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Establishing basic requirements for cooperation development: Information technology and organisational change in SME (FIRST DRAFT)

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Summary/Abstract

New information technologies form an important basis for manufacturing innovative and high-quality products within increasingly short times as well as for cooperation and strategic alliances. However, making efficient use of these technologies for business processes both inside and outside the company requires that the staff will be qualified accordingly. Given the magnitude and pace of technological changes, it is possible to keep abreast with the state of the art in limited sectors only. Traditional training systems are hardly sufficient any longer to ensure required qualifications as the half-life in the field of computer technologies is as short as 2 1/2 years.

This presents an enormous challenge, especially to SMEs. Existing hierarchic structures are often an impediment to the efficient introduction of computer supported cooperative work (CSCW). Anxieties and particular interests of departments and individuals are not taken into account. These factors that considerably diminish success and are often underestimated in their impact by technology advisors, frequently because they lack the necessary qualifications to consider the human factor in planning a project. Moreover, the key qualifications necessary for the efficient implementation of CSCW cannot be acquired by purely technological training. It has to be borne in mind that the introduction of CSCW also changes areas of work and organizational structures in a company. Mutual exchange of information and skills that have been acquired at the initiative of individual staff members is. It is vital that company staff is trained in key qualifications (learning how to learn, adaptability), so that they will be able to cope with these changes on their own.

A new systemic approach will be presented, which takes into consideration the interaction of technological and organizational developments as well as all levels at which cooperative behavior has to be learned in order to ensure successful networking of SMEs on the basis of new information and communication technologies (ICTs):

- Installation of learning circles to solve EDP problems within companies
- Counseling of managerial staff to assess ICTs and educational measures
- Seminars for inter company training and network development

Based on this systemic approach a project has been implemented in Upper Styria, i.e. in an "old industrial area" where self-initiative and the ability to adapt are comparatively less well developed. The article is based on two years of practical experiences with companies in this region.*

Key Words: Information Technology, Organisational Development, Learning, Co-operation

Introduction

According to several observers, organisations are in the midst of unprecedented uncertainty and chaos, and nothing short of a management revolution will save them [Naisbitt, Aburdene 1985; Peters 1987; Kilmann, Covin 1988; Kotter 1996]. Economic development is driven by production of innovative and high quality products at fair market prices in constantly shorter time. Requirements can be met by ".... discontinuing coercion of new combinations of means of productions" including new markets and implementation of new forms of organisation, as Schumpeter already defined innovation [Schumpeter, 1927]. New technologies such as CNC (computer numeric control), CAD (computer aided design) and new ICT (Information and communication technologies) are important process innovations. Even though on an aggregate level indications for improvements in productivity or profitability are low, heavy investments in IT has developed to a cost of just being in the business [Scott Morton, 1991].

Small and middle sized enterprises (SMEs) are particularly affected by these developments. On the one hand, because due to their small size, they depend on narrow market segments, but still must act quickly and in an innovative way. On the other hand, because as ancillary suppliers they are frequently an immediate part of the net product chain of big companies and, as a rule, have a weaker negotiating position. In order to face these challenges it makes sense for SMEs to accelerate internal and external processes by the deliberate use of modern information and communication technology (ICT).

However, the reasons which lead on one hand to the strategic meaning of ICT for SMEs are on the other the obstacles of innovation:

ICT changes rapidly, thus knowledge for decision making is hard to build within constraints of time pressure and workload. They involve high investments, money is than saved with insufficient qualification due to attitudes of entrepreneurs and employees based on bad experiences with standard seminars. Implementation of ICT therefore is often realised as pure technical solution which leads to a sub-optimal usage of the technology.

The following problems can be observed:

- *Companies* invest in expensive infrastructure which end up in low rates of utilisation, although the existing infrastructure is not exploited to the whole extent. Inadequate organisational structures and lack of information flow can be located.
- *Employees* view new technologies as possible control instruments. Inadequate training leads to anxieties about using the new technology. They have too little experience in productive exchange of information in order to help each other improving their knowledge.
- *Entrepreneurs* who are used to take decisions on their are driven by the fast changes and confronted with the anxieties about information monopoly loss. Information that is widely shared reduces the concentration of power at the top of the organisation. Decision making, once the exclusive province of senior managers who had key information, could be shared by organisation members.

The strong technology-oriented approach, without any consideration for organisational changes can be seen as one of the reasons these problems. This can be traced back to a lack of awareness by managers, entrepreneurs, employees for the necessities of the integration of technology, training, organisational issues. Qualification deficits and traditional cultures lead to insufficient experience in their co-operation. Usually there is almost no participation of employees in the process of planning, selecting and implementing ICT. Training of employees which follows a traditional approach after the implementation of ICT is only reactive . However the effective use of ICT for business processes requires an adequate training which hardly can be accomplished by using traditional training methods since the half-life period of computer technology is only two and a half years.

The following approach shows you a model, which optimises the ICT usage and the organisational development and supports co-operate behaviour by establishing learning teams,

accompanied by technological counselling and coaching of entrepreneurs. Learning teams offer the possibility to get to know the benefits and risks of co-operate behaviour. This intra company interventions sustainably rise the potential to adapt to changes and the innovative power.

The Target Group

Due to their innovative behaviour firms can be categorised as

- * *Outsiders* if they lack any awareness of the problems presented above. Anxieties and prejudices prohibit any counselling into consideration;
- * *Threshold firms* with interest, which are aware of the meaning of research and development but are afraid of losing know-how retention because of missing contacts;
- * *Insiders or innovation experts* have contacts to universities and other keyplayers and are integrated in a network of socio-economic relations.

[Mugler et.al. 1996; Beise, Spielkamp 1996] Whereas *outsiders* usually can't be reached and *insiders* already know how to get the information and support they need, *threshold firms* are of main interest. A sufficient degree of innovation can only be reached when information, counselling and implementation is offered to thresholds firms proactively rather than on a asking bases [Tichy, Wulz 1996].

The Role of Teamwork for ICT Usage

Teamwork is (from production to project management) discussed as a work form to rise productivity, flexibility and job satisfaction. Working in groups may be more fun, but it is not said to be more productive. [Forsythe 1990, Worchel 1991] Problems like social loafing and social facilitation [Shepperd 1993, Geen 1989] can reduce the results of teams compared to results single persons could achieve. Moreover high cohesive groups tend to "group think", thus they resist dissonant information due to a pressure on group consent. [Janis 1982; Titscher, 1992] We often discuss and even try to introduce teamwork without reflecting restrictions and risks. Thus Gebert and Sinclair even talk about "the ideology and tyranny of teamwork [Gebert 1992, Sinclair 1992].

Although most results on teamwork are based on experiments in an artificial environment we would like to emphasise group structures as better reacting to permanent disturbances than hierarchical structures [Bavela, 1952].

Complex technology like ICT can be bewildering to people because they interfere with their normal flow of work. Individuals are able to overlook a small subset of functions only. Moreover CSCW usage needs a deeper understanding of business processes. Thus sharing information and tacit knowledge can provide a better usage of technology.

The need to introduce high level ICT however depends on the size of a firm, the production branch and the market. Where CSCW is not needed, hierarchical structures can still be the best form of organisation.

Description of the Model

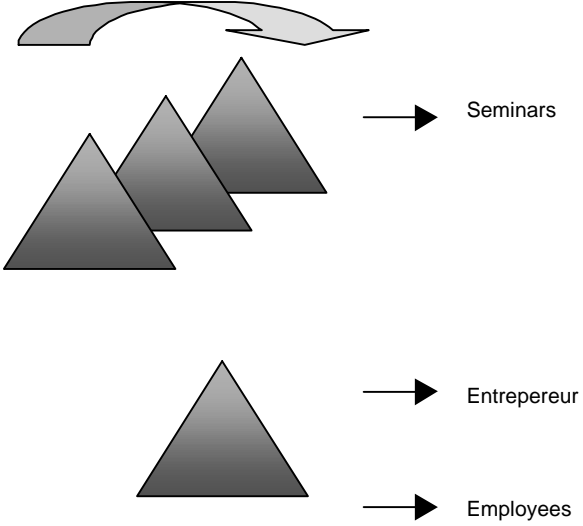
For the development of the concept the relationship between technology, leadership and qualification was taken into account.

Three levels of intervention are offered simultaneously:

- * Top executives get individual counselling concerning the essence and effects of different ICTs on organisational development.

Based on the analyses of the actual technology level of the firm additionally technology counselling is provided to plan the further steps and future investments in ICT. Information about products, development and trends are provided to support decision making.

- * Employees form "Learning teams" whose task it is to solve current EDP-problems by working in groups and to jointly manage the introduction of new hard- and software. Thus the problem solving ability is increased within the company.
- * Inter-company seminars for entrepreneurs, top executives and employees provide them with special knowledge enabling them to continue the training within the company after the end of the project.

Level of Application	Short Time Features	Long Time Features
	<p data-bbox="959 555 1078 611">contracting (seminars)</p> <p data-bbox="959 880 1110 976">Technological counselling & coaching</p> <p data-bbox="959 1014 1129 1111">Learning Team, technological counselling</p>	<p data-bbox="1150 521 1310 618">ICT strategies, qualification representative</p>

Learning Teams

Learning teams with 4-10 participants formed with the aim to cope independently with the problems of the new technology. Here we can differentiate two fields of duties:

Coping with current problems: The groups discuss and analyse the current problems and conflicts related to ICT. By creating an awareness of the different types of approaches of the participants and by accepting them existing knowledge can be exploited and included. All participants work out joint suggestions for solving the problems. If an independent solution is not feasible possible training measures are evaluated and technological consultants are included. Relationships and demands of the different departments are made visible and promote process oriented ways of thinking. Employees learn how to react independently to technological developments. They evaluate the importance for their own place of work.

The concrete contents of the team sessions, time schedules and project plans were found through the "kick-off" analyses mentioned above which took into account the coherence of technological and organisational development. Therefore, depending on the situation of the specific firm in some cases the learning teams could participate in ICT and software decisions and organisational planning.



Coherence of technological and organisational development

In order to define the topics for the learning teams their degree of influence in a specific organisation severe analyses is needed. As their overall topic is the handling of ICT basically a good knowledge about the given infrastructure of the firm is needed. We started with technological counselling. We distinguished seven levels of ICT depending on the degree of support of internal and external communications. *Level 0* identifies no or weak infrastructure and ICT usage, at *Level 6* all business processes and external communication are supported with ICT.

LEVEL	Description of components
0	Single Computers: weak support of work, no network.
1	PCs in a network: common infrastructure supports sharing of data and resources
2	Specialised software supports core competencies (financial accounting, storage administration)
3	external communication supporting internal functions (telebanking, fax server, GSM, central e-mail connection)

4	Internal communication and organisation (mailing system, group-calendar) .
5	Support of internal processes Groupware/Workflow-System, email for everyone
6	full suspension of core competencies, business processes and communication (specific software solutions for branches CSCW, FAX-Server)!!!

Based on the analysis firms planned their further investments. For strategic decisions it is good to consider the work experience of employees, particularly with regard to changing business processes initiated by new technologies. However the degree of possible involvement of employees depends on the organisational culture.

We took leadership as a indicator for communication culture in the company and choose

Likerts rating as an indicator:

Authoritarian Exploiting (AE)

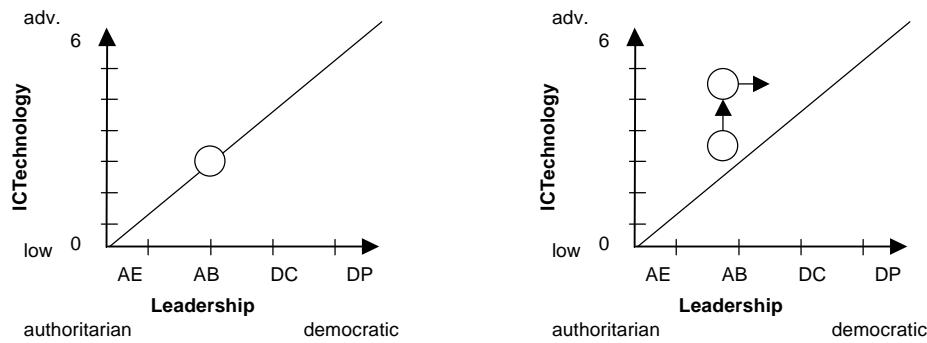
Authoritarian Benevolent (AB)

Democratic Counselling (DC)

Democratic Participating (DP)

The authoritarian exploiting leadership doesn't allow teamwork, employees have nearly no influence on aims, methods and work. The utilisation of job-related knowledge is reduced to higher management. Motivation of employees therefore only lies in personal economic security. *The democratic participating leadership* involves employees in decision making. Teams are a common form of work organisation, motivation for work is high. [Likert, 1961] Likert introduced a normative approach and suggested that there is one best way to manage all organisations. This contrasts sharply with modern theories (contingency theory, system theory), which proposes that managerial practices should vary depending on the organisation's environment, technology, member needs and values.

However we were mainly interested in the aspects of co-operate interchange of knowledge we contrasted leadership with technology level. The optimal balance for a company is defined by the diagonal.



The analyses supports the search for the right intervention: companies rising their technology standard and authoritarian leadership be should move towards more teamwork. Were teamwork is already known counselling may start at a different level.

Type 1: authoritarian leadership and low technology level

Were leadership can be classified as authoritarian exploiting teamwork will not be accepted by management because its dynamic is hard to control. Employees, when asked to act autonomously, will fear to do something forbidden. Qualification for employees will be rare and is taken into account technical aspects will be of greater interest than training of key qualifications. Only at a low technological level 0 to 1 (see above) sufficient performance can be guaranteed.

Type 2: authoritarian leadership and moderate technology level

Leadership is authoritarian, but benevolent. Suggestions of employees, but teams are not empowerment to take decisions. Employees are still blocked by fear of sanctions. Information technology will support core competencies and external communication for special administration purposes only. Awareness of the importance of qualification is given, but realisation is restricted by time load and budget shortage.

Type 3: democratic leadership and high technology level

Technology supports administration with specific branch software, external communication is ensured with decentralised email and fax functions. Personal mastery [Senge 1990a. S7ff] of employees is promoted. Qualification is not planed strategically but can be classified as reactional behaviour.

Type 4: team and training orientated leadership and advanced technology level

All departments and communication processes are supported by ICT. There is a dynamic development of competencies in which all employees are involved. Information and internal knowledge is made available electronically for everyone (success is accelerated by accelerating the failure rate [Peters, 1989]). Qualification is an important aspect of strategic development, technological aspects are combined with key qualifications. Level of qualification is high and further improved as an important aspect of strategic development, whereas technological aspects are combined with key qualifications.

Expected impacts

Training contents and methods have to be tuned on the given organisational structures of a firm. The expected impacts of such an approach are

- improved usage of ICT within companies,
- improved flows of information due to a adaptation of organisational structures to companies needs,
- improved capabilities of companies in strategic planning and implementation of innovations,
- first steps towards networking through learning of intra-company co-operation (see below).

Conclusions

Three major trends are shaping change in organisations: globalisation, information technology and managerial innovation [Stewart, 1993]. ICT as a "key technology" may function as preparation for a continuous structural change, through the technology itself as well as the process of implementation and training for efficient usage. Especially SMEs lack sufficient awareness of ICT impacts. It is important to refocus the efforts from technology towards human capital and organisational issues. However due to system theory firms resist too many simultaneous changes [Willke, 1996]. Careful analyses is needed in order to find the right starting point and a sufficient time line has to be considered (the practical experiences with the project INVAR has shown the necessity of up to a half year planing, technological counselling and coaching of entrepreneurs before learning teams could start their work properly).

Discussion

With our approach we try to adapt threshold firms to rapidly changing environmental conditions. We do so by taking care of human resource and structural development. New forms of learning and project organisation are introduced in SMEs. With respect to the magical square for promoting organisational learning these are only small aspects of a complex system where structure, aspects, culture and employees have to be taken into account [Probst, Büchel 1994]. System thinking is practised only in a tiny field of interest, based on the introduction of SME and only on the levels of entrepreneurs and management.

In order to change cultural values and to train system thinking sustainably longer and different training would be necessary. Approaches like "the fifth discipline" should be promoted [Senge, 1994]. However with the given lack of awareness it would be impossible to reach SMEs in structural weak regions directly. Even additional training of consultants as a pre-requisite of such an approach. It is necessary to start with problems they can realise more easily and develop further perspectives in the long run.

Further development: effects if intra-company change on further co-operations

A strategy nowadays promoted to overcome structural weaknesses and severe competition is the "top down" search and implementation for networks. These efforts only companies (*insiders*, see above) can be reached which have already a certain stage of awareness and fulfil the cultural and technological prerequisites.

As co-operative behaviour is a question of culture, for which especially trust is an important value, for outsiders cultural changes have to be stimulated in order to prepare these firms for networking activities in the long-run. Our approach takes this further development into account by combining intra-company training with seminars where entrepreneurs and employees. While learning about the benefits of co-operative behaviour within their own firms potential partners with complementary competencies get to know each other [Picot 1998, Williamson 1991].

We would like to stress that even networks build with a top-down approach should additionally provide intra-company training for their further sustainable development [Kotter, Heskett, 1992].

Notes

* INVAR ("innovative Arbeitsreorganisation" i.e. innovative re-organisation of work) is a project organised by the Institute for Industrial Management and Engineering (Industriewirtschaft) of Technikum Joanneum in Kapfenberg, Austria. It is carried out by order of the Arbeitsmarktservice (employment service) Styria and it is co-financed by the European Social Fund via the programme ADAPT.

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