisions about organizational development not taken care of in daily operations. Input is informed by events or ideas noted for organizational development. Required TICs to conduct the event are defined and estimated to carry out the actions, after having consulted the K-bank to verify status of existing IC. The knowledge consequences may enter into the shared budget processes and the background provides a later organizational transparency, if prioritized as an up-coming element in the not yet released strategic K-budget.

“Customer Demand” and “Stakeholder Demand”

The above described generic process is valid for two other types of input for K-budgets from customers and stakeholders in order to generate K-budgets. Unless prohibited by firm or network rules actors are requested to note future need for actions in relation to customers or stakeholders in the structured process to plan HC in time and avoid risks in HC.

Everybody can pop into news at a dinner table about an upcoming law or public demonstrations against areas hitting a company somewhere/sometime. This software structure can capture data about events not following the hierarchical streams of information. An actor outside a sales force might get wind of sales opportunities and actors occupied by daily operations might realize an open window of opportunities. Valuable insights escaping hierarchy are often difficult to capture to add value.

Operations of “Future Knowledge” and “Company Knowledge Budget”

The sub function “Future Knowledge” distributes K about local needs for knowledge and competence to designated actors in the network and supports shared dispersed processes of prioritizing of demand for knowledge and competence in a filtering process of 3 layers of decision turns. Informed by the entered K-consequences over a period of time from dispersed actors these turns narrows the number of decision makers for every turn allowing them to choose a number of knowledge and competence objects that are passed on as “approved” to the next group/ layer of decision makers. This hierarchy of decision makers may be designed free of hierarchy and can thus be changed quite easily. The final result of the filtering processes represents a shared decision process and the strategic knowledge and competence budget for an entity. When named and approved it is saved and opened in the sub function “Company Knowledge Budget”.

The list of knowledge and competence expressed in TIC determines, which K is “Strategic Knowledge” and thus who are “strategic persons” in the network. There are two notions of “Strategic Knowledge”: Existing Strategic Knowledge/ persons, which are owners of actual strategic K, and future Strategic Knowledge/ persons, which are persons that have sign up in their K-budget for acquiring future strategic K. The screen shows these as marked respectively with red and green colors. The labelling may have practical impact on lay-off decisions, if the wish to keep long/short term strategic HC in house is present.

Annex 3.5 ICMCS, Business Intelligence

Business Intelligence, BI, is defined as the process of converting data into information and then into knowledge. (Golfarelli & Rizzi, 2009)

Today, companies and managers are beginning to ask IT vendors for new tools capable of handling the changed business scenario. In fact, during the last ten years the approach to business management has changed from both the technological and the organizational points of view. On the technological side, outsourcing the information system has progressively become the keyword to cut fixed costs: no investments are required and only the actual services are paid. This approach hampers the usage of DWs [data warehouses, red], since analysis becomes a direct cost. On the organizational side, companies are now more process-oriented than in the past; in fact, in order to reduce the costs and keep pace with the market, they are adopting an end-to-end strategy that involves both customers and suppliers to synchronize all the business activities. At the same time, companies have understood the importance of enforcing achievement of the goals defined by their strategy through metrics-driven management. Thus, the new requirement of managers is to ensure that all processes are effective by continuously measuring their performance through Key Performance Indicators (KPIs) and score cards. Communication and enforcement of the strategy is obtained by sharing goals and measurements at all the company levels, thus promoting the so-called information democracy. Translating the company strategy into a detailed set of indicators that are closer to the operational tasks allows employees to better understand the desiderata of managers.

(Golfarelli & Rizzi, 2009)

This ICMCS is designed to deliver BI/ knowledge and competence metrics about coordination, distribution and application of IC in real time to intervene ex ante at a distance. As the processes of allocation and choice of knowledge and competence precedes workforce output, real time KPIs on knowledge and competence might act as early warning in operations, because FM based KPI's are constructed on history and financial translation not susceptible of IC.

To get the right knowledge and competence to the right decision makers in the right time is defined as a decisive advantage very hard to get. (Kao, 2009) Institute for Large Scale Innovation in San Francisco have screened a number of MNEs to define this problem.

N-F BI distinguishes from financially based BI, because the system values knowledge and competence, provides transparency and shared coordination of resources & development of IC. The system provides access to knowledge and competence for actors in the network, for allocation of knowledge and competence and thus for distribution of knowledge and competence based on global overview of IC capacity. As BI is designed and generated automatically in real time, IC BI might be able to inform operations in decisions about exploration & exploitation and produce corrections on the fly, proactively intervene within timelines and add/change IC at a distance. Only a company case using the software will create evidence for the assumption and it requires further research.

Countless BI can be designed and produced automatically like

- 1 Agility in chosen processes like allocation of IC resources*
- 2 Diversity in teams > < Innovation*
- 3 Distance management > < costs > < added value*
- 4 Self- management > < production time & quality*
- 5 Creativity/innovation*

Operations generate accounts of strategic features, which may act as early warnings in knowledge-based decision processes by measuring identified KPI's in order to benchmark the output with similar accounts. Results may indicate underperformance timely enough to adjust resources before bad results, because the elements in the IC are prerequisites to the elements in financial capital. A remote project-portfolio management situation may gain advantages by this new transparency in projects conducted at a distance and by the new possibility to interfere and change the capacity.

Ad 1: Agility

TIC- based metrics are constructed for comparable processing times in presales, sales, lead-time, time to optimal team, dispersed teams, over all processing times, error / region / team / person (not just expenses to lawyers, including other errors too), growing / declining diversity in teams/ time

Ad 2: Diversity

Identify teams assigned to specific tasks and combine data about 1 Age, 2 Gender, 3 Work location (country), 4 Birth location, 5 Department, 6 Education, 7 Education level, 8 Professional experience in company, 9 Creative Competence, 10 Performance Competence. Benchmarking real-time data to accounts of average metrics deviations can be judged and acted upon in a distance.

Ad 3: Distance Management

At the basis of accounts of metrics on employees with managers placed in a different location, number of phone conferences, number of video conferences, number of tele-presence conferences, number of persons working in digital teams, number of physical meetings/time, efficiency in work, repetitions, time to co-operate optimally in a virtual teams, quality of the output, number of errors, number of designed teams before the group functions, number of search and application of new knowledge, internal transaction-time in processes with/ without diversity in teams – real time BI will indicate benchmarked figures to act on at a distance.

Ad 4: Self- Management

Individual metrics on participation in number of courses and cancellation/attendance to courses, new educations, number of employees with very broad user roles indicating broad range of authority taking initiatives, contribution to practices of registration as indicator for engagement (number of completed templates for knowledge and competence-demand), contributions to defined processes or achievement of targets, number of initiatives (self-generated teams/ participation in teams)

Ad 5: Creativity/innovation

Real time metrics compares to average metrics producing relative intelligence about number of ideas/opportunities/pitches in presale/ person, number of new customers /new solutions, number of innovative R&D demands/teams/persons, demand for creative competence in teams, applied creative competence in teams.

To illustrate how IC BI can add management options at a distance an example about diversity is provided in the following section; As diversity and innovation is positively related (Page, 2011a; Page, 2011b) it indicates that enhanced diversity entails more innovation.

Assume that product development in a region does not perform well and managers decide to intervene the set up. At a distance managers collect BI about the degree and quality of diversity in the teams and add more diversity to the teams. Managers know if the age of the team members are too equal, or genders the same, or knowledge and competence not mixed in due orders.

Secondly they might offer open teams to other regions to establish internal competition and invite extern specialist or open innovation into digital rooms. These actions are completed remotely with no transaction costs or –time, because the BI informing the overview are automatically up- dating the set KPIs and benchmarks in real time. The currency is TIC. There are no travel costs.

The estimations of diversity might become constructed according to a model. Surveillance at a distance of crucial metrics for digital collaboration like diversity, interdisciplinary, internationality, inter-organizational relations, cross border functionalities, remote managers (W.

F. Boh, 2007a; W. F. Boh, 2007b) informs about digital team profiles and deliver detailed K of the nature of collaboration and thus tools to mediate barriers at a distance.

Annex 3.6 ICMCS, Reports on IC

A vision is presented in the thesis about IC reports potential impact on financial annual reports by adding true representation of intrinsic strategic IC values in order to stabilize the financial market's reactions and prolong the financial business perspectives by providing reliable enhanced transparency about to-day's unmanaged values.

An IC report will document aggregated values in the knowledge and competence-bank, which are existing knowledge and competence. On the basis of a true and fair practice of registration according to the recommendations in the FASB for valuing of intangibles/ underlying resources – the metrics in The Intangible Currency, TIC, representing individual knowledge and competence is accrued in a digital media showing screenshots of the values. The procedure is reproduced for the individual K-budgets. Future value of IC can be disclosed. Documented processes assure path-dependent aggregations on the basis of daily operations.

The reports can become segregated in departments and various representations can be designed: The most creative department, the fastest growing IC, the most innovative team, the most strategic department etc. The annual increase of IC dispersed to departments is represented as well as the expected growth in IC. Reports can be drawn without costs of time and money any time, any place – and they document the state of affairs in IC when needed to bids, mergers, refinancing activities etc.

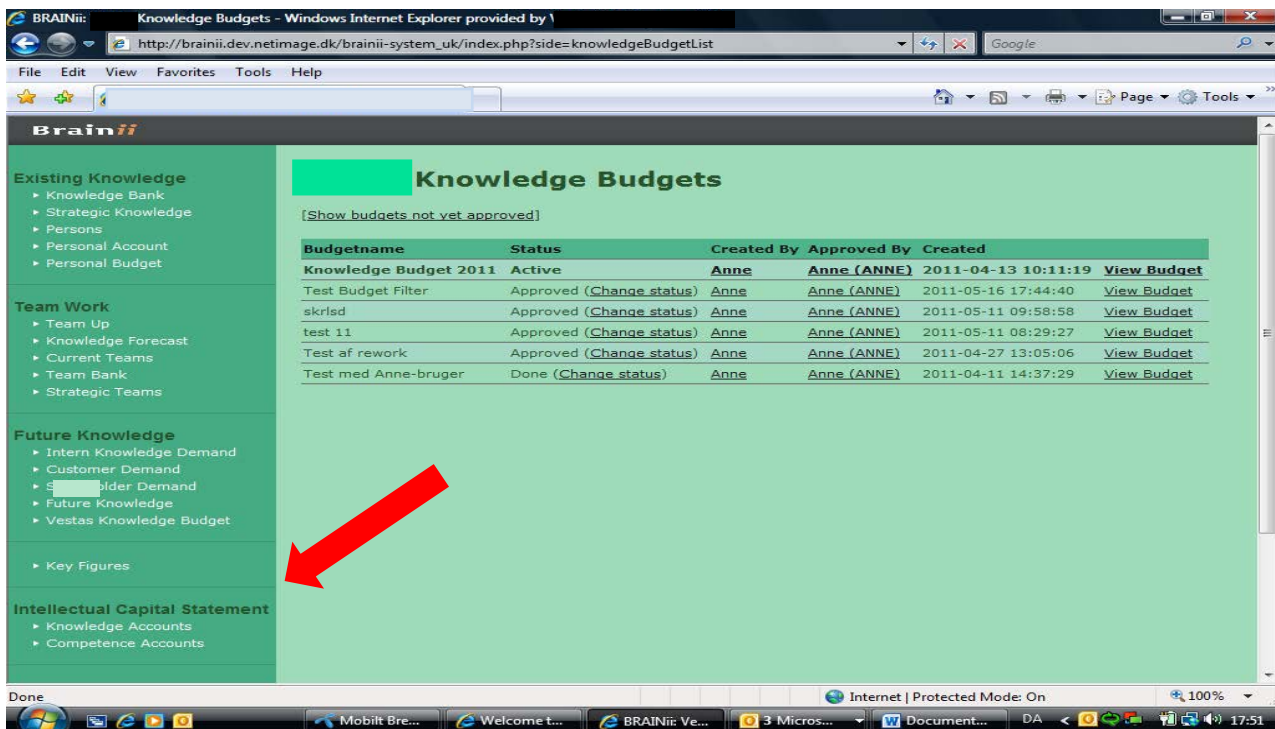


Figure 61 ICMCS screen dump of Reports of existing K&C accounts and K&C budgets, corporate and department, by author

Annex 3.7 Construction of Databases and Output

The model introduced in chapter 3 is repeated in the table below, now added with icons of 5 databases in a depiction of how ICMCS works.

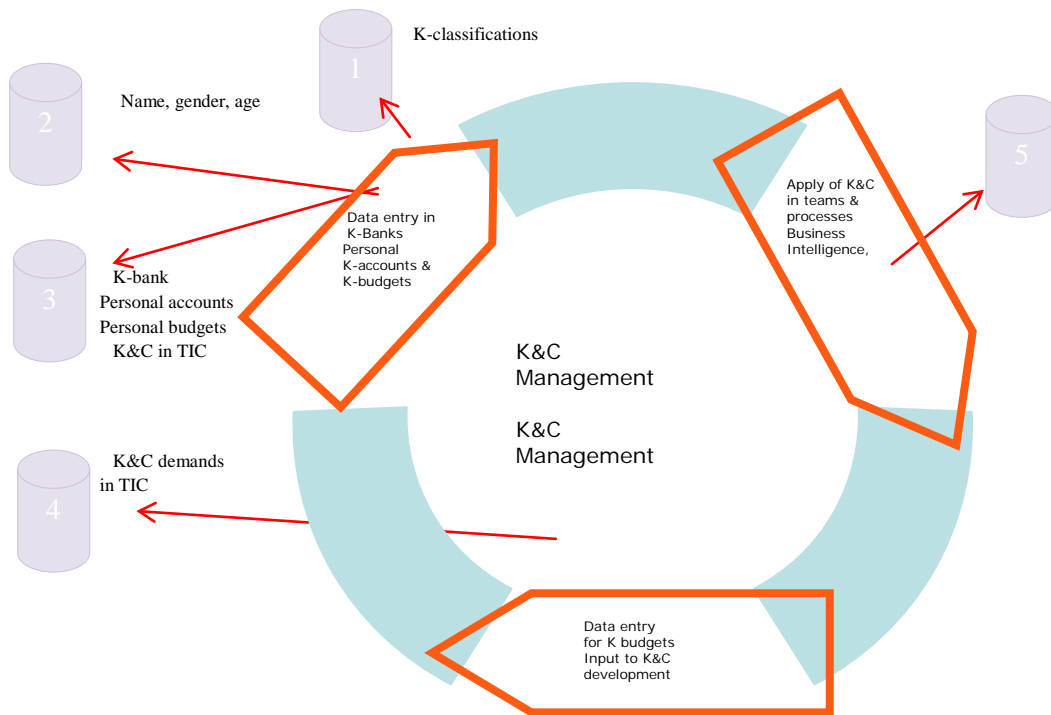


Figure 62 A model of ICMCS, by author

To produce relevant BI for management of a knowledge driven firm/network according to the model, 5 databases are separately constructed. Initially, deployment only requires three databases; the other two contain data from daily operations of IC. K-classification database (1) contains various K- classifications like academic K, experience based K, company specific K and local K. The “administrative” database (2) with names, gender, location and age is established as a K-base up front, too. Data in the third database are entered individually by users and combine K-data from the first database with persons from the second and provide K-data with C, valued in TIC. It is named “K-Bank”, because N-F values are stated in figures.

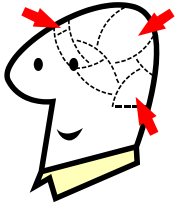
The fourth database contains future demands for K entered locally in daily operations. When somebody acknowledges future needs from stakeholders, customers or internally an opportunity occurs and this opportunity is noted and translated into future requirements for knowledge and competence in TIC. According to literature these kinds of transactions (Cohen & Levinthal, 1990; Lyles & Schwenk, 1992; Volberda et al., 2010) are important to companies in competitive markets and still research has not provided being traced with difficulties, because the events were hard to localize and hitherto did not belong to structural capital.

The fifth database contains “Team Bank” as the result of management of ideas, knowledge and competence in teams and portfolio management of teams.

The K-classification database contains representations of existing, valued, human individual K objects and their competences ready to be related to in assemblages or teams, self-managed or/and by hierarchy.

Below a personal bio from the CC is illustrating how knowledge and competence is entered individually and an account is activated by persons entering their K.

Data Source:



BIO for NN¹⁶³

Address

Phone: +xx-xx-xx-xx

GSM: +xx-xx-xx-xx

Bio text	Education degrees	Experience category and number of years
<p>Nov. 2003</p> <p>Founded and running XXsolutions.dk in Denmark primarily around processes, systems and skills around Key Account Management, handling Strategic Accounts, general sales skills like needs analysis, sales presentations, etc. www.XXsolutions.dk</p>		<p>Entrepreneur, consultant HR training, performance management, private services</p> <p>Belgium</p> <p>5 years</p>
<p>Sept. 2000</p> <p>Founded and running XX T&D sprl. – Performance Management Training and Development – in Belgium advising companies in recruitment, hiring, performance management systems, training and development. Conducting training in the same areas as well as customer service and motivation, coaching and feedback, and Situational Leadership.</p> <p>www.XX.net</p>		<p>Entrepreneur, consultant HR training, performance management, private services</p> <p>Belgium</p> <p>3 years</p>
<p>2000-Sept.2000</p> <p>Training and Development Mgr. Coca-Cola Northwest Europe Div.based</p>		<p>HR manager, private manufacturing company, Belgium</p>

¹⁶³ Anonymized example from case company

in Brussels.	>1 year
1999-2000 Training and Development Manager Northwest Europe Div. and Nordic Northern Eurasia Division, based in Copenhagen.	HR manager, private manufacturing company, DK 1 year
1997 -1999 Learning and Development Director for Coca-Cola Nordic Beverages Headquarter in Copenhagen – and Coca-Cola Nordic and Northern Eurasia – Headquarter in Oslo.	Top Manager HR private manufacturing company, DK 2 years
1993 - 1997 Learning and Development Director Coca-Cola Nordic and Northern Eurasia Division, based in Oslo, Norway.	Manager HR private manufacturing company, Norway 4 years
1992 - 1993 Management Consultant for TMI – Time Manager International - based in Oslo, Norway.	Consultant, Norway, private 1 year
1988 – 1992 International Management Consultant for TMI in Australia and New Zealand, based in Sydney.	Consultant, Australia, New Zealand, private 4 years
1982 – 1988 International Management Consultant in Scandinavia and the Soviet Union for TMI.	Consultant, Scandinavia, USSR, private 6 years
1979 –1982 Editor for the Danish business Newspaper- Erhvervs-Bladet.	Manager, printed media, private company 3 years
1974- 1979 News Reader and Journalist for the Danish Radio.	Airborne media, public company 5 years
1968 – 1974	Printed Media experience, private

Journalist at the Danish newspaper Morgen-Posten.

company

6 years

Education:

Participated in the Coca-Cola top-management program Leadership for Marketplace excellence in Atlanta with a field project in Mozambique.

Manager experience in US and Africa

Number of years?

1995

Completed the Coca-Cola education in HR.

HR Experience in manufacturing private company – number of years?

1968 – 1971

A bachelor = 2

Degree in Journalism.

A master = 3

Languages:

Experienced K

English - fluent written and verbal,

No exams

French –practitioner,

The fluent practitioner is valued with the figure 2 at the K-scale and without exams a higher rate is not obtained

German - reasonable verbal and written, Danish – fluent written and verbal,

Swedish – fluent written and verbal, Norwegian – fluent written and verbal

For other language capacities the rate is 1

Figure 63 An existing, anonymized bio prepared to enter K&C into ICMCS, by author

Bios formed as lists are optimal points of departure for actors in network to enter their K in a K-bank. This above CV is mainly experience based and registers therefore mainly in Laborsta Classifications, an international classification for labor market. It classifies as a standard within EU positions in branches and sub branches and serves as a punctualized network in K-location mechanisms of translations in the TIC.

Punctualized Actor network theorists sometimes talk of such precarious simplificatory effects as punctualizations, and they certainly index an important feature of the networks of the social. Thus, I noted earlier that I refuse an analytical distinction between the macro- and the microsocial. On the other hand, I also noted that some network patterns run wide and deep--that they are much more generally performed than others. Here is the connection: network patterns that are widely performed are often those that can be punctualized. This is because they are network packages--routines--that can, if precariously, be more or less taken for granted in the process of heterogeneous engineering. In other words, they can be counted as resources, resources which may come in a variety of forms: agents, devices, texts, relatively standardized

sets of organizational relations, social technologies, boundary protocols, organizational forms--any or all of these.

(J. Law, 1992) p 153

Law describes here the purpose of using a punctualized network in constructions. The classifications are depicted in figure 65, below; it needs no boundaries to install order and is therefore able to distinguish and assemble things. The screenshot shows the classification and where to enter experience based K according to methodologies explained in chapter 5. To fulfill the construction of the databases and thus create visibility and accessibility of individual knowledge and competence in dispersed settings, humans have to answer the questionnaire about their personal use of their K-objects, their competences.

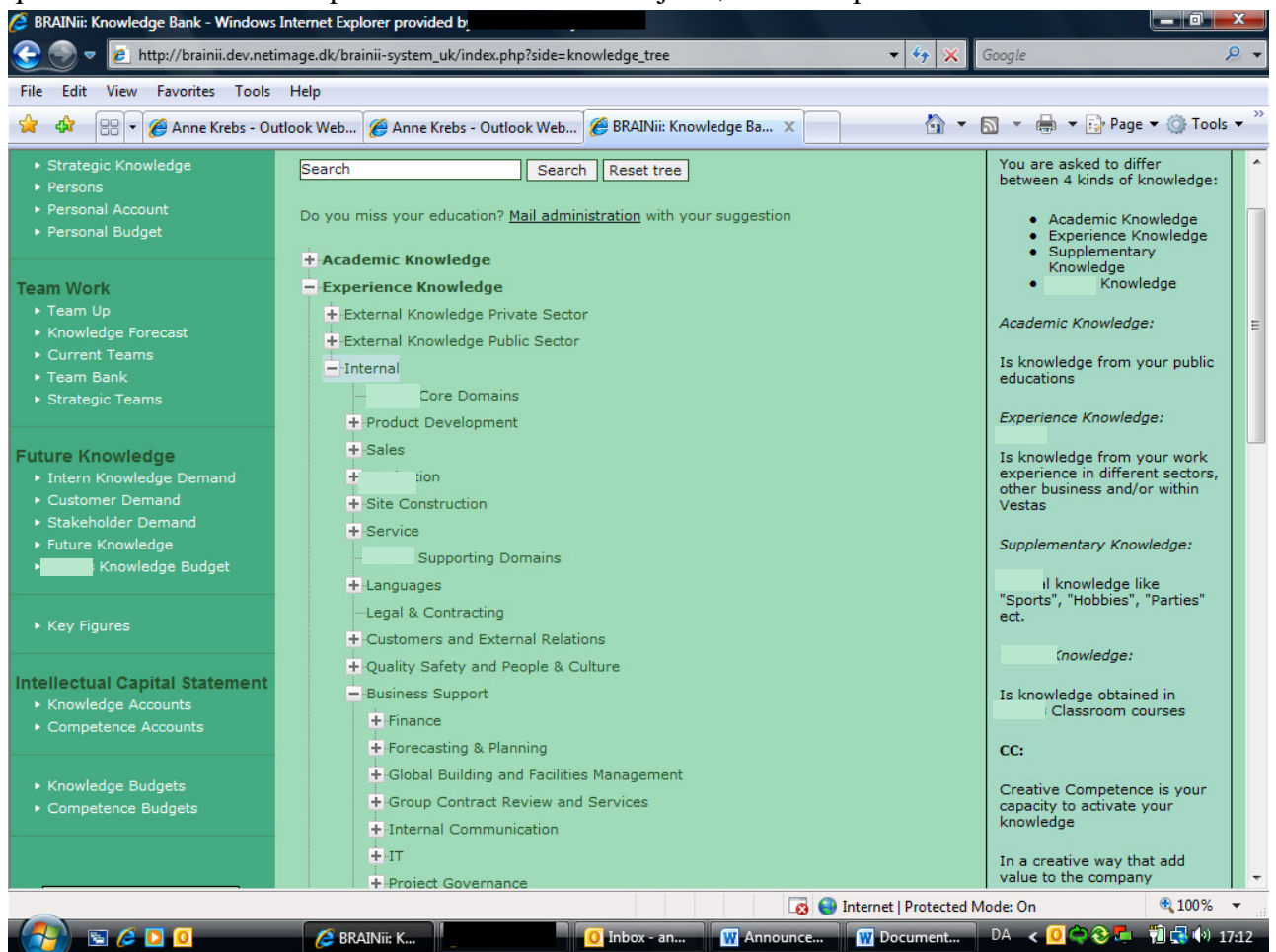


Figure 64 ICMCS, screen dump from K-Bank, showing the experience based classification of K

Competences cannot become self- assessed and still conserve general credibility (Andriessen, 2004). Therefore a questionnaire mirroring the taxonomies has been constructed. It is of course possible to guess specific combinations of clicks to obtain certain values, but the range of combination is $4 \times 26!$, which is almost infinite, so probabilities to be successful in cheating is still low. The automated system provides the two C values to an entered K-object in one process immediately and makes these values visible in the generated, personal K-account.

This method of registration of knowledge and competence is developed to distribute valued individual knowledge and competence in dispersed settings, but first of all to produce reliable data of knowledge and competence on which to manage.

The questionnaire looks as follows:

Knowledge

After having registered your Academic Knowledge from your educations as a consequence of your level of education, which goes as below:

Level 1	Level 2	Level 3	Level 4	Level 5
baccalaureate or similar	bachelor or similar	master or similar	PhD	>PhD

And after having registered your Experience based knowledge from your different positions outside and inside The Firm after the following rules:

Level 1	Level 2	Level 3	Level 4	Level 5
6-12 months Full time	13 – 24 months Full time	25-60 months Full Time	61-120 months Full time	>120 months Full time

you are asked to answer the Competence questionnaire below.

Competences

After having clicked your preferred answers in the 26 lines in the questionnaire, one click pr line and one click in every line, the system automatically provides your Knowledge Account with two figures between 1-5 that register your Creative Competence and your Performance Competence.

To answer the questionnaire:

1. Read all the questions at first.
2. Make a reflexion on how you normally work; Do you practice the situation A,B,C,D when you work with the questioned kind of knowledge?
3. It is **important** to answer as close to the way you work as possible, because the figures document your capacity to activate your knowledge with your competences.

In a web search you rely on the credibility of the figures and they create expectations and demands to the outcome of a (new, maybe remote) collaboration.

Knowledge Field:				
	A: Definitely	B: Often	C: Some times	D: It is not important for me, this notion has no impact on my work
1. I am always prepared to talk about my knowledge field as long as we have an appointment				
2. I prefer to plan and prepare a conversation about my knowledge field				
3. A collaboration can take part whenever and wherever				
4. A task involving my knowledge field is OK as long as I know the process and have tried it before				
5. I have a clear urge to work in depth with my knowledge field				
6. What I really like is to plan a process to assure a meaningful use of the resource				
7. Choosing between collaboration and to work alone I definitely prefer collaboration				
8. I really like to display <u>MY</u> understanding of a topic				
9. I really like to insert a topic in a broader perspective				
10. I prefer to prepare and present a presentation about a topic				
11. I really like unexpectedly to be challenged in my				

knowledge				
12. I find it easy to exemplify my knowledge field to explain a topic easily and quickly				
13. I don't think that work can be done without being aware of the context in which the knowledge is applied				
14. I find it important to explore and define the boundaries to neighbour knowledge fields				
15. It is important to solve a task within the given framework				
16. I prefer to solve a task alone				
17. I like to expand a problem into neighboring knowledge fields				
18. In most tasks I will look for an underlying logic that might be common for other types of tasks				
19. I will always look for ways to share my results to engage and take responsibility				
20. I feel that it is a duty to deliver constructive criticism to my department in its limited way of working with my field				
21. I consider it important to improve knowledge about my knowledge field in the company				
22. When I dive into a topic I				

like to look into its neighbour fields				
23. I like to reject a given task because it makes more sense to move the challenge to another framework and formulate the question differently				
24. I like to be able to evaluate and review processes within my knowledge field				
25. I like to find new solutions and create approval for new ways of working				
26. I like to use my knowledge to communicate in visual medias like television				

Figure 65 Table showing a questionnaire for automated addition of C figures to K in the process of registration, by author

When the employee has clicked answers in the questionnaire in relation to every K-object registered, a personal K-account is automatically established showing the values of her registered knowledge and competence.

All accounts are merged into database no3. Various automated reports are now possible as shown in the sub section Reports. The database is automatically updated by daily operations when fully integrated in processes.

Input of Experienced K

When entering K-objects obtained through experience in the Classification in K-Bank¹⁶⁴, time is a parameter of valuation and used as determination factor.

Entering Experienced K differs from different positions outside and inside GCC after the following rules:

Level 1= 6-12 months, Level 2= 13-24 months, Level 3= 25-60 months, Level 4= 61-120 months, Level 5= >120 months - of full time work in a company in the same sector/branch/function, chapter 5.

¹⁶⁴ Annex Laborsta

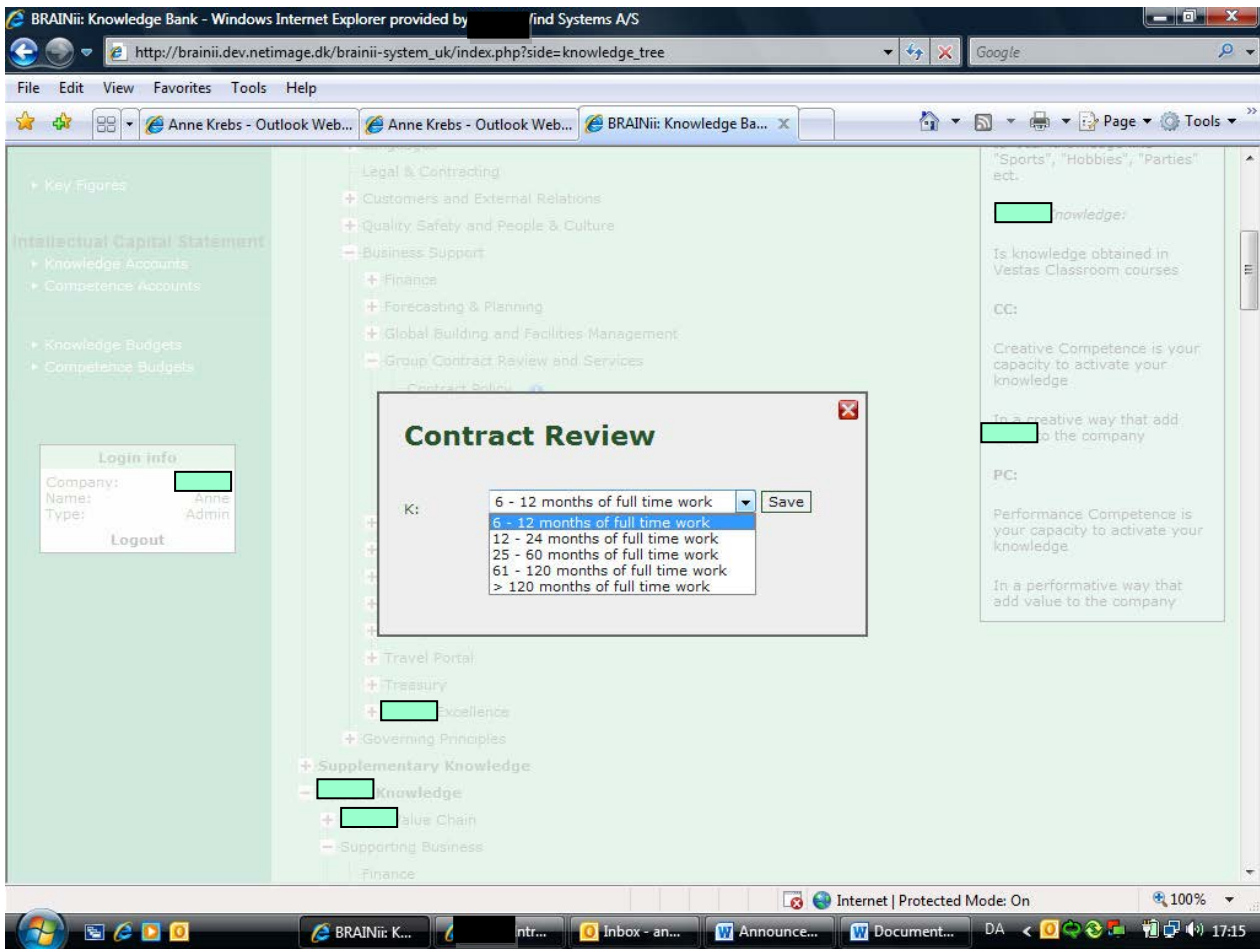


Figure 66 Author, Screen dump K-Bank registration template for Experienced K

The translated example of the former bio looks now like this:

Bio text	Education degrees	Experience category and number of years	Translated to K figure
<p>Nov. 2003</p> <p>Founded and running XXsolutions.dk in Denmark primarily around processes, systems and skills around Key Account Management, handling Strategic Accounts, general sales skills like needs analysis, sales presentations, etc. www.XXsolutions.dk</p>		<p>Entrepreneur, consultant HR training, performance management, private services</p> <p>Belgium</p> <p>5 years</p>	<p>Relevant K-objects are equipped with a 4</p>
<p>Sept. 2000</p> <p>Founded and running XX T&D sprl. – Performance Management Training and Development – in Belgium advising companies in recruitment, hiring, performance management systems, training and</p>		<p>Entrepreneur, consultant HR training, performance management, private services</p>	<p>Relevant K-objects are equipped with a 3</p>

development. Conducting training in the same areas as well as customer service and motivation, coaching and feedback, and Situational Leadership. www.XX.net		Belgium 3 years	
2000-Sept.2000 Training and Development Mgr. Coca-Cola Northwest Europe Div.based in Brussels.		HR manager, private manufacturing company, Belgium >1 year	Relevant K-objects are equipped with a 1
1999-2000 Training and Development Manager Northwest Europe Div. and Nordic Northern Eurasia Division, based in Copenhagen.		HR manager, private manufacturing company, DK 1 year	Relevant K-objects are equipped with a 1
1997 -1999 Learning and Development Director for Coca-Cola Nordic Beverages Headquarter in Copenhagen – and Coca-Cola Nordic and Northern Eurasia – Headquarter in Oslo.		Top Manager HR private manufacturing company, DK 2 years	Relevant K-objects are equipped with a 2
1993 - 1997 Learning and Development Director Coca-Cola Nordic and Northern Eurasia Division, based in Oslo, Norway.		ManagerHR private manufacturing company, Norway 4 years	Relevant K-objects are equipped with a 3
1992 - 1993 Management Consultant for TMI – Time Manager International - based in Oslo, Norway.		Consultant, Norway, private 1 year	Relevant K-objects are equipped with a 1
1988 – 1992 International Management Consultant for TMI in Australia and New Zealand, based in Sydney.		Consultant, Australia, New Zealand, private 4 years	Relevant K-objects are equipped with a 3
1982 – 1988 International Management Consultant in Scandinavia and the Soviet Union for TMI.		Consultant, Scandinavia, USSR, private 6 years	Relevant K-objects are equipped with a 4

1979 –1982 Editor for the Danish business Newspaper- Erhvervs-Bladet.		Manager, printed media, private company 3 years	Relevant K-objects are equipped with a 3
1974- 1979 News Reader and Journalist for the Danish Radio.		Airborne media, public company 5 years	Relevant K-objects are equipped with a 3
1968 – 1974 Journalist at the Danish newspaper Morgen-Posten.		Printed Media experience, private company 6 years	Relevant K-objects are equipped with a 4
Education:			
Participated in the Coca-Cola top-management program Leadership for Marketplace excellence in Atlanta with a field project in Mozambique.		Manager experience in US and Africa Number of years?	
1995 Completed the Coca-Cola education in HR.		HR Experience in manufacturing private company – number of years?	
1968 – 1971 Degree in Journalism. Example of academic K, enters in the academic classification, in this bio the only academic K. The other objects of K, Experience K enter the classification of experience K.	A bachelor = 2 A master = 3		Academic K “journalism” [3, PC,CC]
Languages: English - fluent written and verbal, French –practitioner, German - reasonable verbal and written, Danish – fluent written and verbal, Swedish – fluent written and verbal, Norwegian – fluent written and verbal	No exams	Experienced K The fluent practitioner is valued with the figure 2 at the K-scale and without exams a higher rate is not obtained For other language capacities the rate is 1	English = [2,PC,CC French= [1,PC,CC] German= [2,PC,CC] Swedish= [1,PC,CC] Norwegian= [1,PC,CC] The numbers indicating C’s are filled, when user

			answers the questionnaires
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Figure 67 Example translations to TIC of anonymized bio consistent of mainly experienced K, by author

The K-owner notes his/her bios in ICMCS and is instructed to follow the manual. How centralized or local entering-processes will be designed escapes the framing of this work and will differ between extern free agents applying for a position and interns signing up to become assigned to a team.

By establishing separate databases high degrees of combinability in capacity is obtained still with regard to a great number of parameters. This organizational flexibility is equally accessible in dispersed units based on K&C input at individual level and addresses research gabs in theories about K&C and related fields (Björkman, 2007; Cohen & Levinthal, 1990; B. Kogut & Zander, 1992; Volberda et al., 2010) as combinative capabilities and absorptive capacity, because these theories mainly operates at firm or unity level although they admit that individual level is an important antecedent to these levels and don't embrace dynamics as an element in the building of theories (Volberda et al., 2010).

System Output

The translation of HC into TICs and to digital media enables operations to find and allocate individual knowledge and competence in new cross disciplinary, cross organizational and inter-organizational processes, because individuals are registered independently of their current position and chart and because knowledge and competence are separate distinctions valued apart. These processes of disentanglement pioneer new processes.

At a longer range of time and if TIC is generally mobilized, networking entities between public/private, small/big, present/remote, contractor/bids, clusters, innovative collaborations, collaborating binding and responsibly, IC accounts will be able to document values of knowledge and competence in entities and network, setting out new mediators and rooms for management of HC at a distance.

The previously described system, ICMCS, has 3 modules + 2, BI and Reports. In the following text the 5 elements are disclosed only to explore outputs and their potential relevance for operations.

Output from Module I

In module I representations of values of individual, human knowledge and competence, are accessible from every point in the network at individual, aggregated and corporate level. In an integrated system accounts are updated automatically, when processes are operated in daily operations.

Output are in various designs:

Lists of existing/ future strategic employees

Lists of existing/future strategic knowledge and competence and its value

Photo of persons in various entities incl. relevant personal information
Strategic knowledge and competence budgets on personal or corporate level
Stocks of individual knowledge and competence

Output from Module II

The Team module operates allocations, forecasts, teams, portfolios representing the value flow of HC in ICMCS. Examples of outputs are:

Lists of forecasts for problem-solving knowledge and competence profiles describing elements of dynamic capabilities (Teece, 2007; M. Tushman, 2003) and their knowledge and competence values

Lists of scenarios for radical innovation processes describing knowledge and competence elements for development of new products/ services

Lists of operating teams, members and contributing knowledge and competence, stages, owner, managers,

Bank of approved/refused ideas/teams

Bank of completed team tasks

Output from Module III

The module operates future K. Business opportunities are translated to TIC and entered in templates representing the absorptive capacity (Cohen & Levinthal, 1990) decomposed into demand for individual knowledge and competence. Dispersed, shared processes distillates future demands for IC subtracting existing IC and filtering these demands to TIC budgets addressing different levels of management:

Definitions of existing and future HC

Strategic HC budgets - Lists of demand for corporate knowledge and competence

Lists of department knowledge and competence budgets

Stakeholder's demand for future IC related to expected effects and outcome

Customers' demand for IC related to expected effects and outcome

Intern demand for IC related to expected effects and outcome

Output as BI, Reports and KPI's

TICs measuring IC value at individual level opens for endless types of KPI's, BI and reports. These outputs have no frequency restrictions and the design may reflect the strategy. If management believes in a positive relation between innovation and diversity in teams, diversity in teams gets a real time KPI. Approaching limit values management intervene at a distance regulating parameters of diversity reported in ICMCS. System output act as early warnings.

In this sub section the former conceptual operational questions about *organizational perspectives* are addressed: How does the values get coordinated, exploited, distributed, developed, stored, trusted, accessible and planned and *strategic perspectives*: How is a non-financial value recognized as strategic, can it become planned, can it become exploited at the right place at the right time and it has been shown how.

Annex 3.8 Relevance for operations and for RQ

By operating the system employees will know who knows what, where and be able to contact persons owning relevant knowledge and competence with a click to the connected world. Updated documentation about IC is designed to be happen 24/7 on personal, department or network level. This is supposed to facilitate processes of tenders, bids, investment, M&A's, outsourcing, sourcing, layoffs and recruitment, because exchangeable, reliable and revisable representations of HC are at hand with a click. The *organizational and strategic perspective* has now been introduced in the design of the proposed control system.

A4 - A Short Description of Technologies in GCC

The below listing of technologies in GCC refer to figure 53 explaining the technologies:

People in SAP (1)

People in SAP is a system supporting global staff administration handling wages, identities, leaves, replacements, promotions, rewards and compensation. Names, age, origin, position, location, gender, address, time and place of birth are examples of registered data. Almost all other technologies connect to People in SAP.

As mentioned, a SAP template has been developed to document some "education and some experience" for a smaller pilot population. The figure based competence data are mixed Knowledge and Competence (K&C) data. There is thus no identifiable or few, text-based Knowledge data. SAP is loosely coupled with the systems no 2, 3, 4, 5, 7, 9, 10.

Talent management (2)

Talent management is a MT (Management Technology) to secure future relevant IC resources in GCC. Talent management is operated through special training programs. Data: names, age, origin, position, location, gender, address are common variables with (1) so 1 and 2 are loosely coupled. There is no visual or structural relation between talent and K&C, because there is no data to be found to relate the actors although substantial literature claims a relation between the two (K. E. Sveiby, 1997; TUNG, 2008).

Top 300 (3)

Top 300 is the name of a segment of global employees, 300 highest ranking managers in GCC's organizational chart identified by their level of wages. The construct was identified to secure global strategic coordination at top management level and create a global physical arena between dispersed actors at top level. The activities were event-driven i.e. an annual meeting of several days at changing locations in the world. There are no special data on K&C to be found for Top 300 concerning IC in the group nor are members of Top 300 able to share K in a

structured way, although these connections are able to provide interesting advantages. (Lyles & Schwenk, 1992; McDonald, 2011)

Retention (4)

Retention is a management concern made visible by part of the administration of HR dealing with the issue, which handles both the average number of employed months and brain-drain. The company had identified a goal of 92 months and constructed KPIs in metrics within the construct to be met locally. The notion of future loss of IC was not handled in a structured way. It was possible to identify key staff on the basis of data of names, age, origin, position, location, gender and addresses, but not through their ownership to IC.

Recruitment (5)

Recruitment is a management concern made visible by several administrative groups of employees dealing with various aspects of the issue. They handle different segments of the market of search & selection and the on-boarding of the right people into identified positions. There are many stakeholders to the processes, both intern and extern human and non-human actors: interns having identified the demand for resources, administration of formulating, listing, gathering the applications, several selection processes, tests, physical meeting and existing IC capacity. To-day the processes are not related and automated, but data in (1) names, age, origin, position, location, gender, address are available.

GCC Academy (6)

GCC Academy constitutes a mental frame covering processes for improving the level of IC in the staff. In the Academy courses and training are to be found both as physical group training (courses), e-learning and teaching at demand. It has a digital presence. The academy relates to (7, 8 and 9).

Courses (7)

The logic of courses was related to functions and processes in GCC. They thus had the practical purpose to prepare and develop skills for existing jobs. Courses owned a proper IT web structure that turned visible and accessible the courses and distributed the range of offers. A supportive function for signing up to courses was included as a self-management device, which also kept account of individual data on passed courses. An interface to FM could inform about individual costs. An evaluative quality device was installed to keep account of the outcome of the courses at 2 points in time: immediately after having received the teaching and 3 months later. E-based analyses were conducted to inform the employee of his/her state of art, whether it was a good or a bad performance compared to other results. Identification of need and demand for IC and execution of transportation of IC to the staff resided in the nearest manager, which did not base decisions on fact based data of K&C, but rather on routines. Data about names, age, origin, position, location, gender, address was may be redundant to (1)/imported from (1) or interfaced with (1, 6, 8)

E-learning (8)

E-learning is a cost saving method to transport IC to the staff that collapses distances in time and space in teaching activities, interfaced with (6, 7).

In GCC e-learning was used as a general tool to secure new staff's K about specific matters (CC's history) or to inform global staff about general new K (ethical codes or new institutionalized methods for whistle-blowers).

Financial accounts (9)

In this range 1-15 of different technologies more or less rooted in the structural capital, financial accounts is the only technology to be named a system in the sense that it comprises every aspect of an IT system: data storage, databases, data retrieval, data transmission, data manipulation. Furthermore it is the only accounting and control system mentioned, because it is concerned with providing data for management that work with management control systems are comprised of definition (1) of goals and the measurement of goal attainment (2), data to evaluate organizational effectiveness (3) overall support of business process and operations management (4) codification of the means (5) benchmarking (6).

The FM accounts produce comparability to non-comparable activities across the company horizontally and vertically in time and space and maintain the financial narrative through frequent value representations ex post and ex ante of all processes. Financial accounts are integrated to most other activities, whether they are IT supported or not.

Personal review/ organizational review processes/ PDD (10)

Yearly managers assess employees in Personal Review processes estimating their results on the job in terms of professional and social capabilities. It is not only the nearest manager but other managers too in a physical dialogue estimating and arguing about the individuals in a 2by2, where an assessment in one of the quadrant functions as an early warning of risk of termination if not improved into another quadrant.

Personal Development processes coordinate & distribute personal management of staff by securing time with the nearest manager and enter decisions in paper sheets, which can document and share status and plans between the two parties. Yearly meetings actualize more personal reflections apart from daily management and allows for mutual reflections at longer range of time. The meetings get structured by templates securing and standardizing content using corporate, departmental and personal KPIs and incentives as career ladders.

Organizational Reviews [OR] seek to aggregate the processes from personal to business level involving relevant managers to produce a shared view on coordination & distribution of resources and function's relations to the stakeholders. This is to optimize top management's management of sections & departments across silos and create an updated coordinated understanding of the state of art to act upon.

OR did not get rooted in IT structures, so paper-born documents were saved in physical folders on book selves or in digital folders.

Although the core focus of the processes are plain or aggregated data on individual capabilities these are not defined or visualized in MTs. A substantial body of literature demonstrates tight links between personal capabilities and individual K&C (Guthrie et al., 2012; J. F. L. Hong, 2012; Hsu & Sabherwal, 2011; London & Siva, 2011; Review & Collaborating, 2011). Data entered in the sheets are accumulated, cross assessed, situated, mixed performance metrics from actual nearest managers and highly accumulated performance representations on organizational level. There is apart from FM representations no integrated IT structure ordering and informing OR processes.

Annual Report on work satisfaction 11

The annual report establishes a shared understanding of the perceived state of art in the staff. It is a stand-alone project distributing surveys to the staff by emails once a year. The input is analyzed and put into figures and tables to illustrate a certain management view. Green, yellow

and red colors indicate the seriousness of acting to improve the elements behind the figures. It is a management tool in its own value. It is not a system and the figures are not structurally interfaced with systems. It is handled as an outsourced service and analyzed in-house. An annual, physical report is produced and functions as a distribution mechanism of awareness about invisible features in organizational state of the art like employee's feeling proud to work for GCC, wish to leave GCC sooner or later, harmony between individual and GCC's strategy/brand etc.

Analyses 12

The group Analysis is mainly a support function to top management. The group extracts fact-based KPI's and statements and constructs matter of concerns that can become facts, when mobilized. They combine occasionally selected data and run designed interfaced data in order to do this. Reports on employee work satisfaction were edited once a year.

MTs about Diversity/Inclusiveness, From-good-to-great, Competence mapping (13)

2 of these 3 technologies are avoidance strategies: they are management foci to proactively manage culture across intern business boundaries to remove/avoid conflicts (Rochlin, 1989)

The avoidance technologies are highly (Boxenbaum, 2006; Chung & Yeaple, 2008) K&C dependent (Page, 2011b) but not related to K&C. The technologies are not rooted in structures.

Text-based K Technologies: Intranet, repositories, yellow pages, doc archives (14)

The passive technologies are mobilized in an IT technology to share K on demand, as an individual pull function in situated or slightly classified contexts. Tapped- in words in search functions serve as identifier of the search item, which is searched in unordered, non-assessed data. (Kreiner, K, Mouritsen, J, 2003) Therefore the search-result requires more searches to become validated or it can remain as is, depending on time and quality.

The technologies are comprised of data storage, databases, data retrieval and data transmission but not of data manipulation. They are not management systems, but search machines constructed of constants, not variables. A variable is a value that may change within the scope of a given problem or set of operations and variables are the main issue of accounting and control systems (Otley, 1999). In contrast, a constant is a value that remains unchanged, though often unknown or undetermined. A "constant" in this context should not be confused with a mathematical constant which is a specific number independent of the scope of the given problem.

People-based technologies: Communities of practice, experience- groups, project sites (15)

The concept in these technologies is to share situated K in groups – often project-oriented and limited in time. The means are the explicating of common experiences within a defined territory, shared docs and words, physical meetings, occasionally situated, interfaced structures. Tacit K (C. Argyris, 1999; I. Nonaka, 1998; Polanyi, 1974 (1962); Polanyi, 1997) might be shared to the members of the groups in unordered, non-assessed data. The technology could be regarded as a local additive to a coded K&C system, because only few elements are in common. Tacit K escapes from the logic of codified K&C, because it is unconscious K, still K has to be communicated in the groups by identifying K in words. As a consequence no IC data are relating the 3 technologies to IC data.

Going through this short recapitulation of existing technologies in GCC it is notable that there are no traces of K&C data worthy to be labeled immutable mobiles and no distribution service. This prevents fact-based management of practices relying on management of K&C to which self-management and management at a distance belong.

There is no IC predictability in the IT architecture. The systems are not able to document personal HC in reports, nor its application in operations. The calculated analyses on non-financial information as for instance various selected constructs of employee satisfaction are constructed by humans calculating and informing in low frequencies (6-12 months) in a push mode – thus not in real time. Decisions of mobilizing actions of corrections are fed once or twice a year by the frequency of analyses and results in a slow pace of adaption and repair. A last MT should be mentioned: a managerial Cockpit, an easy graphic way to communicate levels of loyalty, leave, employee turnover, absence, employee forecast, time to fill, etc. – comparing to objectives and between geographical regions. Output frequencies for these performances measurements and collection mode is excluded this dissertation. Chances are that other MT's not discovered in this study, exist.

The review indicates that there is a potential for a measurement unit of K&C interfacing the range of technologies, which deals with various aspects of corporate people management, because K&C theoretically is identified as a hidden, common variable in most of the technologies.

A4.1 – TIC's Integration to Existing Technologies in GCC

This paragraph describes visions of technological interfaces between existing MTs and ICMCS.

People in SAP

SAP HRM operates at individual level and is able to support IC MTs by registering common variables of K&C in TIC and develop interfaces to new functionalities.

Talent management

The aggregated accounts of K&C of personal IC budgets and accounts from the global list of employees attending the Talent program will represent the growth in the total IC for the group/ the future IC capacity in the group/ which part of the world is producing the best talents/ if the K&C of the group correspond with the future needs for IC in the firm- innumerable benchmarks can be drawn independent of time and space.

Top 300

Top 300 is the label for a global community of the highest ranking 300 employees in the hierarchy of GCC. The group is globally dispersed. The label covers at the same time information about salaries, grades and functions as a synonym for a high profiled annual meeting, where presidents deploy strategies to the next level.

Career ladders referring to demand for IC expressed in the TIC becomes a translucent management tool for motivation and comparisons across boundaries of time and space. The top 300 group, which is an unstable group with a high exchange rate, might improve horizontal collaboration being fast informed about remote IC capacity of colleagues in the phone/ mails/ meetings.

Retention

Management will at a fact-based metric foundation be able to communicate, argue, plan, negotiate and share retention activities, because they are informed at long range of time and space about specific existing or up-coming movement in IC capacities.

Recruitment

Managers in need for future employees create K&C account describing the demand for IC capacity in terms of TIC. The academic K, the experience-based K, the company K and the required competences in each distinction and discipline are listed, maybe negotiated at a distance with stakeholders to the recruitment process and easily shared as a representation of a special combination of N-F values internally and externally through the Web. When decided upon the saved demand-site can travel as a an IC value representation on which the involved various employees can act. When using digital processes in recruitment processes the representation of demands is fast compared with applicants' supply list in an automated process, if applicants are asked to apply using a TIC template. The non-human process can be designed to select within a range of variables delivering a capable group for further human investigations. Applying applicants are highly motivated to register and the effort of data entry into the system is placed outside operations. When engaged the account is imported into the K-bank and thus added to the total IC. The K&C of the new employee gets visible and becomes accessible for the firm right away. The on-boarding processes are facilitated by the IC transparency of the ICMCS enabling the newcomer to find out who knows what where – without bothering new colleagues unnecessarily.

Academy, Courses, E-learning

Future description of courses might contain K lists indicating which K&C will be taught on which level to inform the employees about which kind of IC input they will get/expected output. Integration between output and personal K&C accounts secures an automated update of IC accounts when the course is passed.

Financial accounts

Probably potential integrations between FM and N-FM turn interesting. Every N-F process has a monetary representation too, for instance the need for investment, if the department will enhance the general level of K. The N-F representations decompose the financial figures into N-F processes, which can be negotiated and valued in both F and N-F values.

Personal Review

Today's Personal Review is a process once a year, which output is a 2by2 document showing how managers estimate the individual performance. Ending up with a score in the 4th quadrant is a warning, which certainly tends toward termination. Of the other 3, 1 is brilliant the 2 remaining of various promising status. These are thus managers' estimation of performance.

The Review might be translated into a TIC values for the quadrants and integrated into operations to indicate currently to the employee, in which K&C areas flaws are evident and repairable to avoid proactively to end in the 4th square.

Translated into the TIC Personal Review goes from an annual frequency and a huge consumption of management's hours to a higher frequency aiming to give detailed feed-back in time to avoid unnecessary loss of relevant resources.

Organizational Review processes

Automated aggregated representations in TIC of resource supply on section or departmental level can be compared with forecast describing the total demand for resources, results can be distributed and the meeting prepared into details – a history of the reviews can be saved and benchmarked independent of time and space.

Personal Development Process

Personal IC accounts and budgets can be shared to manage mutual expectations before the physical meeting with nearest manager. They both know corporate strategic K&C budget and can mediate between the employee's personal situation and the firm's need for development of resources. Results from Personal Review can be integrated at a personal site. Potential K&C gaps can be pointed out as well as potential conflicts can be transformed into development of K&C. Organizational change can proactively be prepared by enhancing certain K&C areas.

Annual Report on Work Satisfaction

The Report gives an annual snapshot of the state of art, a series of non-dynamic KPIs, which are compared with previous years.

Unsatisfying areas, where management decides to intervene might get translated into future demand for K&C in organizational change processes and made an input to the strategic IC budgeting process in ICMCS.

Analyzes

Today "Analysis" is fueled by mainly data from FM, People SAP and Work Satisfaction Report and functions as the backbone in fact-based arguments, departmental outputs to GCC. The task is to inform top management of added/lost IC values and their relation to operations.

It is often a matter of belief, some would call it religion, to put a non-fact-based advocacy together in the face of the FM driven top management, because budgets concerning KM, HRM and IC oscillates between the identity of investment and cost. Analysis is today an event-based function.

Provided with TIC data from operations of IC, values added values would be made visible and analyzable and combined with FM data and forecasting capacities in ICM could get accompanied by financial representation.

Diversity, Inclusiveness, From-good-to-great

Processes identified and labeled Diversity, Inclusiveness, From-good-to-great should maybe get categorized rather as projects than technologies. They are methods to change the organization on identified, critical parameters and can as such be seen as technologies. The 2 constructs diversity and inclusiveness are interrelated (Boxenbaum, 2006; J. F. L. Hong, 2010; Kirkman, 2004; Page, 2011b) and the latter subordinated the first; there is a lot of K produced to explicate the elements in diversity (Hofstede et al., 2010) and enhance awareness in teamwork. From-good-to-great was used as a code for MT processes described in practice oriented literature in 2001-7 about how to optimize team work.

By measuring in TIC fact-based aggregated pictures (teams with various degrees of diversity) the impact of the technologies can be turned into metrics to argue and share results.

Competence mapping

The competence mapping process was initiated to reduce the number of different positions and classes of wages. It was carried out to solve administrative coordination problems and reduce administrative complexity and not to provide awareness about capacities. The mapping uses a mixed notion of K&C and identifies exclusively competences linked to positions. The mapping doesn't identify individual capabilities separated in identifiable unities that can be reused in other settings. The question: Who knows what where cannot be answered by this process. If the concern is to share who knows what where, TIC visualize and turns accessible K&C in ICMCS, which distributes K&C in the organizational network.

Text-based K Technologies: Intranet, repositories, yellow pages, doc archives,
Search machines are helpful to find words, but the reuse is often restricted by lack of K about K's context and actuality (Kreiner, K, Mouritsen, J, 2003). Good search takes time¹⁶⁵ 8-20 h/week. Research proves it to be more qualified and effective to find a knowledgeable person to exchange with than stay text-based. The spoken word outdoes the written word, because K is developed quickly and is reusable in new contexts. TIC based search results guarantee K context and quality, because K is related to its rooting context and measured.

Tacit K in Face-to-Face Technologies: Communities of practice, experience groups, project sites

By nature these technologies are situated and some are rooted in systems (W. F. Boh, 2007b; Wenger, 1998). They exchange K between the members in spoken or written words – and when the wording ends by observations, imitations and practice. The technologies cannot be accessed by everybody and don't aim to operate outside the groups. The boundaries reserve the benefits to the members and do not provide corporate notions of control, structured predictability, shared planning or value measurements. The focus on tacit K, which claims K to be situated, is criticized for not being able to travel (J. F. L. Hong, 2012) in a global setting. Accepting such boundaries for the technologies they still serve local conversion mechanism that is supposed to share K and C through social interactions (I. Nonaka, 1995).

What is sharable is discussable, especially when distinctions between K&C does function, because “something” that is named skills, which are capabilities not to be externalized, because words does not exist, only claims to be converted through the doing of the “something”.(Easterby Smith, 2011) The phenomenological call by Haridimos Tsoukas (H. Tsoukas, 2005) in chapter 21 “Do We Really Understand Tacit Knowledge?” reopens the paradox that persons can do, what they cannot tell, but are not able to do, what they cannot remember, i.e. the dementias of Ahlzheimer's disease can walk, but cannot find their way and they can pour water, but not make the tea having forgotten, what tea is. It becomes obvious that the distinction between K&C serves to identify the separate capabilities in skills and share, which skills are able to serve in a social setting, but also that the K&C separation allows for a conversion mechanism to act between K&C.

¹⁶⁵ 2011 Report on UC and Cloud-based services, Urquart : Virtual teams, Distefano & Maznevski: Creating Value with Diverse Teams in Global Management, Tang & Hu:

Communication in Virtual Project Teams in Global Economy, Iacono & Weisband: Developing Trust in Virtual Teams, Hinds & Cramton: Intercultural Collaboration in Global Teams, Montoya-Weiss et al: Temporal coordination and Conflict Mgt in Global Virtual Teams, The Economist, Cognizant Jim Nash: Change Agents for the Global Virtual Workplace

As members of communities of practice are employees registered in People SAP, an interface to their personal K&C accounts would provide outcome measurements from the people-based MTs, because metrics in TIC significant for the community/ the group/ the project would be altered through practice in communities.

How is “something”, which does not even have a name converted into words and metrics and into structure? The communities of practice and experience groups are labeled to identify members. This label is registered in the structure as an object of K and the members register according to this notion of K. The K-object is supposed to become decomposed during social processes of co-presence into K-objects (I. Nonaka, 2005), which are entered into ICMCS and on which the members of the groups register again. The application of TIC ensures the distinction into K’s and C’s. In this way the now local K are distributed over dispersed settings and transmitted outside the groups.

Therefore K becomes sharable, when highly skilled employees with special competences relate to the focus of the groups and K&C can to some extent become converted through the collaboration processes (The home bakery spiral (H. Tsoukas & Mylonopoulos, 2004) and shared, if registered.

All K is personal and involve skillful action (Polanyi, 1974 (1962)) according to Polanyi, who found the notion of “objective” knowledge wrong and pernicious. But he operated with a “personal coefficient” – impacting the skilled action. This must induce a separation between something, which is “known” and somebody acting on the “known” giving it a “personal” color. It is this separation, which is reflected in the construction of the measurement unit The Intangible Currency.

A5 Inquiry Forms in Surveys

A5.1 Survey of Intellectual Capital, knowledge about knowledge:

The following questionnaire is composed for this research project:

Survey on attitudes to “Knowledge” , “Teams” , “Diversity in teams” “Future Knowledge /Planning”								
Open question 1: What does the word “Intellectual Capital” mean to you? Please write a short definition.								
Open question 2: What does the word “Knowledge” mean to you? Please write a short definition.								
Indicator	Question	Answer Category	Other Indicators					
	3 Are you in general aware of how you use knowledge in your daily work?	<table border="1"> <tr><td>1 Not at all</td></tr> <tr><td>2 To a small extend</td></tr> <tr><td>3 Sometimes</td></tr> <tr><td>4 Often</td></tr> <tr><td>5 Almost always</td></tr> </table>	1 Not at all	2 To a small extend	3 Sometimes	4 Often	5 Almost always	Indicator 7: Willingness to act to improve knowledge level Q 5,6,7,9,10,11,12
1 Not at all								
2 To a small extend								
3 Sometimes								
4 Often								
5 Almost always								
	4 Are you aware of using	<table border="1"> <tr><td>1 Not at all</td></tr> </table>	1 Not at all					
1 Not at all								
			Indicator 8:					

Indicator 1: Awareness and behavior with "Existing knowledge"	specific knowledge for specific tasks?	2 To a small extend	Degrees of top down management of teamsetting/ potential for self-management Q 8, 3,17, Indicator 9: Potential for diversity in teams Q 10, 17,20 Indicator 10 Experienced realised diversity in teams 2010-2011 collaborating about legal matters Q 11 Indicator 11 Potential for collaboration in global, virtual teams Q 11,12,13,14,17 Indicator 12 Potential for the establishment of global transparency within the IC on a personal level Q: 15,16,17,20,21 Indicator 13 Diverse management Q 19 Indicator 14 Potential for IC management system Q 20, 21, 26 + indicator 12,11,9, 8,7 Indicator 15 Awareness for future knowledge Q 22,23,24 Indicator 16 Awareness and willingness to develop personal strategic capacity (personal knowledge budget) Q 22,23,24,25,26 Indicator 17 Generally high awareness of knowledge application > < willingness to strategic development of IC <IC management system
		3 Sometimes	
		4 Often	
		5 Almost always	
	5 Do you ask others for help when you have to solve a problem and don't know how?	1 Not at all	
		2 To a small extend	
		3 Sometimes	
		4 Often	
	6 Do you search for knowledge (cases, documents, persons, minutes, accounts, best practices)?	5 Almost always	
		1 Not at all	
		2 To a small extend	
		3 Sometimes	
7 How long time daily do you spent searching?	4 Often		
	5 Almost always		
	1 0,5 - 1h		
	2 1-2 h		
Indicator 2: "Team setting"	8 Who is mainly setting up the teams that you participate in? (The sum must add 100%) Dette svar skal oversættes til nye variable på svarprocenterne	3 2-2,5h	
		4 2.5-3h	
		5 > 3h	
		1 your manager 0-100%	
		2 other managers 0-100%	
		3 your self 0-100%	
	9 How do you choose a collaborator?	4 Colleagues 0-100%	
		5 Externs 0-100%	
		6 Others 0-100%	
		2 The nearest	
	10 Do you prefer to collaborate with Dette svar skal oversættes til nye variable på baggrund af svarprocenterne	3 The usual	
		4 The preferred	
5 The relevant specialist			
1 I never chose my self			
1 Colleagues of same gender			
2 Colleagues From same organisational level			
3 Colleagues of same age			
4 Colleagues same national culture			
5 Younger colleagues			
6 Older colleagues			
7 Cleverer colleagues			
8 More creative colleagues			
9 I have no preferences			

	<p>11 Looking back on the last 12 months: Have you mostly collaborated with</p> <p>(The sum must add 100%)</p> <p>Dette svar skal oversættes til nye variable på baggrund af svarprocenterne</p>	1 Colleagues of same gender 0-100%
		2 Colleagues from same organisational level 0-100%
		3 Colleagues of same age 0-100%
		4 Colleagues same national culture 0-100%
		5 Younger colleagues 0-100%
		6 Older colleagues 0-100%
		7 Cleverer colleagues 0-100%
		8 More creative colleagues 0-100%
		9 I have no preferences 0-100%
		<p>12 Do you collaborate with people you don't know?</p> <p>Dette svar skal oversættes til nye variable på baggrund af svarprocenterne</p>
3 yes, we use digital work space		
1 no		
<p>Indicator 3: "Trust in team-setting/working"</p>	<p>13 How do you establish trust in the mutual work when you use digital workspaces?</p>	1 It is not possible, we establish a physical meeting
		2 I investigate my network
		3 It is not important
		4 I study previous work
		5 we just do it
<p>Indicator 4: "Time to optimal remote collaboration"</p>	<p>14 How long time do you estimate to get a remote collaboration up running 100%?</p> <p>Dette svar skal OGSÅ oversættes til nye variable på baggrund af svarprocenterne</p>	1 a physical meeting is a shortcut
		2 1 day of intensive collaboration
		3 1 week of intensive collaboration
		4 1 month of intensive collaboration
		5 3-6 months of intensive collaboration

Indicator 5: “Prior awareness/ expectations to demand for capacity”	15 Do you know your colleagues’ knowledge and competences?	2 no 5 yes 3 more or less 4 not enough 1 I have never thought about it
	16 Do they know yours?	3 not enough 4 I wish they did 2 no not yet 5 yes 1 I prefer them not to
	17 How would you choose between for collaboration? Dette svar skal OGSÅ oversættes til nye variable på baggrund af svarprocenterne	1 An unknown, but optimal capacity 2 A known less Capable colleague
	18 And what would be the reason for your choice? Dette svar skal oversættes til nye variable på baggrund af svarprocenterne	Texts indicate “Best result”
	19 Do you know any process, department, account or anybody in the company that keeps account for the intellectual capital in the company? Det SKREVNE svar skal oversættes til nye variable på baggrund af svarprocenterne	2 yes 1 no. Pls give ex. of process, departments, accounts, persons
Indicator 6: “Future knowledge/ expectations to demand for capacity”	20 Do you expect a relation between knowledge capacity and bottom line?	1 no 4 yes very important 2 yes on short terms 3 yes on long terms
	21 Do you believe in an important relation between knowledge capacity and the competitive power of the company?	3 yes 2 To some degree 1 not really
	22 Do you know which kind of knowledge The Firm needs in the future?	5 yes 3 yes more or less 4 I would like more transparency 2no but I would like to 1 no
	23 Do you know why	5 yes

	The Firm need that knowledge?	3yes more or less
		4I would like more transparency
		2 no but I would like to
		1 no
	24 Do you know for what kind of use?	5 yes
		3 yes more or less
		4 I would like more transparency
		2 no but I would like to
		1 no
	25 Would you strive to develop your own knowledge to become a more strategic employee?	5 Absolutely always
		4 yes, sometimes
		3 yes, if I had a reason to do it
		1 No, I know my work already
		2 No, only if I had to
	26 Would it help you in your work and carrier planning to have transparency in corporate future knowledge development?	5 Yes, it makes sense to my work
		4 Yes,it would make sense to my carreer planning
6 Yes, it would make sende to both my work and my carreer planning		
3 Transparency is always nice		
2 I would study the relevancy for my work		
1 No I stick to my work		

A5.2 Survey of Self-management

The following questionnaire has been used from the National Competence Account,

<http://pub.uvm.dk/2005/NKRrapport/>

Survey "Self Management"							
Indicator	Question	Q#	Dep.	Answer Category	Index	Frequency	Share %
Indicator 1: Behaviour With Self-Management	Do you plan your working hours in a working day?	1		1 Not at all			
				2 To a small extend			
				3 Sometimes			
				4 Often			
				5 Almost always			
	Do you decide how you will solve your	2		1 Not at all			

	tasks?		2 To a small extend			
			3 Sometimes			
			4 Often			
			5 Almost always			
	To what extend do you have an impact on what you are working with /your tasks?	3	Not at all			
			To a small extend			
			Sometimes			
			Often			
			Almost always			
	Have you within the last 3 months extended your working hours because you felt that it was necessary to do your work properly?	4	Never/ it is not possible			
			Now and then			
			Sometimes			
			Often			
			Very often			
Indicator 2: Incentives to get more self managed	Do you feel any desire to enhance your own impact on your work?	5	Not at all			
			To a small extend			
			Sometimes			
			Often			
			Almost always			
	Do you feel well informed about the strategy in The Firm?	6	Not at all			
			To a small extend			
			Sometimes			
			Often			
			Almost always			
	Do you feel any responsibility toward the development of The Firm?	7	Not at all			
			To a small extend			
			Sometimes			
			Often			
			Almost always			
	Can you identify with The Firm'S image?	8	Not at all			
		To a small extend				
		Sometimes				
		Often				
		Almost always				
Indicator 3: Corporate frames for self management	Does your manager inspire you to take more responsibility?	9	Not at all			
			To a small extend			
			Sometimes			
			Often			
			Almost always			

Indicator 4: Balance between work and private life	There is normally a good balance between my working life and private life?	10	Not at all			
			To a small extend			
			Sometimes			
			Often			
			Almost always			
Indicator 5: Action on collaboration	Do you decide with whom you want to collaborate?	11	Work alone			
			Not at all			
			To a small extend			
			To some extend			
			Sometimes			
			Often			
Indicator 6: Action on work/life balance	Did you within the last 12 months take any actions to alter the time-balance between work and private life?	12	No			
			Yes			
			Not really			
Indicator 7:	There are in my work context obstructions for establishing a higher degree of self-management	13	No wishes to become more self-managed			
			From management			
			From company,			
			From colleagues			

A6 Critical Reflections over Data Entry in Existing KM TM

The paragraph explores existing knowledge-sharing MTs. It outlines current ways to think of and execute knowledge sharing to illustrate differences in basic conceptions of knowledge. The study of distinctions in practice contrasts and purifies the conceptualization of “attractive features” in accountable knowledge. Major differences are identified in the use of data like reliability/trust and updating activities, partiality, objectivity and multi-functionality.

One Danish company, DIEU, has chosen to record data that is complex, i.e. data called “Sales”, “Requirement management”, “Power Point”, “On-the-job-training” considering data “measurement of competences” (P. N. Bukh et al., 2003). Their knowledge geography is inconsistent, however: “Power Point” is a software program, you can learn to use; “Sales” is an activity measured by turnover in monetary terms; “On-the-job-training” is an activity that may be contra-productive in sales. The measurement of competences is compared to the preceding years in the same organisation, but not to that of other organizations. In DIEU, the identification of level of complexity of data was strategically founded (P. N. Bukh et al., 2003; P. N. Bukh et al., 2003). The ambition was to communicate a strategic gap to the employees and fill it through situated education, which is only one element in the range of actions in the knowledge coordination & distribution logic and here linked to time and space. The chosen level of complexity prevents potential combinations of the elements.

Another example: in the public Danish Competition Authority, DAC, a competence catalogue dealing with general meta-competences like:

- autonomy and responsibility,
- capacity to collaborate,
- quality and efficiency,
- capacity to adapt and develop,
- disciplinary knowledge
- competence

measures those on a scale from 1-5, and serves both to communicate and remove gaps through education. These competences are not specific to the company and could apply everywhere. The reason for using measurement of competences is to translate intellectual capital into data that makes the capital manageable. Although these examples are about repetitive routines, the organizations also engage in ad hoc project work and expose themselves to development and demand for innovation. They have not considered the recording of competences as a proactive tool for development or projects, even though the technologies are individualized, but only as general tools for appropriate education. The usefulness of the competence assessment is thus dependent on local ability to identify the competences that management want to measure. The technologies cannot overcome their proper blindness to inter-organizational or market gaps, because data in DIEU is framed by strategy and internal managers, as well as self-assessed without comparison of data from outside the company, and – in the case of DAC - because data is generic, complex modules of mixed K&C and personal attitudes. The intermingled data prevents qualitative measurements, they are self-assessed, situated, and offer no mechanisms for external comparisons providing corrections and repair legitimacy of future management processes. Finally, they provide no trust at a distance (Andriessen, 2004). Combining the elements does not make much sense,

because they cannot be trusted and accounted for. What, then, is the appropriate level of complexity for individual data of K&C?

Repositories are representative of the perception of knowledge as linked primarily to text rather than figures (merged). In repositories, often accessible from local Intranets as text on sites in a digital media, knowledge is frequently context-dependent and often searchable only in relation to predefined organizational issues and topics. Repositories act as extended digital telephone books, often known as Yellow Pages, which store knowledge in relation to staff, linking their education and experiences, typed in or imported as text. The reuse of the compiled knowledge is problematic, because it is complex and may be, and often is, outdated (Kreiner, K, Mouritsen, J, 2003). Knowledge can be found in media and archives, more or less structured, often as information. Best Practices are on the contrary, human transport of unstructured, even tacit knowledge in rule-based, experienced processes, linked to contexts, which means that knowledge cannot travel (A. M. Barrett, 2006; Figallo & Rhine, 2002; Gammelgaard, 2010; Mavin, 2007; Wenger, 1998). Even though expert systems are elements in this kind of storage, chained to human actors, segregation and organizational culture can prevent them from having relevant or even necessary impact (Garrett, 2004). Experts are required to travel, and there is an account of embedded knowledge represented by the numbers of experts, their educations and total wages in financial figures. This way of knowledge thinking is thus the foundation for the development of digital glossaries like Yellow Pages, "People to document" and Q&A systems. These non-dynamic text based encyclopaedias imply that the world does not change, or at least not too fast, that the organisation consists of repetitive processes, and that time as a strategic parameter is relatively unimportant. Texts are sensitive to local interpretations and may be read with different cultural glasses and preconceptions (Hofstede et al., 2010). These KMTs are therefore ineffective optimization tools, ignoring dynamics in knowledge by ignoring the interpretive aspect in the understanding and management of knowledge and by not taking into consideration the rate of change, time, and location.

Contrary to knowledge stocks, systems are more complicated tools offering functionalities that are more sophisticated. Investigating where knowledge is found in systems represent a group, here represented by selected few, the broadly deployed management system, Balanced Scorecard, (Epstein & Manzoni, 1997; R. S. Kaplan & Norton, 1996) and a newer program manufactured by SuccessFactors. The Balanced Scorecard is chosen because it probably is the most applied system (Qu & Cooper, 2011) and SuccessFactors, because it is the most recently traded, most costly system. They both market a holistic attitude to management and the objective of creating business information on which to operate strategically, but IC resources are black-boxed. They do not assign identified resources to tasks across locations, there is no account of individually located IC, no distribution/coordination mechanisms, and knowledge does not become individually operable, although transcriptions are created to exercise power in the development of Balanced Scorecard indicators, where management consultants and clients seek influence in pursuit of their own aims (Qu & Cooper, 2011), or as an arena for mediation of unstructured collaboration (Quattrone & Hopper, 2005).

Globalization, innovation and system integration are key objectives in the market¹⁶⁶. In December 2012, SAP, the fourth biggest software company in the world, announced the strategic acquisition of SuccessFactors for USD 3.4 billion, and a few months later Oracle bought Taleo for USD 1.4 billion, indicating that the market is ready for systematic management of human capacity. SuccessFactors deconstructed their market communication into sales packages as follows: Performance Management,

¹⁶⁶ <http://www.sap.com/index.html>

Goal Management, Compensation Management, Recruiting Management, Learning, Jam, Succession Management, Employee Central Workforce, Analytics, Workforce Planning and Mobile.

Calculative practices should be analyzed as "technologies of government" as the mechanisms through which programs of government are articulated and made operable. (P. Miller, 2001)

The most general and visible examples of technologies using calculative practices are those belonging to the translation of the world within the economic paradigm. Here the management option or “the program of government” is to coordinate and distribute resources by making actions comparable, which have already or are about to take place; actions that are only comparable through the translation into the economic paradigm. Every action, event, delivery, task, or operation is translated into financial figures, and qualitative reductions take place that remove knowledge from visible representation: documents like budgets, accounts, annual reports etc. The recurring reproduction of these non-human actors through the practical processes of translation into figures is supported by “calculative practices”, which are constituted in organizational routines (Qu & Cooper, 2011; Sarker et al., 2006). The translation of individuals in the Human Resource paradigm is represented by an amount of money, a cost representing wages, social contributions, and personal development. Financial accounting argues that the financial figures capture the value of the employee: the higher numeric value reflects more added value created by the employee but, as previously argued, this translation is not satisfactory for knowledge control; we do not know who knows what, to which extent and the capability to activate this knowledge.

Some companies apply systems to register “competences” as Knowledge Management Technologies, KMTs based on principles of self-assessment via simple rating scales, e.g. expert (5), trained (4), good (3), less trained (2), and beginner (1) - a translation into figures of dubious validity (Andriessen, 2004)- because the self-assessment is heavily influenced by differences in gender, nationality, psychological profile, age, and profession. The method generating input as systemic data is not reliable nor valid (Andriessen, 2004).

In similar systems, the underlying organizational assumption is that of competences as functions of organizational roles (R. Lindgren et al., 2004), or as elements in job descriptions – rather than strategic capacity. Organizations are perceived as stable entities containing various jobs, the sum of which constitute the company. The locality, routines, the self-assessment methodology and the idea of a stable company-entity seem to be elements in these calculative practices that prevent organizational flexibility in exploration and exploitation of the IC (ibid). Therefore, rational, dynamic coordination and distribution of IC cannot be supported by these systems. Their design reveals no intention to coordinate and distribute resources embedded in human K&C, because intellectual resources are not articulated and therefore not operable. Existing KMTs are addressing parts within economic thinking and do not provide devices for combination, distribution, application and leveraging of knowledge to achieve strategic objectives. Nor are management of knowledge, competences or individual calculative practices supported by the KMTs or their IT systems, because

- i) The world view locks competences into local hierarchy and positions
- ii) K&C is intermingled and used randomly
- iii) Few chosen IC items are self-assessed, but the main part is left out
- iv) Individual knowledge is not identifiable

In the following, translation into non-monetary figures will be further illustrated below through advertisements from a global Human Capital Management market leader. In an annual process of personal reviews, non-monetary figures are constructed on a set of negotiated critical success factors, like “communication” and “customer focus”, in different fields of competences.



“Getting an accurate assessment of your talent quickly and efficiently is always a challenge, but when critical business decisions need to be made, you want to have the most up-to-date” “information available at your fingertips.

Figure 68 Screen dump from a product from a global HCM market leader

Annual performance reviews capture performance information, but they do not provide valued overviews or the side-by-side team comparison essential for allocating processes. Non-monetary figures in “valuation processes” based on self-assessed estimations related to skills and competences in job-descriptions are thus found in KM TMs. On this basis, self- assessed key performance indicators or measurements are constructed. In the above example, the construction facts are not revealed. The self-assessment may be mixed with the assessed figures from the nearest manager or with figures from organizational reviews. Still, they are constructed figures of estimations or output, retrospectively informing the user about accounts or intentionality, but not in any reliable, documented way about the potential knowledge input available in the staff as recommended in the guidelines (Baltazar & Ernst & Young. International Financial Reporting Group., 2012). The process belongs to valuations in group 4 in the valuation table¹⁶⁷.

Summing up:

- *K&C are susceptible to local interpretation, so it may be difficult to compare & choose figures constructed of multi-dimensional measurements in global firms, because the translations are black-boxed, the reductions and amplifications are uninformed;*
- *Communication about values is not reliable: local interpretations will vary and may lead to inappropriate interventions;*
- *There is uncertainty in and about what is measured; the multi-dimensional figures are conglomerates of K&C and the complex figures cannot inform about the quality of individual knowledge;*
- *Self- and manager-assessments are known to be biased by other interests;*

¹⁶⁷ Chapter 2.5 Valuation of Knowledge in Organizations/ Valuation of Knowledge in Existing IC Management Technologies

- Conflicts are created, because activities across locations may be staffed inadequately or inappropriately

- K&C are intertwined, locally situated and linked to persons and job-descriptions. The noted knowledge therefore partial and rigid

These points demonstrate that these MTs do not support management of individual knowledge as input nor as assets in operations and that MTs fail to enter data about individual resources which are objective and independent of time and space.

The ambiguous understanding of KMTs call for a conceptual framework for knowledge, its valuation and control in order to facilitate a common understanding of the phenomena as assets in operations (Bontis, 2001; Guthrie et al., 2012).

A7 Research agreement between the department and the researcher



**PLANNING FOR THE
UNKNOWN**

Industrial PhD in “Anonymized”

Agreement

About

Participation in Research Project

“Planning for the Unknown”/ PLATUN

Agreement

About

Participation in Research Project “Planning for the Unknown”/ PLATUN

WHO

The research project is an industrial PhD project between "Anonymized" A/S, "name" president, department "Anonymized", specialist Anne Krebs, "Anonymized" and CBS, Copenhagen Business School

and

"Anonymized" title, name, company. 50 employees in CR Function working all over the world will participate in the project.

WHAT

The research will examine and document a new way of measuring knowledge and competences that shows the total quantity and the quality in chosen knowledge areas.

An assumption is that change in the intellectual capital will impact the bottom line - an ambition is to show how and in which way.

The overall ambition is to prove the Intellectual Capital to be controllable and a suitable foundation for forecasts and increased corporate agility via fast establishment of ad hoc virtual teams on a global basis.

For details, please look index no 1, Project Presentation

WHY

One of the parameters to distinguish The Firm from our competitors is our knowledge and competences. This parameter is getting more important in the future. Unfortunately we don't know how to identify and measure this very important competitive resource.

Looking backward the Annual Report tells us if we performed good or bad, but we don't know how our knowledge and competences, the Intellectual Capital, in the most optimized way contribute to the bottom line. Exactly these two features, knowledge and competences are the main elements in this research project.

Looking forward The Firm want to collect and share knowledge in a way that allows us to plan and execute our decisions exploiting the capital in the best way

HOW

The project will establish a test using soft ware that transforms Intellectual Capital, e.i. the employee's knowledge and competence into structural capital and make it visible and accessible in a Knowledge Bank.

Invested time in Kick Off, Training and Use will already within a few months equal the advantages of

- having fast access to cross sectional knowledge and competences
- establishing self-management

- enabling remote control

Kick offs will be 1-2 h of physical presence, Training will be E-learning based and on demand. Support will be established in dual ways, as context-sensitive help in the software and as super users/helpdesk. Super users will be trained locally. For time schedule look index no 2.

FOCUS ON REMOTE MANAGEMENT, DIVERSITY AND AGILITY

Knowledge and competences in Self-management will become measured before and after intervention. When the options for self-management are reached in staff and management, remote management will become practiced and measured. The fact based rationale will enable benchmarking and management decisions on levels of self management and remote management in departments

DATA COLLECTION

The qualitatively collected data will be based on web-surveys to employees in the population every 6 month 4 times during the project and a number of analytic interviews of managers carried out by the researcher.

The quantitatively collected data will be based on clicks. Using the tools in daily operations the employees will search for knowledge, establish knowledge teams, plan their knowledge budget etc. – and the data collection does not demand any action only the use of the software.

EXPENSES

The CRF will have to invest the time in the research processes here described. Mainly the work consists in answering surveys/ interviews and register knowledge and competences in the Knowledge Bank.

The CRF will have to invest time in an operating project team working together with the researcher, a manager and 1-2 super users.

Travel expenses excl. the researcher's will be on CRF's account.

EXPECTED RESULTS

In research no results can be guaranteed, but it is an ambition to create considerable savings and improved quality of work. The software will offer a range of functionalities to document, develop and exploit intellectual capital.

On longer terms the software will support strategic development of IC in a fact based way, supporting the planning of quality and quantity in IC to reach financial goals.

The software can be used to allocate Intellectual Capital globally in an optimized way, enact remote management and document strategic staff, identify up-coming global employees etc.

Attached index no 1 Project Presentation, no 2 Time Schedule

Randers, Approved:

Dato navn

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