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Inside the Black-box: Analysing the Generation of Core Competencies and Dynamic Capabilities by Exploring Collective Minds. An Organisational Learning Perspective**

The paper combines resource-based thinking with perspectives from theories of organisational learning and knowledge management. According to the resource-based view (RBV) strategy can be defined as emergent pattern of interaction generating core competencies and dynamic capabilities. These processes of interaction and their relation to core competencies and dynamic capabilities are of major concern in the presented analysis. A synthesis with learning theories further leads to the basic assumption that processes of knowledge identification, knowledge diffusion, knowledge integration and the enactment of the environment are critical for generating core competencies. Moreover, learning theories show how to approach the causal ambiguity-argument that is important in the explanation of core competencies given by RBV. It will be argued that the analysis of the shared mental model of the organisational members is a method to explore critical processes for generating core competencies. A related research instrument will be validated in a case study analysis that was conducted in a medium-sized enterprise aiming at testing the instrument and the aforementioned basic assumption. The instrument can explore the critical processes in which the generation of core competencies and dynamic capabilities is embedded in. It provides a better understanding of the critical processes within the organisation than the RBV.

Key words: Causal ambiguity, collective minds, competitive advantages, core competencies, dynamic capabilities, knowledge management, organisational learning, resource-based view, strategic processes

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1. Introduction

The resource-based view (RBV) of the firm has been thoroughly discussed in strategic management literature. The basic assumptions of this approach have been developed further during the last twenty years, specified for certain organisational functions and validated in hundreds of empirical analyses (see Barney/Arikan 2001; Rouse/Daellenbach 2002; Ray/Barney/Muhanna 2004). As a consequence, the RBV became a leading paradigm in strategic management (Wernerfelt 1995; Bresser 1998). Even though there is considerable theoretical and empirical progress in resource-based research shortcomings still exist in the theoretical underpinnings of the approach. These restrict related empirical investigations that try to measure critical resources and processes for sustainable competitive advantages. One of the major shortcomings of the RBV is the fact that the organisation remains a black-box even though it is considered as *the* source of organisational success (Ortmann/Sydow 2001; Priem/Butler 2001). There is a lack in explanations of how heterogeneity arises (Helfat/Peteraf 2003: 997). This is not only a limitation in the eyes of those who regard the RBV as a theory of competitive advantage – if the major interest relies on “rules for richness”, the causal ambiguity argument of the RBV is somehow dissatisfying. Causal ambiguity means that the link between the resources controlled by a firm, internal processes and sustained competitive advantages can neither be attributed from outside nor from organisational members (Barney 1991). Rather, the causal ambiguity paradox – even though it is inspiring – veils the view on organisational internal processes that might have a strategic impact. The RBV does not only lay emphasis on the internal organisation but also limits a deeper understanding of organisational internal strategic processes. For a further development of strategy research a broader perspective of social action within and between organisations as well as between organisations and environments is essential. As Mintzberg (1978, 1994) points out these processes of forming a pattern of strategic action have been neglected in strategy research (see also Quinn 1984). Mintzberg and his colleagues suggest different organisation theories that help to specify critical variables, interactions and dependencies of strategic processes (Mintzberg 1999; Mintzberg/Lampel 1999).

It is the aim of this paper to go beyond the RBV by combining this framework with ideas from organisational learning theories and theoretical concepts of knowledge management. Learning theories are regarded as promising because they allow the outlining of processes taking place in the black-box: the generation of core competencies or dynamic capabilities for gaining and sustaining competitive advantages. Learning theories specify critical variables, interactions or relations for strategy generation and hence lead to an understanding of strategy as embedded process. Moreover, a learning perspective corresponds well with the basic assumptions of the RBV. It emphasises knowledge as a critical resource. Similarly, in resource-based thinking “several authors have suggested that knowledge is the most important resource that can be controlled by a firm” (Barney/Arikan 2001: 139; also Wiklund/Shepherd 2003). Hence, emphasis will be laid on knowledge related internal processes. Finally, learning theories have implications for a further development of a research design aiming at testing the rela-

tion between internal processes and core competencies. We argue that collective minds can give access to the causal ambiguity-paradox.

In the next section we are going to outline the theoretical background of the strategic processes of generating core competencies and dynamic capabilities. The RBV and the dynamic capability approach serve as the economic framework. A synthesis with theories of organisational learning and knowledge management then leads to a broader perspective of strategic processes that helps to overcome one of the major shortcomings of the RBV, namely the black-box paradox. The learning perspective gives access to critical organisational processes without disturbing the heart of the causal ambiguity-argument anchored in the RBV. This is due to the proximity of the knowledge management perspective to theories of constructivism that take a closer look at social constructions of reality and collective minds (Fried 2003). The identification of critical knowledge processes by exploring the collective mind will be demonstrated in a case study conducted in a medium-sized knowledge intensive firm (KIF) (see section 3). The administered instrument can be developed further as a diagnosis tool for critical strategic processes or as a test instrument for the RBV. First ideas on this will be presented in the final section 4.

2. Theoretical background for exploring strategic processes

2.1 *The economic framework: Resource-based view and dynamic capability approach*

The basic assumptions of the RBV (Wernerfelt 1984; Barney 1991) and its synthesis with the dynamic capability approach (Teece/Pisano/Shuen 1997) have been thoroughly summarised by Rouse and Daellenbach (2002, 966): “The framework is essentially one that privileges:

1. *resources* (tangible and intangible) which are bundled, linked, incorporated, converted and *organized* into
2. sociotechnical *processes* (knowledge, routines, structures of relationships, cultures, etc.) some of which are *rare*, *inimitable* (or costly to duplicate), and *non-substitutable* that form
3. *capabilities* and *core competencies*. These then become sources of *competitive advantage* which when leveraged into products and services generate
4. *value* and *competitive advantage* which are indicated by their *performance* consequences.”

With respect to Penrose “it is never resources themselves that are the ‘inputs’ in the production process, but only the services that the resources can render. (...) The important distinction between resources and services is not their relative durability; rather it lies in the fact that the resources consist of a bundle of potential services and can, for the most part, be defined independently of their use, while services cannot be so defined“ (Penrose 1959/1995: 25). In more recent writings, services are paraphrased as “core competencies”. These competencies are activities and contributions which lead to high customers’ satisfaction through the organisation of resources in a complex social system with causal ambiguous combination processes behind (Prahalad/Hamel 1990; Barney 1991). ”(C)ausal ambiguity exists when the link between the re-

sources controlled by a firm and a firm's sustained competitive advantage is not understood or understood only very imperfectly" (Barney 1991: 109). This means that organisational internal processes of action and interaction are decisive for the generation of core competencies. But how does heterogeneity as a prerequisite for core competencies arise?

Even though it has been critically reflected whether the RBV might have a too static perspective on resources and core competencies since their relative durability has been related to sustainability (for summary: Duschek 2002) – Leonard-Barton (1995) even emphasises inertia, the core rigidities that are inseparably linked with core competencies – the RBV can undoubtedly be treated as a process-oriented dynamic approach (Ray/Barney/Muhanna 2004). This process perspective has been stated more precisely in the dynamic capability approach that is interested in processes of renewal in order to gain sustainable competitive advantages in dynamic environments (Teece/ Pisano/Shuen 1997). Dynamic capabilities are defined as "the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (Teece/Pisano/Shuen 1997: 516; see also Winter 2003). While the competitive advantage in the RBV will become noticeable in a quasi-rent – the difference between the first and second best way of using resources (Peteraf 1993; Mahoney 1995) – the dynamic capability approach refers to the Schumpeterian rent (Teece/Pisano/Shuen 1997; for an overview: Duschek 2002).

Meanwhile there is agreement on an integrative or synthetic perspective of the RBV and the dynamic capability approach since processes of bundling resources to core competencies and processes of renewing resource combinations for generating dynamic capabilities cannot be separated meaningfully (Mahoney 1995; Makadok 2001; Rouse/Dellenbach 2002; Ray/Barney/Muhanna 2004). Especially in empirical analysis no clear distinction can be made between core competencies and dynamic capabilities. Empirical investigations usually follow a rent-seeking approach (for a critical discussion: Nicolai/Kieser 2002) that does not allow a clear distinction since rents cannot be specified to that extent. The most appropriate dependent variable to describe a competitive advantage is the "*effectiveness of business processes*" since "*distinctive advantages observable at the process level are not necessarily reflected in firm level performance*" (Ray/Barney/Muhanna 2004: 23). Whether the effectiveness of the business process results from the process innovation of the organisation (Schumpeterian rent) or from an outstanding combination of resources (quasi-rent) cannot be answered. Usually, both schemes are applied: a more durable outstanding combination of resources is integrated into a system of further development of the firm's services in order to meet the demands of dynamic environments in a sustainable manner. Therefore, these two concepts will be treated as a non-distinguishable pair.

Since there is the common understanding in the field of RBV and dynamic capability approach that the sociotechnical processes trigger core competencies and dynamic capabilities, a further analysis of these processes is of major concern in strategy research. From this point of view the veil of the causal ambiguity-argument in the mentioned frameworks is not only a shortcoming of these theories but might become an iron curtain preventing a deeper understanding of strategic actions, interactions and processes respectively of the generation of competitive advantages in general.

Even though there are hundreds of empirical analyses based on the RBV (Barney/Arikan 2001; Ray/Barney/Muhanna 2004) the causal ambiguity-paradox has not been given much thought. The examination of causal ambiguities by King and Zeithaml (2001) is therefore noteworthy even though it does not solve the conundrum of causal ambiguity in a very sophisticated way. The authors ask managers if there might be causal ambiguities regarding the characteristics of firm competencies and their relation to firm performance. According to Argyris and Schön (1978) these are “espoused theories”, individual beliefs of what is going on in the black-box or organisation. A picture of the system’s dynamic within the box can not be drawn on the basis of the estimation of a single person. Moreover, whereas the causal ambiguity-argument of the RBV especially serves to characterise the processes of bundling, linking and converting resources into inimitable competencies (Barney 1991), the instrument administered by King and Zeithaml (2001) searches for causal ambiguity in the performance contribution of core competencies. Hence, the method King and Zeithaml (2001) use in order to handle the casual ambiguity-paradox shows some limitations.

It will be necessary to go beyond the RBV and the dynamic capability approach in order to understand the processes that form the strategic patterns of organisations. As will be outlined next, the perspective of learning theories does not only serve as a framework to specify critical processes of strategic action and interaction but also as a framework that suggests alternative ways of exploring these critical processes.

2.2 The process-oriented and methodological framework: Organizational learning theories and concepts of knowledge management

It has been suggested and demonstrated that organisational learning theories (originally: Cyert/March 1963; Argyris/Schön 1978; for an overview: Dierkes et al. 1999; Dierkes et al. 2001; Pawlowsky 2001) serve as a framework for analysing strategic processes in organisations (Mintzberg 1999; Mintzberg/Lampel 1999; Noda/Bower 1996; Burgelman 1996; Schreyögg 1999; Wilkens/Brussig 2003). The learning perspective especially contributes to an understanding of strategic processes as emergent development patterns resulting from the interaction and resource allocation between different organisational agents (Mintzberg 1978; Noda/Bower 1996). This understanding of strategic processes – resulting from a synthetic view on ideas presented in learning theories – will be further outlined. In order to parade the implications for strategy related research a distinction between different learning theories will not be necessary (for a synthesis of learning theories related to strategy research see also Mintzberg 1999; Wilkens/Brussig 2003).

The learning perspective helps to specify the individual and collective agents of strategic processes. Dominant coalitions, the top management team, the middle managers, boundary spanners, knowledge workers as well as knowledge communities are of major concern (Senge 1990; Nonaka/Takeuchi 1995; Lovas/Ghoshal 2000). These agents are interest groups, critical sources of knowledge and information as well as enablers of knowledge diffusion processes that might be of major concern for the development pattern of an organisation. Another key variable in learning theories is the social environment. The organisation is regarded as an open system with a multitude of

exchange processes and interactions with the social environment in which the organisation is embedded (Ulrich/Probst 1990; Probst/Raub/Romhardt 1997). This environment has to be monitored, interpreted and reinterpreted by the organisational members. Thus, learning theory is perfectly aware of the wealth of different sources of information inside and outside the organisation. Moreover, it is important to note that learning theories do not treat sources of information as objective contingencies. Agents are members of an *interacted* system and the environment can best be characterised as *enacted*. Weick (1969) has created the phrase 'enacted environment' which means that "the human being creates the environment, to which the system then adapts. The human actor does not react to an environment, he enacts it" (Weick 1969: 64). Subjective construction of meaning is developed on the basis of symbols and language (von Krogh/Roos/Slocum 1994). Organisational reality is constructed by interaction of organisational members who develop a joint interpretation.

The key element of knowledge thus is not the intellectual capacity. It is the capacity to interact and develop a common understanding and pattern of interpretation in turbulent fields. Organisational knowledge results from former experiences in the enacted system and leads to organisational images (Boulding 1956; Argyris 1964), organisational theories-in-action (Argyris/Schön 1978), organisational minds (Sandelands/Stablein 1987), organisational interpretation systems (Daft/Weick 1984) or shared mental models (Senge 1990). From this constructivist perspective, organisational knowledge can be defined as a result of the subjective interpretation of its members. By this definition knowledge is not understood as an 'objective' mental reflection of reality, but essentially as a co-existing and conflicting interpretation of reality that is based on the history of each participating member of a joint interaction system.

This constructivist definition of knowledge that is rooted in organisational learning theories perfectly meets the ideas of resources, capabilities and causal ambiguity explained in the RBV. In addition, it is able to go further than the RBV by specifying these processes and showing ways for their identification (see also Fried 2003). From the perspective of resource-based thinking knowledge is both, a resource and a dynamic capability. "Heterogeneous knowledge bases and capabilities among firms are the main determinants of sustained competitive advantage and superior corporate performance" (Eisenhardt/Santos 2002: 139). Knowledge is the resource that can be specified independently of the services it renders. Knowledge is the intangible resource which "firms use to conceive and implement their strategies" (Barney 2001: 138). As a specific or heterogeneous enactment concept knowledge can also be regarded as dynamic capability sustaining competitive advantages. "Competence resides in the tacit capability of the firm that results from a process of continued and collective learning, and is embodied in the firm's localised skills and organisational routines" (Cantwell 1992: 8). Moreover, knowledge is a specific pattern of interpretation – the ability to interpret and reinterpret the changing environment – that results from the experiences and interactions of organisational members with each other and with the social environment. Hence, knowledge characterises the sociotechnical process of converting resources into core competencies or dynamic capabilities (see also Wiklund/Shepherd 2003). Even though this idea also belongs to resource-based thinking,

it can be stated more precisely with the help of learning theories. Since the sociotechnical processes are regarded as causal ambiguous in the RBV they remain unspecific. In contrast, the perspective of learning theories places great emphasis on processes of exploring, converting or organising knowledge which are specified in concepts of knowledge management (see below). Moreover, knowledge, as it can be regarded as a resource according to the RBV, can also be treated as a meta-concept, a shared mental model or collective mind that gives access to the system (methodological insights). This idea, even though it is also rooted in resource-based thinking becomes more obvious by combining the RBV with learning theories. The methodological focus can be widened from rent-seeking to system-interpreting. Learning theory thus leads to an understanding of strategic processes as embedded action. This idea of embeddedness goes beyond the perspective suggested in the RBV. Embeddedness concerns both, the internal embeddedness in a community of interaction with shared mental models and the embeddedness in the enacted social environment.

Concepts of knowledge management (e.g. Pawlowsky 1994, 2001; Crossan et al., 1995; Crossan/Lane/White 1999; Crossan/Berdrow 2003; von Krogh/Venzin 1995; Probst/Raub/Romhardt 1997; Boisot 1995, 1998) can further specify the processes of enactment or in other words the sociotechnical processes for generating core competencies and dynamic capabilities. Knowledge management concepts usually distinguish between four phases of organisational learning. According to the concept that was developed by Crossan and her colleagues (Crossan/Lane/White 1999; Crossan/Berdrow 2003) *intuiting* is the first phase that describes a preconscious recognition of knowledge due to individual experiences. Intuitions usually remain individually. *Interpreting* then leads to further insights by combining knowledge with individual cognitive maps and by communicating these insights. *Integration* describes the development of shared understanding or a collective mind. Thus, the individual interpretation will be integrated into group concepts. When it comes to *institutionalising* routines, rules and procedures become established on the organisational level. The four-phase-concept that was developed by Pawlowsky (1994, 2001) is similar. Even though it does not reflect the preconscious processes of the individual to the same extent as Crossan et al. it is more reflective with respect to collective interpretation processes. Pawlowsky (1994, 2001) distinguishes between the *identification and creation* of knowledge which is more oriented on opportunity seeking than the reflection process described by Crossan and her colleagues. The development of shared mental models in a knowledge *diffusion* process is similar in both concepts. When Pawlowsky reflects the *integration* of knowledge he emphasises the institutionalisation of rules and routines as well as the rules for unlearning in order to modify and reinterpret knowledge. The fourth phase in the learning concept developed by Pawlowsky is *action* which means adopting to an enacted environment. While the interpretation and reinterpretation processes are important in both outlined concepts – “As the alignment shifts over time, a firm must be capable of reinterpreting its environment and incorporating its understanding into new products, processes, strategy, and structure” (Crossan/Berdrow 2003: 1090) – the authors focus on different levels on which these critical processes are performed. Whereas Crossan and colleagues (Crossan/Lane/White 1999; Crossan/Berdrow 2003) address the individual level, Pawlowsky (1994, 2001) regards interpretation and rein-

terpretation primarily as collective processes anchored in the collective mind. Therefore, this concept can be regarded as particularly suitable to stress the idea of causal ambiguity that is related to sociotechnical processes that form competencies and dynamic capabilities. These sociotechnical processes can be further specified by the identification, diffusion, integration and modification of knowledge as well as the process of (en)acting the environment.

It is the aim of further analysis to investigate the relation between core competencies respectively dynamic capabilities and processes of generating, interpreting, re-interpreting and adapting knowledge. Are these processes critical for an organisation in order to gain competitive advantages? The relation between the aforementioned variables will be analysed by exploring the collective mind of the organisational members. As will be further outlined in the next section, this is our approach to deal with the idea of causal ambiguity in a methodological sense.

3. Data and method

We conducted a pilot study in order to explore the relation between knowledge processes and core competencies respectively dynamic capabilities. The aim of the empirical analysis is to identify which knowledge processes can be considered as critical for generating competitive advantages. We combine resource-based thinking and the dynamic capability approach with the knowledge process and organisational learning perspective to identify possible firm-specific drivers for generating competitive advantages and dynamic capabilities. For the case study presented next we developed a standardised questionnaire in order to explore critical process variables and to test the assumed relation between knowledge processes and core competencies.

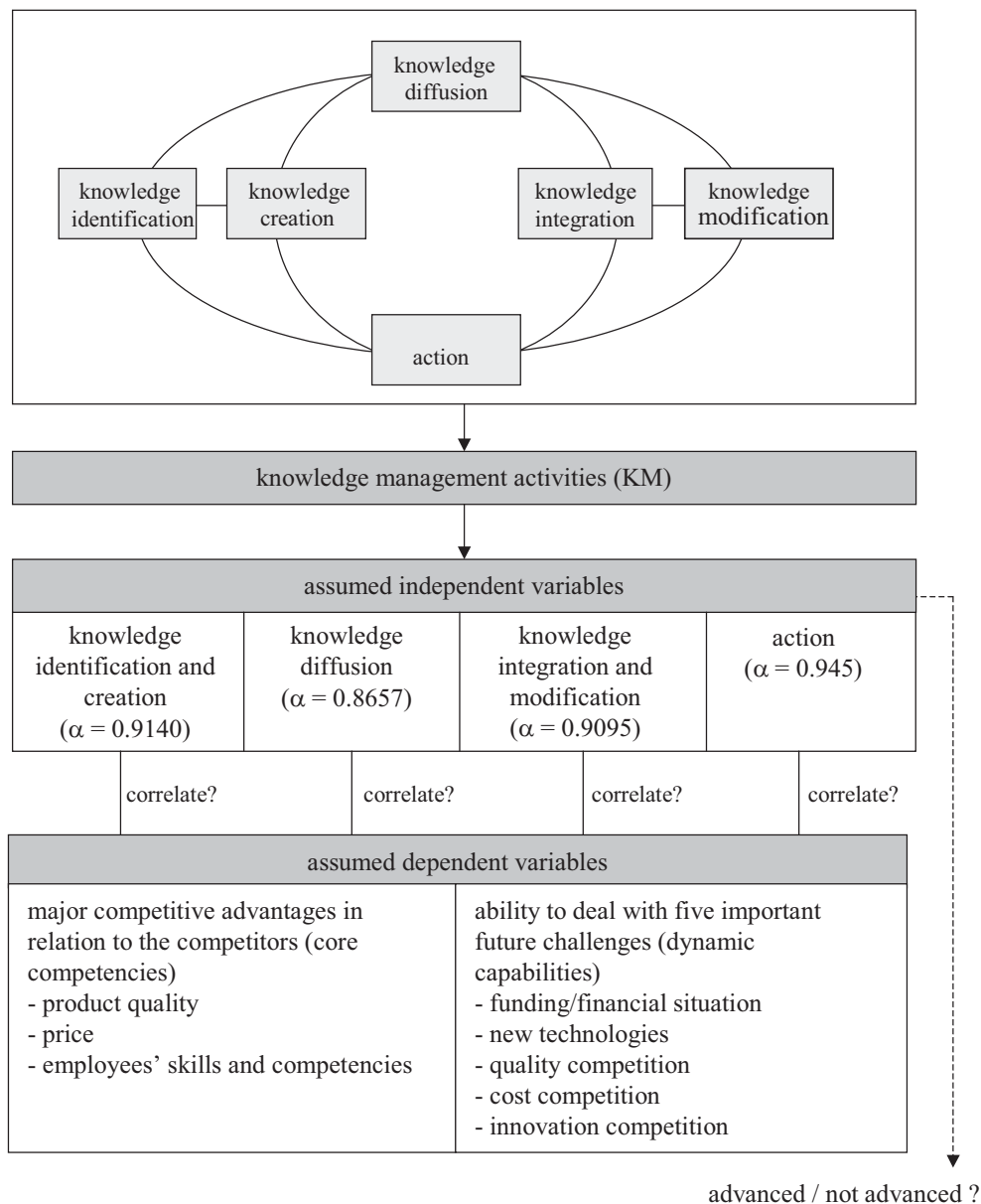
3.1 Variables and measures

Assumed independent variables: The four-phase-model of organisational learning and knowledge management developed by Pawlowsky (1994, 2001) serves as conceptional framework (see figure 1 and section 2.2). The model systemises knowledge related activities in organisations along four – not necessarily sequential – key phases: (1) knowledge identification and creation, (2) knowledge diffusion, (3) knowledge integration and modification as well as (4) action. It includes routines, practices and behaviours that can be regarded as important for organisational learning and development (Pawlowsky 1994, 2001; Pawlowsky/Reinhardt 2002 and the references mentioned there). These knowledge activities will be evaluated by organisational members in our instrument of analysis¹ – assuming that the knowledge process quality can best be judged by those who have to cope with organisational challenges on a daily basis (for further explanation see below).

¹ The instrument of analysis was developed in the research project “Entwicklung und Evaluation eines Wissensmonitoringsystems als Instrument zur Erfassung der Ressource Wissen und ihr Beitrag zur Wertschöpfung“ conducted at Chemnitz University of Technology. The project is led by Prof. Dr. Peter Pawlowsky and supported by the ABWF. Further members of the research team are PD Dr. habil. Uta Wilkens, Dipl.-Soz. Daniela Menzel (nee Haeuser) and Dipl.-Päd. Maud Krohn.

The administered standardised questionnaire integrates more than sixty items for possibly relevant processes of generating, interpreting, reinterpreting and adapting knowledge. Organisational members were asked to indicate the advancement of certain knowledge process related activities on a scale from 1 (very low) to 5 (very high) (see table 3).

Figure 1: Model of organisational learning and knowledge management combined with the design of analysis



During the data analysis these activities were, on the basis of mean scores, combined into variables symbolising the four key knowledge phases. Against the theoretical framework (Pawlowsky 1994, 2001) we assumed four independent variables: (1) knowledge identification and creation ($\alpha=0,9140$; 22-item scale); (2) knowledge diffusion ($\alpha=0,8657$; 14-item scale); (3) knowledge integration and modification ($\alpha=0,9095$; 13-item scale) and (4) action ($\alpha=0,9045$; 14-item scale). The variables had reliabilities above the accepted level of alpha coefficient of 0.70.

Assumed dependent variable: The perceived competitive advantages in relation to competitors (core competencies) and the perceived ability to master future challenges (dynamic capability) are assumed as dependent variables. The ability to master major challenges is a dynamic capability due to the turbulent environment the organisations have to deal with.

Different items describing competencies and capabilities were used as key variables. Employees estimated how far their organisation is able to deal with certain future challenges on a scale from “completely (1) to “not at all” (5). Moreover, the respondents were asked to compare the competitive advantages of their own firm relative to their competitors. We used a 5-point scale ranging from “strongly agree” (1) to “strongly disagree” (5).

3.2 Collective minds to access the causal ambiguity-paradox

As already mentioned, the RBV explains the formation of core competencies with the social complexity and causal ambiguity of organisational processes which means that the causes and effects of knowledge processes for the organisational success cannot clearly be attributed from the outside.

A learning perspective of understanding knowledge as joint interpretation system or collective mind gives access to the causal ambiguity-paradox. We explored the collective mind of the organisation by asking the whole workforce of a company to evaluate the different stages of the introduced knowledge process model. Moreover, the identification of core competencies and dynamic capabilities is based on the joint perceptions of the organisational members. On the basis of shared mental models, joint interpretations of reality and the history of each organisational member we filtered important competitive advantages in relation to major competitors as well as the ability to deal with future challenges.

This means, organisational members do not need to be aware of the contribution of specific knowledge activities to the competitiveness of the organisation. In contrast to King and Zeithaml (2001) who asked experts to specify causal ambiguities we asked all members of the organisation about knowledge processes, competitive advantages and future challenges and searched for relations by correlation analysis. Therefore, none of the organisation’s employees needs to be aware of the contribution of specific learning processes towards the generation of core competencies. The knowledge about the generation of core competencies is anchored in the collective mind. Since the collective mind represents a specific interpretation scheme of an organisation’s advantages and challenges its exploration does not lead to a better imitation of the

specified core competencies. The administered instrument does not bear the risk of disturbing core competencies by spelling them out.

Learning theories have a methodological approach towards causal ambiguities. They help to overcome the iron curtain of the RBV with respect to critical internal processes without disturbing the basic assumptions of the concept. The administered instrument can thus be regarded as an advancement in the research area of empirical studies dealing with the RBV.

3.3 Sample

Our empirical design can be described as a case study research. With regard to complex phenomena – such as processes of generating, interpreting, reinterpreting and adapting knowledge and their relation to core competencies and dynamic capabilities – case studies enable an in-depth understanding (Yin 1984). We use a single case format to examine our basic assumption that knowledge processes affect the generation of core competencies and dynamic capabilities. In summer 2002, we collected survey data in a firm based in the telecommunication-sector. Since knowledge is an important input factor that firm could be described as “knowledge-intensive” (Starbuck 1992). The medium-sized company with 180 employees is located in East Germany. This is worth mentioning since there are a few characteristics that differ from typical companies in West Germany. The workforce is highly motivated, non-unionised, and homogeneous in terms of age, race and qualification. The company places strong emphasis on financial questions and has a comparatively low degree of internationalisation. Even if funding is always an important aspect in small and medium-sized businesses the awareness for problems in this field can be described as very high in East Germany. Our sample includes a total of 116 employees (64,4 percent response rate).

3.4 Data analysis

The data analysis started with the selection of those competitive advantages and future challenges which were indicated as important by the employees of the organisation. Competitive advantages are defined and measured as perceived internal and external advantageous organisational positions in comparison to competitors (core competencies). For further analysis, only those competitive advantages were considered that the employees had quoted as important. In addition, the organisational members identified the most important future challenges and assessed the firm’s ability to deal with these challenges (dynamic capabilities). As a next step we used correlation analysis in order to explore the relation between knowledge processes respectively perceived core competencies and dynamic capabilities.

Moreover, the phase-specific mean scores of knowledge processes clearly indicate which role the four phases of knowledge management play within the organisation. The analysis thus allowed us to draw a conclusion about the advancement of critical knowledge related activities and instruments, since a mean score of 3.5 or higher indicates that the activities are considered by the employees as being highly or rather advanced.

4. Results

Table 1 gives an overview of descriptive statistics (means, standard deviations) for all variables of our research design. In order to specify the relation between knowledge processes and competitive advantages respectively future challenges we conducted a correlation analysis. Table 2 presents the correlation matrix.

The major competitive advantages in the eyes of organisational members of our case are product quality (69.9 % strongly agree and agree); price (64.0 %) as well as employees' skills, competencies and experiences (58.4 %). With respect to resource-based thinking price can hardly be regarded as a means of gaining sustainable competitive advantages since it can easily be imitated by competitors. This variable should therefore be treated with caution in the further analysis. However, product quality as well as employees' skills, competencies and experiences can be a sustained source of competitiveness.

Table 1: Descriptive Statistics

	Mean	Std. dev
<i>Knowledge processes</i>		
knowledge identification and creation	3.04	0.62
knowledge diffusion	2.73	0.67
knowledge integration and modification	2.80	0.76
action	2.71	0.73
<i>Core competencies</i>		
product quality	2.13	0.93
price	2.20	0.95
employees' skills and competencies	2.38	0.76
<i>Dynamic capabilities</i>		
funding/financial situation	2.95	1.06
new technologies	2.16	0.93
quality competition	2.09	0.94
cost competition	2.31	0.84
innovation competition	2.56	0.96

The employees identified the company's financial situation as its most important future challenge (96.0 % of employees said very important and important). New technologies (87.4 %), quality competition (85.7 %), cost competition (80.7 %) and innovation competition (74.3 %) could also be identified as the firm's major challenges. After ranking the future challenges according to their importance the ability to cope with these five major challenges was worked out in the next step where the employees gave their opinion about their organisation's capability to deal with the aforementioned challenges.

In order to test the relation between core competencies respectively dynamic capabilities and processes of generating, interpreting, reinterpreting and adapting knowledge according to the four-phase model developed by Pawlowsky (1994, 2001), a correlation analysis was conducted. If there are significant correlative coefficients knowl-

edge management activities can be regarded as possible promoters for generating core competencies and dynamic capabilities (see table 2). The case study shows that activities of all four phases of organisational learning and knowledge management seem to be important for being competitive. As a major finding it turns out that knowledge identification, creation, diffusion, integration, modification and action can have an influence on all included dimensions of competitiveness in terms of perceived competitive advantages and the ability to master future challenges except the price. As already mentioned, price can hardly be regarded as core competency in the perspective of resource-based thinking since it is easy to imitate. Therefore, it is interesting to note that especially the perceived competitive advantages that are rather inimitable – product quality as well as skills and competencies of employees – correlate with knowledge management processes. Knowledge management processes are also positively related to the ability to master challenges such as funding/financial situation, new technologies, quality competition, cost competition and innovation competition. The significant effects between knowledge processes and perceived advantageous organisational competitive positions support our basic assumption that knowledge related sociotechnical processes enable the development of core competencies and increase the ability to deal with important future challenges.

Table 2: Correlation Matrix

	knowledge identification and creation	knowledge diffusion	knowledge in- tegration and modification	action
<i>Core competencies</i>				
1. product quality	-0.291**	-0.265**	-0.347**	-0.262**
2. price	-0.043	0.011	-0.001	0.043
3. employees' skills and competencies	-0.279**	-0.237*	-0.189*	-0.217*
<i>Dynamic capabilities</i>				
1. funding/financial situation	-0.463**	-0.387**	-0.324**	-0.299**
2. new technologies	-0.374**	-0.323**	-0.256**	-0.272**
3. quality competition	-0.282**	-0.210*	-0.204*	-0.210*
4. cost competition	-0.335**	-0.321**	-0.316**	-0.308**
5. innovation competition	-0.366**	-0.311**	-0.383**	-0.434**

**p<0.01; * p<0.05

From the employees' judgement about important knowledge processes it becomes obvious that numerous of important activities exist (see table 3). For example, the analysis of errors; the exchange of opinions and experiences with colleagues; the documentation of processes and projects as well as the support of superiors/managers are extremely important knowledge related activities. It is interesting to note that according to the joint interpretation of organisational members all phases of the knowledge process play an almost equally important role. This can be demonstrated by the phase-specific mean scores of importance which are in all cases higher than 3.54 (see table 3). Hence, employees assessed the learning processes of identifying, interpreting,

Table 3: Importance and advancement of knowledge management activities and instruments

	importance		advancement	
	mean	N	mean	N
<i>identification and creation (mean of importance: 3.89 / mean of advancement: 3.04)</i>				
analysis of successful projects	4.23	114	2.88	103
analysis of errors	4.59	115	3.13	110
talks with colleagues	4.28	114	3.49	114
talks with superiors / managers	4.02	114	3.33	114
talks with experts and consultants	3.78	115	3.13	110
talks within networks	3.56	105	2.96	89
informal talks (cafeteria, breaks)	3.47	114	2.87	105
visits at congresses, seminars, conferences	3.70	114	2.64	105
further training	4.28	115	2.78	110
reading periodicals	3.70	115	2.88	106
contacts with customers and clients	3.98	110	3.40	104
contacts with suppliers	3.41	111	3.09	93
talks with staff association	3.00	112	2.65	97
contacts with partners in the value chain process	3.68	105	3.21	89
analysis of competitors	4.06	111	3.08	93
assessment of future developments	4.41	112	3.49	104
market research	4.05	111	3.00	98
use of creative technologies	3.66	104	2.56	84
intranet and internet information research	4.18	113	3.39	107
analysis of information	3.86	109	2.86	98
identification of experts	3.99	112	2.78	97
observation of colleagues	3.66	113	2.86	100
<i>diffusion (mean of importance: 3.54 / mean of advancement: 2.73)</i>				
exchange in task forces	4.17	112	3.49	109
exchange in learning- and quality-circles	3.49	110	2.35	94
exchange during conference attendances	3.32	111	2.49	97
exchange in knowledge networks, exchange- and expert-groups	3.65	107	2.49	94
exchange in forums	2.97	108	2.12	90
informal exchange	3.28	110	2.76	101
exchange of opinions and experiences with colleagues	4.32	114	3.60	111
exchange of opinions and experiences with superiors/ managers	4.01	113	3.18	110
job rotation	2.93	113	1.87	101
coaching and mentoring	3.31	108	2.02	91
exchange via video conferences	2.20	107	1.34	93
transfer of knowledge from further training, conferences and congresses within the company	3.71	112	2.24	108
exchange of opinions and experiences to employees	4.19	113	3.16	110
information exchange with project databases	3.59	111	2.57	107
information exchange with e-mail	3.82	113	3.77	108

Table 3: Importance and advancement of knowledge management activities and instruments (cont.)

knowledge management activities	importance		advancement	
	mean	N	mean	N
<i>integration and modification (mean of importance: 3.84 / mean of advancement: 2.80)</i>				
documentation of process flows	4.31	114	3.23	114
documentation of projects and experiences	4.30	114	3.12	113
documentation of know-how of employees leaving the company	3.93	108	2.13	97
documentation of expert knowledge	4.06	111	2.56	102
mentoring-model	3.83	108	2.23	85
use of individual files	4.43	110	3.17	101
use of catalogued files	3.92	111	2.74	104
use of files in the intranet	3.87	114	3.04	103
use of databases	4.18	113	3.30	112
description of working routines	3.43	113	2.46	105
standard operating procedures	3.81	113	2.65	108
formulation of case studies	3.36	110	2.18	97
methods of visualisation	3.37	111	2.82	107
<i>action (mean of importance: 3.77 / mean of advancement: 2.71)</i>				
regularly reconsideration of experiences and routines	3.58	113	2.53	108
post-processing of seminars and conferences	3.66	113	2.44	97
admitting high fault tolerances while testing new methods or processes	3.54	108	3.00	91
demonstration of models, best practices or prototypes	3.46	111	2.49	97
testing of new methods and processes	4.09	113	2.92	103
deadlines for change processes	3.79	113	2.94	104
specifying indicators for evaluating changes	3.68	108	2.78	91
formulation of standards for using new knowledge	3.67	112	2.69	104
realisation of simulations and evaluations of test runs	3.83	108	2.41	95
regular realisation of personnel development talks	3.98	111	2.95	108
regular realisation of performance reviews	3.89	113	3.00	107
support of experienced experts	3.74	113	2.31	108
incentive systems	3.77	108	2.03	101
support of superiors / managers	4.10	103	2.90	102

reinterpreting and enacting as being important or very important. In addition, an overall phase-specific mean score was worked out in order to assess the advancement of certain phases of knowledge management (see table 3). In general, the phase-specific mean scores of advancement are lower than the phase-specific mean scores of importance (2.71 to 3.04). Despite the strategic importance, some of the knowledge activities and instruments are expandable. The findings therefore have a diagnostic character and include information about necessary interventions.

Another finding concerns the relevance of different phases of organisational learning and knowledge management for generating core competencies or dynamic capabilities. According to our empirical findings (see correlation coefficients in table 2) all phases are relevant. Knowledge identification and creation as well as knowledge

diffusion, however, seem to be especially important. With respect to knowledge diffusion this can be explained with the development of a collective mind of common interaction. But since the phase *action* includes several items describing reinterpretation processes a similar high importance as for *diffusion* could have been expected. The phase-specific differences have to be reflected more deeply in further analyses.

5. Summary and outlook

It was the aim of this paper to explore strategic processes that take place in the black-box of the organisation when generating core competencies or dynamic capabilities that sustain competitive advantages. Learning theory served as a broader theoretical framework in order to specify critical organisational processes, interactions and relations. The basic assumption that learning processes of identifying, interpreting, reinterpreting and enacting the environment would generate sustainable competitive advantages was tested in a case study analysis conducted in a knowledge-intensive firm based in the telecommunication sector. In order to analyse our basic assumption we explored the collective mind of the organisational members.

The analysis shows that knowledge processes could be a source of sustained competitive advantages (core competencies) and increase the ability to deal with future challenges (dynamic capabilities). Hence, the empirical test confirms the assumption that sociotechnical processes of knowledge management and organisational learning generate capabilities and core competencies (see also Rouse/Daellenbach 2002). Indeed, the introduced instrument is able to identify critical knowledge processes according to the logic of the resource-based view and the dynamic capability approach. Its measurement focuses on shared mental models of organisational strengths and weaknesses as well as perceived competitive advantages and future challenges. This research approach goes beyond the measurement administered in empirical studies that are based on the RBV. The approach does not only mention causal ambiguity but explores causal ambiguous relations on the basis of a constructivist knowledge perspective. The evaluation of organisational members with regard to the advancement of knowledge processes, the naming of important competitive advantages and future challenges as well as the ability to deal with these challenges is the central idea of the presented research design. Joint interpretations of employees were the key to open the black-box and to deal with causal ambiguity. On the basis of collective minds we outlined the relationship of knowledge processes on the one hand and dynamic capabilities or core competencies on the other hand. With respect to Helfat and Peteraf (2003: 997) and due to the lack of explanation of heterogeneity it can be deduced that internal organisational learning processes play a role that should not be underestimated. Interactions between organisational agents as well as interpretations and reinterpretation activities are undoubtedly necessary within a turbulent environment. We argue that knowledge is not only an intangible resource and dynamic capability but also a causal ambiguous conversion process.

Finally, some limitations of the analysis should be mentioned. The first limitation concerns the data basis. Only one case was presented in this paper. The findings can therefore not be generalised. On the basis of this case study, however, we developed a more detailed picture of the internal strategic processes. As a further research step we

will thus extend the survey to a larger number of organisations in order to re-test the assumptions. The pilot study should therefore be treated as a test of our questionnaire and the analysis design. We have met this goal and our experiences encourage us to extend the analysis e.g. in the form of cross-case comparisons.

A second shortcoming is that while the described method of measuring core competencies and dynamic capabilities is especially suitable to deal with the criteria of causal ambiguity it does not allow to correlate these activities with organisational rents in order to test the broader economic argument of the RBV. A cautious identification of suitable organisation-specific process variables with respect to the identified core competencies and dynamic capabilities that need to be monitored in a long-term analysis can be a further step in the development process of our research instrument (see Ray/Barney/Muhanna 2004). It is worth mentioning that performance indicators have to be identified on an organisational basis. However, the test of the economic framework of the RBV was not the key issue of the presented analysis. The study aimed at an exploration of critical strategy-related internal processes in order to go beyond the RBV and strengthen an understanding of the embeddedness of strategic processes.

In addition, the instrument has the capacity to be further developed as a diagnosis of critical knowledge processes. Our case study already confirms that the questionnaire is able to specify necessary interventions to optimise knowledge and learning processes. Since the instrument serves as a diagnosis tool it can be used for the implementation in organisational internal change processes. The employees' estimation of the organisational strengths and weaknesses should prove to have an important diagnostic value. Therefore, an employee survey combined with a discussion of data in feedback sessions with organisational members does not exceed the capacity of companies – even small and medium-sized companies are able to use the diagnostic instrument. All in all, the instrument allows both: the gathering of firm specific data in order to identify critical points for intervention as well as cross-company comparisons.

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