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# Absorptive capacity, learning processes and combinative capabilities as determinants of strategic innovation

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## KEYWORDS

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**Summary** The current paper focuses on absorptive capacity in the context of strategic innovation. Strategic innovation aims at a re-conceptualisation of business models, the creation of uncontested market spaces, and leaps in customer value. By using the learning-process perspective of absorptive capacity (exploratory, assimilative, transformative, and exploitative learning processes), we suggest that transformative learning processes in particular, play a key role in strategic innovation. In addition, a follower strategy and participative role in the knowledge network, instead of a first-mover strategy and a dominant role in the knowledge network, do indeed promote strategic innovation. Companies should not only manage the accumulation of external knowledge, but also adapt their combinative capabilities (systematisation, coordination, and socialisation of knowledge) in order to succeed with strategic innovation. The findings yield a set of research propositions for further academic and managerial consideration. Two longitudinal case studies of European electricity providers form the empirical background.

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## Introduction

Both practitioners and academics increasingly recognise that competitive advantages no longer rely on internal knowledge alone, but rather originate from absorbing external knowledge. This in turn is based on learning processes, which are directed at exploring, assimilating, transforming, and exploiting external knowledge (Camisón & Forés, 2010; Lane, Koka, & Pathak, 2006; Lichtenthaler, 2009). These

learning processes support companies in converting their external knowledge into innovations (Lichtenthaler, 2009). The literature refers to the absorption of external knowledge and the underlying learning processes as a company's *absorptive capacity* (Cohen & Levinthal, 1990).

*Absorptive capacity*, as an application of external knowledge for commercial purposes, can lead not only to product or service innovation, but also strategic innovation. Strategic innovation aims at reshaping the existing business model, opening-up new and uncontested markets, and creating a leap in customer value (Christensen, Johnson, & Rigby, 2002). However, the research on absorptive capacity has

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only marginally addressed its impact on strategic innovation. Lichtenthaler (2009) measures performance through four items: overall performance in relation to competitors, attaining growth and market share, and current profitability. These outcomes explain differences in the success of existing business models, market share extensions, and incremental customer value enhancements. However, they do not necessarily capture situations in which companies depart from existing business models, open-up uncontested markets, and achieve leaps in customer value.

Our study attempts to fill this gap by examining the relationship between absorptive capacity and strategic innovation. We contribute to theory building, by showing how learning processes and combinative capabilities influence absorptive capacity and determine strategic innovations. In addition, we elaborate how strategic behaviour and network-position variables interact with absorptive capacity. Following these theoretical extensions, we attempt to answer three questions. (1) How do learning processes promote strategic innovation? (2) How do combinative capabilities contribute to or constrain learning processes? (3) How do strategy and network position affect learning processes aimed at strategic innovation?

The research questions are exploratory. The answers to them are expected to contribute to theory-building on absorptive capacity, learning processes and combinative capabilities in the context of strategic innovation. The explored contributions to theory-building are formulated as testable propositions for further academic investigation and managerial application.

The strategic innovation initiatives of two electricity providers form our empirical background. It is increasingly difficult for both electricity providers to create competitive advantages through their *internal* knowledge. Achieving competitive advantages thus shifts toward absorbing *external* knowledge. The next section discusses the existing research. Section "research methodology" describes the research methodology, Section "emergence of strategic innovation" presents our findings, and Section "discussion" concludes with theoretical and managerial implications, also highlighting some limitations of this study.

## Theoretical background

### Strategic innovation

When it comes to innovation, the literature typically uses concepts of product or service innovation. Our use of strategic innovation supplements these notions with those of value and business model innovation. Common aspects of strategic innovation revolve around three key elements: a fundamental re-conceptualisation of the business model, reshaping existing markets, and substantial value improvements for customers (Christensen et al., 2002; Pitt & Clarke, 1999). By comparing standard with strategic innovation, these three key elements can be described in the following way.

Firstly, product and service innovations reinforce the existing business model, but strategic innovation questions it fundamentally. Strategic innovation departs from 'taken-for-granted' assumptions about existing competition

and deviates from the dominant industry recipe (Kim & Mauborgne, 1999; Matthysens, Vandenbempt, & Berghman, 2006). Such an approach can explore a far wider range of strategic options than companies following the conventional logic, because they question almost everything about their particular industry. Strategic innovation thus allows companies to find opportunities, where others see only constraints (Kim & Mauborgne, 1999).

Secondly, product and service innovations can extend existing market shares. Strategic innovation reshapes existing markets by changing the nature of competition. In that sense, strategic innovators look beyond the conventionally defined boundaries of competition, in order to discover uncontested market spaces and seek radically superior value, which renders competition irrelevant (Hamel, 1998).

Thirdly, innovation strives for incremental or radical new products and services. Such product and service innovations are characterized by their newness, from customer or technological perspectives (Brentani, 2001). Strategic innovation generates leaps in customer value perceptions, which are not limited to the newness of products and services from the customer and technological perspective, but also include innovating customer roles and skills in the value creation process (Michel, Brown, & Gallan, 2008; Normann & Ramírez, 1994).

### Absorptive capacity

The concept of absorptive capacity is embedded in the debate on dynamic capabilities (Helfat et al., 2007; Teece, 2007; Zollo & Winter, 2002). Dynamic capabilities originate from the evolutionary theory of the firm (Nelson & Winter, 1982). Dynamic capabilities enable companies to respond to changes in the business environment. They avoid a 'competency trap', in which competencies become irrelevant due to changes in the business environment (Teece, 2007). Zahra, Sapienza, and Davidsson (2006, p. 918) define dynamic capabilities as the managerial ability "to reconfigure a firm's resources and routines in the manner envisioned and deemed appropriate". Dynamic capabilities are beneficial in highly turbulent settings (Teece, 2007; Zahra et al., 2006).

*Absorptive capacity* was defined originally as a firm's ability to recognize the value of new information, assimilate it, and apply it for commercial purposes (Cohen & Levinthal, 1990). Since the original definition, various conceptualisations of absorptive capacity have emerged (Lane et al., 2006; Lev, Fiegenbaum, & Shoham, 2009). While the early conceptualisations focused on R&D-issues, later research broadened the concept to developing absorptive capacity at the organisational level (Lichtenthaler, 2009; Tsai, 2001).

The existing conceptualisations describe absorptive capacity as the independent variable and innovation performance as the dependent variable. Conceptualisations also entail moderators, which can either strengthen or weaken the relationships between absorptive capacity and innovation outcomes. For example, Bosch, Volberda, and de Boer (1999) propose business strategy as a moderator. A first-mover strategy yields advantages when it comes to building-up absorptive capacity. By contrast, a follower strategy requires lower absorptive capacity. Similarly, Tsai (2001)

argues that the centrality of a company's position in the knowledge network strengthens the impact of absorptive capacity on performance.

Zahra and George (2002) divide absorptive capacity into *potential absorptive capacity* and *realised absorptive capacity*. The former captures knowledge acquisition and assimilation, which refer to a firm's capacity to identify and acquire externally generated knowledge. Realised absorptive capacity refers to the capacity to transform and exploit the knowledge for commercial purposes. The literature is contradictory on the sequence of knowledge absorption. Zahra and George (2002) and Jansen, van den Bosch, and Volberda (2005) conceptualise the sequence as a linear relationship between acquisition, assimilation, transformation, and exploitation, whereas Todorova and Durisin (2007) interpret assimilation and transformation as two parallel elements. Knowledge is assimilated, if the existing cognitive structure of organisational members does not change. Transformation means that new knowledge is interrelated with changing existing cognitive structures.

Independent of the sequence of knowledge assimilation and transformation, potential and realised absorptive capacity are linked through an efficiency factor. A higher efficiency factor leads to greater innovation performance, because organisations pursue a course of action in response to their potential knowledge (Zahra & George, 2002). According to the efficiency factor, Winter (2000) suggests that satisficing, rather than optimising, guides managers in transforming potential into realised knowledge. Knowledge stocks accumulated through potential absorptive capacity function as strategic reference points and aspiration levels.

Both potential and realised absorptive capacities are cumulative and depend on past experiences. Efforts to develop absorptive capacity in one period make it easier to accumulate it in the next (Cohen & Levinthal, 1990). Accordingly, absorptive capacity is not static, but rather evolves through learning processes (Todorova & Durisin, 2007). Lane et al. (2006) conceptualise absorptive capacity as a firm's ability to utilise external knowledge through three sequential learning processes: exploratory, transformative, and exploitative. Exploratory learning is about the acquisition of external knowledge and corresponds to the notion of potential absorptive capacity. Through exploitative learning, companies can apply acquired knowledge. Such learning reflects the concept of realised absorptive capacity. Transformative learning links the exploratory and exploitative learning processes. Lichtenthaler (2009) conceptualises transformative learning as maintaining and reactivating knowledge over time, and refers to combining existing knowledge with newly generated knowledge. Transformative learning can span from maintaining and reactivating knowledge to conversion and combination of knowledge (Flatten, Engelen, Zahra, & Brettel, 2011). Camisón and Forés (2010) even extend that perspective on transformative learning. The authors describe transformative learning as developing and refining "...the internal routines that facilitate the transference and combination of previous knowledge with the newly acquired or assimilated knowledge. Transformation may be achieved by adding or eliminating knowledge, or by interpreting and combining existing knowledge in a different, innovative way" (Camisón & Forés, 2010, p. 709). Alternatively, exploratory and

exploitative learning processes can be linked through assimilative learning. The term assimilation is more about integrating this knowledge into the organizational knowledge base. Considering the dynamic capability perspective, exploratory and transformative learning are of particular importance in turbulent environments (Lichtenthaler, 2009).

Learning processes interact with combinative capabilities, which describe how a company systematises, socialises, and coordinates knowledge (Zollo & Winter, 2002). Systemising, coordinating, and socialising knowledge can either contribute to or hinder learning processes and the corresponding level of absorptive capacity (Bosch et al., 1999). Coordinating knowledge refers to cross-functional interfaces and participation in decision-processes. Knowledge can be systematised by the formalisation and routinisation of organisational actions. The socialisation of knowledge is based on the density of social linkages (structural aspects) and shared social experience (cognitive aspects) in an organisation, and between the organisation and its external partners (customers, suppliers, and so on) (Bosch et al., 1999; Jansen et al., 2005; Kogut & Zander, 1992).

This argumentation indicates that increasing the level of external knowledge does not always enhance innovation. More important is how combinative capabilities interact with learning processes. Of course, more turbulent business environments strengthen the impact of absorptive capacity on innovation performance (Lichtenthaler, 2009). Creating an in-depth understanding of the interaction between learning processes and combinative capabilities could also explain why, in similar business environments, some companies achieve greater competitive advantages than others, through converting external knowledge into strategic innovations (Dyer & Singh, 1998).

The term *knowledge* subsumes both procedural and declarative knowledge. The latter provides a description of state, such as information on customer needs, technological trends and strategic plans, and is described through the notion of *know-what*. Procedural knowledge describes the current practices inside a firm, defining the tools and processes that companies use to determine customer needs, extrapolate technological trends, or formulate strategic responses (Kogut & Zander, 1992). The notion of *know-how* captures procedural knowledge.

Against this background, past experiences set the reference points for developing absorptive capacity. The degree of strategic innovation is the dependent variable. Learning processes (exploratory, assimilative, transformative, and exploitative learning processes) driving absorptive capacity form the independent variable. Combinative capabilities (systematisation, coordination, and socialisation) mediate the relationship between learning processes and innovation outcomes, whereas strategy and network position are considered as moderating the evolution of learning processes and combinative capabilities.

## Research methodology

Investigating absorptive capacity, learning processes, and combinative capabilities, as determinants of strategic innovation, is a complex and context-bound organizational issue. Therefore, we used an exploratory, qualitative research

approach (Strauss & Corbin, 1990; Yin, 1994). However, while the study is qualitative due to its context, it is positioned between deductive and inductive qualitative studies, being neither a test of an already developed theory, nor a development of a new theory. Rather, it is a contribution to theory-building through dialectic interaction between field studies and existing theory (Strauss & Corbin, 1990).

### Empirical setting

Due to market liberalisation, electricity has become a commodity with little potential for differentiation through electricity provision itself (Wiering & Verhoef, 2007). In order to take advantage of strategic innovation, electricity providers must absorb external knowledge, which fosters innovative ways of value creation. Typical examples of external knowledge are smart grid and smart meter technologies, renewable energies, the decentralisation of energy generation, or encouraging appropriate consumer behaviour with respect to energy saving and consumption.

In this study, we investigate two medium-sized electricity providers. Both companies share similarities in such company characteristics as the number of employees (800 and

1400 employees, value chain activities (power generation, trading, and distribution), and type of electricity generated and provided (renewable energy and non-renewable energy)). Further similarities include characteristics of the business environment, such as customer structure (households and industry customers), as well as the degree of market liberalisation (see Table 1).

Our research was guided by Lincoln and Guba's (1985) criteria for achieving methodological trustworthiness: credibility, consistency, and transferability. Credibility was ensured through triangulation of different types of data (e.g., participation in internal workshops, interviews, and secondary data, such as internal reports and documentations). Additionally, the series of internal workshop allowed one research to observe the daily business in both companies over a period of time. Consistency of the findings was addressed by accounting in detail for the choices we made in the research process. Transferability refers to internal validity, reliability and external validity (Windahl, 2007). In order to reduce the likelihood of false interpretations, as well as to obtain internal validity, a distinctive feature of the research is the data triangulation and continuous review of research reports (Yin, 1994). Such reviews often

**Table 1** Key characteristics of the case studies.

Company characteristics	Alpha	Beta
Number of employees	1400	800
Value chain activities	– Power generation, trading, and distribution	– Power generation, trading, and distribution
Type of electricity	– Non-renewable energy and renewable energy	– Non-renewable energy and renewable energy
<i>Business environment</i>		
Customer structure	– Household & industry customers	– Household & industry customers
Competitive environment	– Partly liberalised market with prospect of full market liberalisation	– Partly liberalised market with prospect of full market liberalisation
<i>Characteristics of strategic innovation</i>		
Strategic innovation	– Limited (Low degree of strategic innovation)	– Comprehensive (High degree of strategic innovation)
Examples	– Few information and consulting services for supporting households and industry in order to reduce electricity consumption	– Service provision for photovoltaic, services for planning, financing, and running fleets of electric cars, consulting and monitoring services for reducing electricity consumption
Business model & value constellation	– Substantiating existing business model on selling electricity – Exploiting existing value constellation of providing electricity at reasonable prices	– Changing the business model from selling electricity to benefiting from customer producing renewable energies – Changing the business model from selling to electricity to benefiting from customers electricity reductions – Exploring new value constellations in existing markets and uncontested market spaces
Markets	– Exploiting the existing market	Opening up new markets surrounding renewable energies, electric mobility and self-service technologies for monitoring and reducing electricity consumption
Value improvement	– Incremental value improvement	Leap in value improvement

lead participants to provide more detailed information. Finally, to assure reliability and validity, manual and computer-aided content analyses were used for data analysis.

### Data collection

We collected the data through a bi-polar qualitative research design, investigating two European electricity providers for the period 2005–2010. During this time frame, both companies experienced an increased need to absorb external knowledge in order to sustain competitive advantage. The electricity providers are referred to as Alpha and Beta, for reasons of confidentiality.

Despite Alpha's objective of achieving strategic innovation, the firm merely introduced electricity-consulting services for business and household customers, positioning itself as a distributor of energy saving devices and offering information services for reducing energy consumption. Overall, these innovations reinforced Alpha's existing business model, created differentiation advantages in existing markets, and enhanced customer value incrementally. By contrast, Beta's strategic innovation explored opportunities arising from photovoltaic applications, consulting and monitoring services for reducing electricity consumption, as well as services for planning, financing and running fleets of electric vehicles. Beta's services made it reliable for customers to install photovoltaic panels and to produce their own electricity by converting the industry's 'recipe' from selling and consuming electricity to co-producing electricity. Furthermore, Beta understood electric cars as having the potential to reshape the existing automotive market, which has so far been uncontested by other types of vehicles. Thus, it considered investing in the infrastructure for electric vehicles. Beta's consulting services changed the business model from being paid for electricity consumption to being paid for saving electricity. Table 1 summarises the key characteristics of each initiative.

Considering the differences in the degree of strategic innovation suggests a bi-polar (diametrical) approach, where Beta succeeded in strategic innovation, whereas the Alpha could not achieve strategic innovation in terms of the three key elements explained in Section "strategic innovation". We took advantage of the differences between the two initiatives to systematically analyse the absorptive capacity, learning processes, and combinative capabilities (see Table 1). Thus, we chose this setting on conceptual grounds, rather than for its representativeness (Miles & Huberman, 1994).

Data on the two initiatives were collected, primarily through participation in internal company meetings and through follow-up interviews. One of the authors participated in 12 meetings at Alpha and 14 at Beta. Each meeting lasted approximately five hours and entailed 5–10 participants. A preliminary agenda for each meeting was constructed in collaboration with both companies. However, in conformity with inductive case-based research, while we did have some theoretical constructs in mind, our constructs were not fully imposed in defining the agenda and topics for the meetings (Pettigrew, 1990).

Given the proficiency of the participants, once the topics were defined, there was only limited moderator involvement. The moderator frequently used the flip chart to sum-

marise or highlight discussion points and the content. This procedure assisted participants in 'getting' to the key issues of their strategic innovation initiative. The complete discussion and preliminary results were documented.

The participants included both a hierarchically stratified sample for each initiative, and a representative sample of participants, whose work was influenced by the strategic innovation process. The participants refer to the top management (chief executive officers) as well as middle management across various functions (sales, power distribution, renewable energies, technical assistance and customer service).

Participation in the meetings was supplemented with telephone conversations, email inquiries, and most importantly, follow-up interviews. At Alpha, we conducted eight semi-structured interviews, whereas nine were conducted at Beta. Participants were always given the opportunity to review the description for accuracy. These reviews led participants to provide additional insights and offset some of the bias normally associated with qualitative research.

### Data analysis

The primary data and where appropriate, relevant company documentation, were transcribed, resulting in approximately 380 pages of information. Using this extensive data, we developed a chronological description of the both initiatives, aiming at strategic innovation. An assessment of the learning processes, combinative capabilities, as well as strategy and network position, substantiated the chronological description. We developed tables and graphs to track changes in combinative capabilities and visualise the learning processes.

In order to articulate our emerging theoretical understanding, one of the authors read through all the transcripts, making notes of chronological descriptions and emerging themes. We then followed a fine-coding scheme in which codes are derived inductively from transcribed data. Within the coding, we established a description, conceptual ordering and theorisation of our key constructs (see Figure 1 and Table 2). To ensure reliability of such qualitative judgements, we used two independent researchers (one researcher and one masters student) to code the data. We checked for reliability in the coding processes by drawing up an interjudge contingency table. After estimating the number of judgements for which agreement was expected by chance, we calculated Cohen's kappa, an indicator of interjudge reliability as 0.81, which conforms to existing research standards (Perreault and Leigh, 1989).

All these data were coded in Nvivo©. We extracted the most relevant themes from the data, arranged them in a hierarchy and documented their precise meaning (Glaser & Strauss, 1967). For example, notions such as 'identification of new knowledge in various external sources', 'generating information on business environment relevant to new business opportunities', 'acquisition of knowledge through various sources', 'selecting and retaining knowledge obtained from external sources' and so on were indicators of progress in exploratory learning. Similar procedures were used for assimilative, transformative, and exploitative learning processes. The constructs relating to combinative capabilities, strategy, and network position were coded

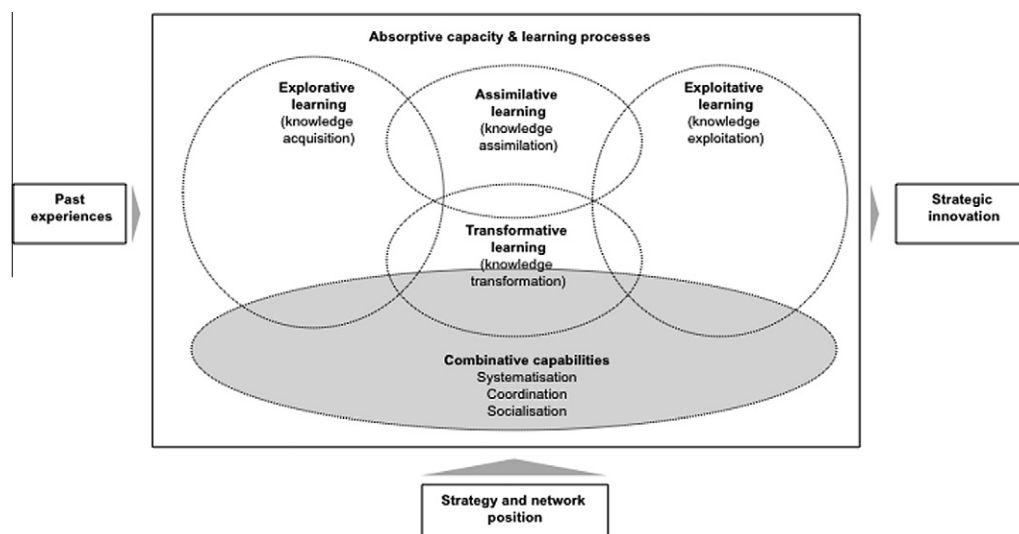


Figure 1 Conceptual framework (Adapted from Lane et al., 2006; Zahra & George, 2002; Zollo & Winter, 2002).

according to their potential range or degree. Strategy covers the range between first-mover and follower strategy, whereas the network-position variable ranges between centralized, dominant and decentralized, participating. Combinative capabilities are organised according to the degree of coordination, systematisation, and socialisation capabilities. A high degree of coordination capabilities is associated with many cross-functional interfaces, substantial participation in decision-processes, and intensive job rotation. A high degree of systematisation capabilities is related to strong formalisation and routinisation of organisational actions. A high degree of socialisation capabilities captures aspects of intensive social relations such as the density of social linkages or shared social experience, such as cognitive aspects associated with gender and role understanding. Table 2 depicts the hierarchical aggregation of coding of all constructs in more detail.

The data analysis commenced with the within-case analysis, so that the researchers could familiarise themselves with each case (Eisenhardt, 1989). After both case reports had been written up and analysed, a cross-case analysis synthesized the findings through a qualitative pattern-matching logic (Yin, 1994).

In order to enhance internal validation, the pattern-matching logic was supplemented by measuring the importance of each construct for the learning processes. Importance was measured as absolute and proportional importance. Absolute importance refers to the total number of sentences referring to one learning process. Proportional importance means that we divided the number of sentences devoted to one learning process, by the number sentences describing all learning processes. In addition, we used a cross-tabulation to explore how past experience and learning processes interact with combinative capabilities, strategy, and network-position variables.

## Emergence of strategic innovation

Our results on the Alpha and Beta strategic innovation initiatives are described in the following two sections. In the next

section, we describe the importance of our constructs with respect to the learning processes and we explain the results of the cross-tabulation procedure. The second section describes both initiatives chronologically. The description includes both an interpretation of the results as well as empirical evidences from the case reports.

## Importance of learning processes

The relative importance of learning processes differs between Alpha and Beta. Both companies are similar in the importance of exploratory (31% for Alpha and 34% for Beta) and exploitative learning processes (46% for Alpha and 38% for Beta), but are significantly different in the relative importance of assimilative and transformative learning processes. For Alpha, the transformative learning process is only of incremental importance (2%). Assimilative learning dominates the linkage between exploratory and exploitative learning (21%). For Beta, the transformative learning (24%) dominates and assimilative learning (4%) is of limited importance.

Cross-tabulations indicate that both companies are similar in their past experience concerning combinative capabilities (low coordination, strong systematisation, and limited socialisation capabilities). For example, the coordination of knowledge uses minimal cross-functional interfaces, with vertically centralised decision-processes, or limited job rotation between technical and market functions, whereas the systematisation of knowledge remains formal. Few external social linkages and similar internal social experiences characterise the socialisation of knowledge. Cognitive aspects of gender and role diversity are also fairly comparable (e.g., dominant gender is male, homogenous behavioural roles around being a reliable electricity provider).

Alpha and Beta apply different strategies and network positions. Alpha applies a first mover strategy, whereas Beta is more cautious, when it comes to an early timing of innovation market entry. The distinct strategies affect the expected results of strategic innovation (Bosch et al., 1999). Alpha's management expected to gain control of unique re-

**Table 2** Coding structure.

Constructs	Indicators & notions referring to the constructs
Learning processes	– Openness towards external knowledge sources
Explorative learning process	– Recognition of external knowledge sources – Engagement in joint knowledge-creation projects – Regularity of meetings with externals – Motivation to use external knowledge sources – Identification of new knowledge in external sources – Generating information on business environment relevant to new business opportunities – Acquisition of knowledge through various sources – Selecting and retaining knowledge obtained from external sources – Classifying and internalizing acquired knowledge
Assimilative learning processes	– Shared interpretation of the newly acquired knowledge – Discussion of the acquired knowledge – Achieving collective understanding of the acquired knowledge – Integration of new knowledge into firm's knowledge base – Dissemination of new knowledge throughout the firm – Using tools for spreading knowledge throughout the firm
Transformative learning processes	– Maintaining and reactivating knowledge – Creation of new knowledge based on the acquired knowledge – Reconstructing acquired knowledge – Facilitating transference and novel associations concerning the knowledge – Discursive interpretation of knowledge – Adding new knowledge to the acquired knowledge – Constructive combination and re-combination of knowledge – Linking existing knowledge with new insights
Exploitative learning processes	– Transmute knowledge into commercial applications – Applying knowledge to commercial purposes – Launching innovations to the market – Converting innovative ideas into commercial applications – Using generated and disseminated knowledge in market activities – Engaging product or service innovations – Commercial use of knowledge
<i>Combinative capabilities</i>	– Degree of job rotation applied (number of job rotations, length and breadth of job rotation, formalisation of job rotation)
Coordination capabilities	– Degree of cross-functional interfaces (e.g., intensity of communication across different functions, knowledge exchange among different teams and functions, demands for periodical cross-functional meetings) – Degree of participation in decision-making processes (vertically-centralised versus horizontally-decentralised decision making, empowerment of middle and lower management, number of managers participating in decision-making processes, emphasis on cross-functional support)
Systematisation capabilities	– Degree of formalising knowledge (e.g., predefined templates, procedures, and methods) – Degree of routinisation for systemising knowledge (e.g. flexibility on templates, procedures, and methods)
Socialisation capabilities	– Intensity of social relations – Density of social linkages – Shared social experience such as education, gender, and role understanding – Gender diversity of participants (ratio male and female executives) – Diversity of role understanding and attitudes among the participants
<i>Network position &amp; strategy</i>	– Emphasizing pioneering advantages
Strategic behaviour	– Importance of market timing – Strategic ambitions on ensuring time to market – Importance of benefiting from first-mover advantages
Network position	– Centrality of network position – Prioritising knowledge exchanges in the network – Channelling knowledge created in the network – Listening to and discussing with other network partners – Collaborating with network partners – Balance of knowledge contribution among network partners
Strategic innovation	– Degree of changes in the business model (e.g., value proposition, revenue and profit mechanisms, value chain) – Newness of market spaces (e.g., number of potential competitors, closeness to other markets) – Customer value (e.g., perceived customer value, degree of newly addressed customer needs)

sources that followers may not be able to match easily. Beta's expectation is more reactive and primarily takes advantage of the pioneering firms' investments in strategic innovation.

With respect to network position, Alpha places more emphasis on achieving a central network position (Todorova & Durisin, 2007; Tsai, 2001). Its goal is to determine, channel and prioritise the knowledge created in the network. Alpha creates strong ties with network partners and shapes the knowledge-creation process. By contrast, Beta rather collaborates with external knowledge sources and places less emphasis on achieving a central network position. Beta participates in knowledge exchange, with relatively weak ties between the firm and its knowledge partners, and develops an equal learning relationship with its external knowledge sources.

The cross-tabulation reveals that Alpha continues with its previous combinative capabilities in the exploratory, assimilative, and exploitative learning processes, whereas Beta departs from previous combinative capabilities towards strong coordination, minimal systematisation, and strong socialisation capabilities in the exploratory and transformative learning processes. In the exploitative learning process, Beta again changes its combinative capabilities and returns to developing strong systematisation capabilities. The next section describes the chronological evolution of learning processes and combinative capabilities in more detail.

### Chronologic evolution of learning processes and combinative capabilities

#### Alpha

*Exploratory learning processes.* Alpha's history of limited job rotation, cross-functional interfaces, and low cognitive diversity restricts exploratory learning processes to specific functions. For example, learning in the context of customer needs takes place within the sales and marketing function, or learning about technology trends within the technical function. The recombination and interpretation of knowledge is, therefore, rather constrained and limited, leading to only a few novel concepts or innovative ideas. However, the low number of ideas does not mean that they cannot open up promising business opportunities. The evaluation of market attractiveness and growth promise high revenue potential.

Consistent with past experience, learning processes entail a strong formalisation of knowledge and vertically centralised decision-processes. The formalisation allows little leeway for exploring the full potential of scanning for in-depth customer needs and recombining different perspectives on customer needs with technology trends and broader social phenomena. Learning processes proceed through retaining and replicating internally selected knowledge, rather than through additional variation and the recombination of knowledge. Consequently, the learning processes narrow down the potential variation in knowledge components. A first-mover strategy accelerates exploratory learning processes and would overcome such constraining tendencies (Bosch et al., 1999). However, the first-mover strategy has a side effect. Driven by the desire to be the first-mover, exploratory learning processes are confronted

with time constraints. Such constraints maintain the preconditions concerning combinative capabilities, rather than opening them up for new routines and systematisation procedures and for infusing more cognitive diversity. Empirical evidence on Alpha's exploratory learning on customer needs confirms this interpretation.

#### Alpha's exploratory learning process around customer needs

Alpha considered acquiring knowledge of customer requirements, needs and expectations as easily achieved through customer interviews and surveys. Alpha scanned and recombined external stimuli on customer value and what the most important value dimensions are today and in the future. Alpha internally learned how well (poorly) it was doing in delivering the value that customers want, and with respect to why Alpha was doing poorly (well) on some important value dimensions. The knowledge of customer needs was not exchanged directly with other divisions and organisational units. In fact, exchanging this knowledge could be considered as rather intra-functional and hierarchical. The latter means that the project team reported the observed customer needs to the executive board. The board then channelled the decision-making authority into vertically centralised decision-making processes. Due to the fact that the customer value dimensions were easily accessible, Alpha's executive board became concerned about competitors outpacing Alpha's first-mover strategy. The threat of being imitated and outpaced by competitors drove the decision-making processes and rendered a more intensive exploration obsolete. Alpha's executive board simply confirmed the customer needs, instead of challenging them. This, in turn, enhanced the retention of knowledge within the marketing & sales unit. Later, it even reduced the variation (scanning and recombining) in customer needs. Driven by the first-mover objective, Alpha aimed at a timely exploration of customer needs, which can be driven efficiently into strategy innovation. Once the customer needs were described, no further scanning for consumer needs and recombining them with technological trends were considered necessary.

While these restrictions were observed in terms of declarative knowledge, exploratory learning processes for procedural knowledge developed differently over time. The first-mover strategy provides sufficient resources for managers to evaluate, share, and retain diverse knowledge of tools and processes for strategic innovation. The accumulated knowledge consists of applied knowledge, in which tools and procedures are, for example, used directly for identifying customer needs, and with respect to observant knowledge, which is gathered without an application context. Due to the fact that exploratory learning process of declarative knowledge is increasingly restricted, most of the accumulated procedural knowledge remains arguably observant, rather than applied.

Interestingly, network position also effects declarative and procedural knowledge. With respect to declarative knowledge, dominance in knowledge networks increasingly constrains the ability to explore controversy and new knowledge areas. The immediate consideration of exploiting business opportunities hampers discursive practices on



customer needs or technology trends. By contrast, discursive practices on procedural knowledge do not constrain the use of new approaches and processes for strategic innovations (Tsai, 2001). The dominant role in the knowledge network does not limit the discussion of strategic approaches with external knowledge sources, and neither does it restrict the exploration of the full breadth of procedural knowledge.

*Assimilative learning processes.* Lichtenthaler (2009) argues that exploratory learning processes spill over to transformative learning processes, but empirical evidence on Alpha's procedural knowledge indicates that learning processes are not transformative.

#### **Alpha maintaining and reactivating procedural knowledge**

The observation of customer needs and technological trends was relatively straightforward, and could easily be assimilated. Alpha considered it most beneficial to assimilate them into definite business opportunities and value propositions. In addition, Alpha had already invested significantly in exploring these needs and trends. On the one hand, considering the sunk-cost, Alpha felt most comfortable not jeopardising the acquired knowledge through new procedures, which are beyond its usual practices. On the other hand, by relying on proven practices in planning and executing complex strategic projects, each corporate function was keen to be the first to put the strategic innovation initiative into practice. Each function employed isolated business plans, and Alpha's management rewarded competition among these business plans. This accelerated the development of business plans and shortened the time to potential market entries.

Considering this empirical evidence, Alpha focuses on assimilation, because the combinative capabilities do not change. Past experience with a strong formalisation of knowledge, routines concentrating on timely decisions, and low cognitive diversity, ensure that maintaining and reactivating knowledge on strategic innovations can best be achieved through a deliberate and planned strategic approach (Mintzberg & Waters, 1985). Interestingly, procedural knowledge that strategic innovation should depart from a planned strategy with the associated planning skills for complex strategic projects, is acquired through the exploratory learning processes. However, the assimilative learning process fails to reactivate this procedural knowledge. The main reasons for struggling to reactivate such knowledge derive from the associated difficulties and uncertainties inherent in applying the observant knowledge and sunk-costs fallacy to exploring the declarative knowledge.

*Exploitative learning processes.* The planned strategy approach stimulates the exploitative learning processes, which leads to individual business plans. The formalisation and routinisation of organisational actions guide learning processes for adapting innovations to target customers. The easiest way to achieve this is to transfer innovation into service and product elements. This approach guarantees an adequate fit with consumer needs, but is not suitable for

achieving leaps in customer value. The low cognitive and behavioural diversity reinforces that approach, where the commercial outputs drive the focus of recognition and understanding of how knowledge should be absorbed through the exploratory, assimilative, and exploitative learning processes. The empirical evidence on the feedback of the commercial outcomes suggests that current success constrain future exploratory and assimilative learning processes.

#### **Feedback of commercial outcomes on learning processes**

*In the case of electronic devices for lowering energy consumption, Alpha entered the market as a first-mover and benefited greatly from gaining control of distribution channels, which followers were not able to match easily. This provided Alpha with a pioneering advantage and demonstrated that the way Alpha approached strategic innovations was a path to success. Even if Alpha understood that selling such electronic devices only produced incremental improvements in value, it neither opened uncontested market spaces, nor broke with industry recipes. Yet, Alpha did not question its fundamental approach to strategic innovation. Failing in the three key elements of strategic innovation was attributed simply to the internally explored customer needs and not to the core learning processes and the way that knowledge was systematised, coordinated, and socialised. Alpha was convinced that it could achieve strategic innovation through the same learning processes.*

As this direct observation suggests, once success becomes evident, the constraining effects on exploring declarative knowledge components, and the difficulties in maintaining and reactivating procedural knowledge reinforce each other (Lane et al., 2006; Todorova & Durisin, 2007). The interpretation was considered contradictory by few participants, because they could not fully agree that the early success actually limited strategic innovation. By reviewing the data, we came to the common sense conclusion that the further exploratory learning could be narrowed by early successes.

Considering the coordination of knowledge, the decision authority for introducing innovations into the market remains at the executive board level (vertically centralised), but the cognitive diversity, in terms of the behavioural role of a reliable electricity provider with technical expertise, is supplemented by a typical managerial mind-set. This mind-set is appropriate, because it entails administering innovation costs, reacting to customer complaints, as well as the development and market introduction of new products and services. Table 3 summarises the key issues for Alpha.

#### **Beta**

*Exploratory learning processes.* As predicted by the follower strategy, exploratory learning processes are initially limited essentially to observing competition and customer reactions (Bosch et al., 1999). The observations indicate that competitors experiment with a broad set of innovative ideas, but no common approaches for strategic innovation are observable. Pioneers in strategic innovation are, therefore, expected to originate from different directions. In order to respond potentially to a wide range of strategic

**Table 3** Summary of results for Alpha.

Past experience	Exploratory learning processes	Assimilative learning processes	Exploitative learning processes
<ul style="list-style-type: none"> <li>• Low experience on strategic innovations</li> <li>• Lack procedural and declarative knowledge on creating strategic innovations</li> <li>• Considerable experience on planning and executing complex strategic projects</li> <li>• Combinative capabilities are characterised by few job rotations, few cross-functional interfaces, highly formal way of systematisation and formalisation of knowledge, low cognitive and behavioural diversity, and few social linkages</li> </ul>	<ul style="list-style-type: none"> <li>• External knowledge on customer needs, social and technologies stimulate exploratory learning</li> <li>• Recombination and interpretation of explored knowledge takes place within single function</li> <li>• Novel associations for ideas on strategic innovation are confined within the single function</li> <li>• First-mover strategy and central network position constrain variation in procedural knowledge</li> <li>• First-mover strategy and central network position intensifies exploratory learning in the field of procedural knowledge</li> <li>• Combinative capabilities on systematisation, coordination, and socialisation remain constant</li> <li>• Highly formalised routines for acquiring knowledge</li> <li>• Low cognitive and behavioural diversity</li> <li>• Low density in the social linkages</li> <li>• Low job rotations and cross-functional interfaces</li> <li>• Vertically-centralised decision processes</li> </ul>	<ul style="list-style-type: none"> <li>• Maintaining and reactivating knowledge within the existing combinative capabilities (e.g. cognitive and behavioural diversity, social linkages, vertically centralised decision-processes, strong formalisation)</li> <li>• Formalisation of knowledge through planned strategy approach</li> <li>• Failing to reactive procedural knowledge on alternative approaches for strategic innovation</li> <li>• Skills and competences on planning and executing complex strategic projects promotes the planned strategy approach</li> <li>• Planned strategies are seldom enriched, because of the low density in social relationships</li> </ul>	<ul style="list-style-type: none"> <li>• Extending diversity in behavioural roles through managerial mind-set on administrating innovation</li> <li>• Exploiting the business plans by transferring customer needs into product and service elements</li> <li>• Highly formalised exploitation of knowledge</li> <li>• Low cognitive and behavioural diversity strengthen direct exploitation of customer needs</li> </ul>

Strategy – first-mover strategy aiming at early market entry.

Network position – central, dominant network position with the tendency to shape the knowledge-creation process.

innovations by competitors, exploratory learning processes are increasingly intensified.

Modifications in socialising and systematising practices for the knowledge acquisition not only led to obvious customer needs, but also generated an in-depth understanding of how consumers construct their social reality. Enhancements in cognitive diversity, greater density in the knowledge network relationships, as well as reductions in the formality of knowledge and information preparation, propel creative scanning and a recombining of external knowledge on customer needs, social trends, and technology trends (Lane et al., 2006). This interpretation can be substantiated through the empirical evidence of Beta's exploratory learning processes with respect to customer energy-efficiency.

#### **Beta's exploratory learning processes with respect to customer energy-efficiency needs**

Beta supplemented its knowledge of customer energy efficiency needs (e.g., energy productivity, environmental awareness, costs), by exploring consumer behaviour with respect to electricity consumption and efficiency in different social milieus. Behind such somewhat poetic customer segment descriptions as innovators, thinkers, believers, achievers, strivers, experiencers and so on, a detailed understanding of value and attitudes evolved, which facilitated constructive combinations with technology trends or social phenomena relating to renewable energy. For example, believers were conservative and predictable consumers with modest incomes, who favour local products and the established reputation of electricity providers. Their lives revolve around family, church, and community. However, their conservative attitudes, in combination with a family orientation, suggest that they were interested in investing in renewable energies, even if they have only modest incomes. Their motivation was based on guaranteeing a safe and clean planet for the next generation. Beta's knowledge of grounding customer segments in value, attitudes, and behaviours, benefits from assessing social milieus. Learning about customer needs regarding energy efficiency, was interrelated with a departure from behavioural roles of being a reliable electricity provider with technical expertise, and extended to educating consumers on energy consumption, enabling them to increase energy efficiency, and being a trusted adviser on all issues associated with energy usage. In addition, Beta's learning about customer needs benefited from deliberate actions to change from a purely male to balanced male and female cognitive diversity. Female executives contributed to deepening the understanding of social milieus, through their unique insights into family or sustainability orientation.

The collaborative learning relationship through weak ties in the knowledge network results in a situation in which employees learn together with and from external companies and institutions (Todorova & Durisin, 2007). The learning experience forms a positive reputation, which, in turn, motivates more internal employees and external experts to participate in the knowledge network. This interpretation can be drawn from the observed spillover of network position, with respect to coordinating and systemising knowledge.

#### **Beta's spillover of network position with respect to coordinating and systematising knowledge**

Beta's efforts in developing electricity efficiency services and electric mobility originated within the technical function. This function assessed various weakly tied knowledge sources, through participating in meetings with other electricity providers, supplementary products and service providers, and specialists in consumer psychology. Beta's employees benefited from this sharing of knowledge. Representatives from external knowledge sources increasingly earned trust through providing unbiased advice on how to solve customers' current and future electricity-efficiency problems. A key point made by Beta's employees was that not everyone could be an expert on all electricity-efficiency issues *and* on consumer behaviour. Employees had to get along with other internal knowledge peers, and network with other external experts. This "getting along" required intensive interactions, in which they had to teamwork, communicate with each other, and solve problems. Beta learned that problem solving and social linkages benefit from increased gender and behavioural diversity. Beta deliberately involved female executives in the strategic innovation initiative, because they perceived business opportunities, where male executives could see only constraints. In addition, the company extended its homogenous behavioural role understanding from being a reliable electricity provider, to heterogeneous roles entailing educating consumers on energy consumption, enabling them to increase energy efficiency, and being a trusted adviser on all issues arising from energy usage. Furthermore, Beta learned that formal procedures for systematising knowledge could restrict teamwork and communicating, and were, therefore, replaced by informal means of systematising and coordinating knowledge. Attracted by the potential to become smarter, an increased number of internal and external individuals were eager to be part of the knowledge network.

As this empirical evidence illustrates, the density of social linkages increases, which, in turn, makes it necessary to revise organisational actions for knowledge systematisation and coordination. Less formal practices are used for acquiring knowledge, instituting job-rotation, and cross-functional interfaces are introduced. Therefore, the exploratory learning process is not restricted to specific issues only, but benefits from the diverse cumulative knowledge of different organisational functions. This laid the foundation for looking successfully beyond the boundaries of existing knowledge areas.

As a result, exploratory learning processes produce a wide range of ideas for potential strategic innovation. The various ideas also facilitate the application of procedural knowledge for strategic innovation (e.g., procedures and tools). Most of the procedural knowledge can be considered as applied knowledge, rather than observant knowledge.

*Transformative learning processes.* Transformative learning processes precede exploratory learning ones. In contrast to Alpha, Beta's learning processes can truly be considered as transformative, because of their interrelation with changing combinative capabilities. The diverse notions on strategic

innovation are transformed into broad strategic directions associated with energy efficiency, renewable energy, electric mobility, and information services. Each strategic direction of knowledge is maintained through an ‘umbrella-strategy approach’.

Because this approach represents a significant departure from the previous skills in planning and executing complex strategic projects, through a deliberate strategy approach, few participants contradicted the imperative to use an umbrella-strategy approach. By reviewing all the advantages and disadvantages of this approach, all participants came to the conclusion that the umbrella-strategy approach is essentially beneficial. However, within the exploratory learning processes, it became evident that strategic innovations benefit from openly defining strategic boundaries and allowing different scenarios to emerge (Mintzberg & Waters, 1985). These open boundaries motivate both external and internal knowledge sources to contribute to each scenario. The transformative learning processes not only maintain knowledge, but also enrich the cumulative knowledge embedded within each scenario. The minimal formalisation of scenarios, in combination with the dense social linkages and higher cognitive diversity, promoted enrichment even further and led to associations in business models and customer value, beyond the existing industry barriers (Kim & Mauborgne, 1999). This interpretation can be confirmed through following adaptive variation in scenarios on the provision of photovoltaic electricity.

#### **Maintaining knowledge through adaptive in scenario variation**

Beta’s intention to explore strategic innovations surrounding the provision of photovoltaic electricity yielded three scenarios. These included: (1) renting the square meters of photovoltaic surface to customers, (2) planning and selling the photovoltaic equipment, (3) planning, selling, installing and operating photovoltaic equipment. The boundaries were left open to opportunities relating to electricity usage, as well as to potential cooperation with manufacturers, local installers, and distributors of photovoltaic equipment. Beta investigated potential distributors for solar panels, such as retailers of furniture garden equipment or building centres (e.g., Ikea, Kingfisher, Groupe Adeo, Obi). For example, by considering Ikea’s self-service approach, Beta was able to create novel associations in the minds of their employees regarding self-service approaches to installing solar panels, with the aim of reducing costs. Another example arises from recombining scenarios for electric mobility, with a decentralised storage of solar power. Beta created novel associations by extrapolating the future usage of electric cars. The batteries for electric cars were considered as potential storages of solar power.

These scenarios are enriched continuously by scanning for additional external knowledge and combining it with the various scenarios. Combining means that attractive additional knowledge is selected internally, replicated, and retained for each scenario. The replication and retention within the scenario benefit from the enhanced cognitive diversity and corresponding problem-solving and creativity skills, which emerged in the exploratory learning processes.

Solving problems and being creative in combining external knowledge with the scenarios, leads to variations in the scenarios, and can even split one scenario into different sub-scenarios. This interpretation can be justified by following empirical evidence.

#### **Enriching scenarios with external knowledge**

By maintaining the knowledge on scenario (3), that is planning, selling, installing and operating photovoltaic equipment, Beta combined this scenario with external knowledge on how to access governmental subsidies for renewable energies. Beta learnt that the subsidies only partly covered the investment and operating costs for photovoltaic equipment. Consumers pay at least 50% of the total costs themselves, and the amortisation rates are considered to be about 25 years. Knowledge on financial services divided scenario (3) into two sub-scenarios: (3a) Beta offers financial services and assumes responsibility for obtaining governmental subsidies, or (3b) independent banks offer the necessary financial assistance, but customers have to obtain governmental subsidies by themselves. Including financial services and assuming responsibility for acquiring governmental subsidies and combining them with the produced solar energy, would create a leap in customer value, and form a value constellation, which is very difficult for equipment, or other electricity providers, to imitate.

Maintaining such diverse sets of scenarios, and ensuring the reactivation of these scenarios when necessary, could not be guaranteed through the previous resource-allocation procedures. The large number of scenarios alone made it impossible for management to consider all of them (Brusoni, Prencipe, & Pavitt, 2001). The decision-making authority on how to proceed with each scenario is, therefore, vertically decentralised, in that senior managers acquire a high degree of decision-making authority for each scenario. However, we observed that not all participants initially agreed to maintain a high number of scenarios. Resource considerations initially led a few participants to believe that only a few scenarios should be maintained. Uncertainty as to which scenario will actually succeed, convinced participants to let diverse sets of scenarios emerge.

*Exploitative learning processes.* The scenarios serve as external stimuli for the exploitative learning processes. The diverse and large number of scenarios and sub-scenarios mean that internal selection becomes a key issue (Grant, 1996). The diversity of scenarios, in combination with problem-solving skills, enable a recombination of elements within each scenario. Through the follower strategy, it was not necessary to push one particular scenario, which could then be implemented as soon as possible. Rather, recombining the most attractive elements into one selected scenario, which fulfils the requirements of strategic innovation (departing from the existing business model) led to uncontested markets and leaps in value.

While problem-solving and cognitive diversity contribute in similar ways to transformative and exploitative learning processes, combinative capabilities associated with systematisation and coordination, refer back to the initial situation. A few participants were reluctant initially on modifying the systematisation capabilities, because they preferred the pro-

**Table 4** Summary of results for Beta.

Past experience	Exploratory learning processes	Transformative learning processes	Exploitative learning processes
<ul style="list-style-type: none"> <li>• Low experience on strategic innovations</li> <li>• Lack of procedural and declarative knowledge on creating strategic innovations</li> <li>• Considerable experience on planning and executing complex strategic projects</li> <li>• Combinative capabilities are characterised by few job rotations, few cross-functional interfaces, highly formal way of systematisation and formalisation of knowledge, low cognitive and behavioural diversity, and few social linkages</li> </ul>	<ul style="list-style-type: none"> <li>• External knowledge on customer needs, social and technologies stimulate exploratory learning</li> <li>• Recombination and interpretation of explored knowledge takes place across through various functions and is intertwined with departing from low to high job rotation and from few to many cross-functional interfaces</li> <li>• Novel associations for ideas on strategic innovation emerge across various functions</li> <li>• Novel associations benefits from increasing cognitive and behavioural diversity</li> <li>• Follow strategy makes it necessary to respond to a variety of strategic innovation, which, in turn, is beneficial for intensifying the exploratory learning processes</li> <li>• Participative role in the knowledge network enhances acquisition of knowledge</li> <li>• Both declarative and procedural knowledge benefit from more intensified exploratory learning processes</li> </ul>	<ul style="list-style-type: none"> <li>• Maintaining and reactivating knowledge benefit from breaking with the past experience in the combinative capabilities (e.g. high cognitive and behavioural diversity, many social linkages, vertically decentralised decision-processes, little formalisation)</li> <li>• Knowledge is maintained through an umbrella strategy approach through various scenarios</li> <li>• Scenarios are continuously enriched and benefit from more dense social relationships</li> <li>• High cognitive and behavioural diversity let creativity and problem-solving skills emerge</li> <li>• Creativity and problem-solving skills enhance each scenario</li> </ul>	<ul style="list-style-type: none"> <li>• Recombination of elements in the various scenarios</li> <li>• Recombining the most attractive elements increases the probability to achieve strategic innovation</li> <li>• Most of the selected elements access former combinative capabilities on highly systemising and coordinating knowledge</li> <li>• Few elements benefit from the former departure from low to high cognitive and behavioural diversity</li> </ul>

Strategy – follower strategy in order to take advantage of pioneers' effort to introduce strategic innovation.

Network position – participate, less central network position with the tendency to collaborate in the knowledge-creation process.

ven way of low formalisation and routinisation of knowledge systematisation from the exploratory and exploitative learning processes. By reviewing all the advantages and disadvantages of modifying systematisation capabilities, all participants ultimately agreed that exploitative learning benefits from the following organisational actions.

For the purposes of exploiting the scenarios, the selected scenario is highly formalised and the routines on coordinating knowledge in terms of decision-making authority, shifts from vertically decentralised to centralised. Higher cognitive diversity and more dense social linkages with external knowledge sources remain limited to small elements of knowledge exploitation. The following empirical evidence justifies this interpretation.

#### **The role of formalisation and cognitive diversity in the market introduction of consulting services**

Beta released formal documents to the sales and project teams for the market introduction of consulting services for electricity efficiency. These documents formalised the necessary internal human resources, service delivery processes, delivery costs, and pricing mechanism, which were embedded in the business model, which aimed at being paid for reducing energy consumption, rather than the customer paying simply for energy. A specific time schedule and specific target markets, with clear expectations of market penetration, was described. The initial target markets were hotels, firms with 15–25 employees and households. One employee, who maintained social linkages with surgeries, challenged this target market and argued that a surgery, with its high throughput of patients, could provide a very attractive multiplication of services. It was actually this new (or modified) target group that was considered most responsive to the new service.

Finally, the exploitative learning processes integrate being an entrepreneur into the relevant behavioural roles. Being an entrepreneur is congruent with the observation that strategic innovation is not specifically planned and executed, but rather emerges through experimentation and improvisation within the implementation of potential scenarios. Entrepreneurial spirit provides fertile ground for experimenting with new business ideas, improvising while reshaping the market or by achieving quantum leaps in customer value. Table 4 summarises the key issues for Alpha.

## **Discussion**

### **Theoretical implications**

Our findings enrich the theoretical knowledge on relationships between absorptive capacity, learning processes, combinative capabilities and strategic innovations. Our contributions to theory-building are formulated as testable propositions for further academic and managerial considerations. The general contribution is twofold. Firstly, using strategic innovation as the dependent variable, the absorptive capacity, learning processes and combinative capabilities as the independent variable and including contextual variables, departs from the existing preoccupation with absorptive capacity and direct innovation outcomes. Secondly, in order to explain how the necessary knowledge for

strategic innovation is absorbed, our findings provide an understanding of how learning processes and combinative capabilities contribute to strategic innovation. The findings suggest that in the context of strategic innovation, assumptions on strategic behaviour, network position, efficiency ratio, and the sequence of learning processes need to be reconsidered.

Bosch et al.'s (1999) argument that first-mover strategies have advantages for a company's absorptive capacity, cannot easily be transferred as a proposition for strategic innovation. Our findings suggest that follower strategies seem beneficial, where first mover strategies would generate counter-productive side effects. Such side effects refer to constraints on combinative capabilities, which are necessary for taking advantage of the exploratory learning processes. First-mover strategies seem to hinder departure from a strong formalisation of knowledge sharing, and constrain the development of more problem-solving skills through higher cognitive diversity, or moving away from vertically centralised decision-making authority. Therefore, Proposition 1 suggests that a first-mover strategy can also hinder strategic innovations, whereas a follower strategy could enhance strategic innovation. Theory-building should elaborate how a first-mover strategy can form rigidities which constrain strategic innovations. Based on the above discussion, we offer the following research proposition:

**Proposition 1.** A first-mover strategy can hinder strategic innovations, whereas a follower strategy could enhance strategic innovations.

Similar to the first-mover strategy, Tsai (2001) argues that a more central network position strengthens the relationship between absorptive capacity and innovation performance. Our findings indicate that a central network position and strong ties with network partners tend to constrain the knowledge-creation process. Interestingly, the restrictive effects on first-mover strategy and centrality in the network position could only be observed for declarative knowledge. For procedural knowledge, the effects limit the application, but not necessarily the number of acquired strategy approaches and extent of strategy development processes. Future research should, therefore, revitalise Grant's (1996) or Kogut and Zander's (1992) distinctions into different types of knowledge, and elaborate how absorptive capacity for one type of knowledge is interrelated with another.

Therefore, Proposition 2 suggests that increasing centrality in the network position constrains strategic innovation. Theory-building should elaborate how centrality in the network position leads to strategic reference points, which limit the declarative knowledge-creation process. Declarative knowledge that qualifies as reference points for strategic innovation, is not replicated or SHOULD THIS BE OR AND NOT AND? retained internally. Thus, the following is proposed:

**Proposition 2.** Centrality in the network position constrains strategic innovation.

We shed light on the discussion on the sequence between the acquisition, assimilation, transformation, and exploitation of knowledge (Jansen et al., 2005; Todorova & Durisin, 2007; Zahra & George, 2002). Assimilation and transforma-

tion are not sequential, but also not necessarily parallel. As suggested by Alpha, if the exploratory learning processes rely on previous combinative capabilities, they will not only lead to some ideas that are relatively close to the existing knowledge base, but will also assimilate, rather than transform the knowledge. Under such conditions, exploratory learning processes are preceded by an assimilation of the newly acquired knowledge. Assimilation continues with previous combinative capabilities. Beta's reconfigurations of combinative capabilities within the exploratory learning process enable transformation, in which the newly acquired knowledge interacts with changes in combinative capabilities. Therefore, Proposition 3 suggests that transformative learning plays a key role in strategic innovation. Thus, the following is proposed:

**Proposition 3.** Transformative learning contributes significantly to strategic innovation.

Our findings contribute to the debate on the efficiency ratio rationale and the fit between potential and realised absorptive capacity (Zahra & George, 2002). Alpha fully transforms the potential knowledge stock into commercial purposes. Beta's efficiency factor is lower, and only a few selected actions in the exploitative learning processes follow the exploratory and transformative learning processes. Nevertheless, these few selected actions enable Beta to achieve strategic innovations. The efficiency factor seems to be a limited predictor of strategic innovations. Our findings are more in line with Winter's (2000) aspiration-level framework. Aspirations should not merely aim at increased efficiency factors; instead, approximate aspirations should be set for exploratory, transformative, and exploitative learning processes. In combination with the former sequence of learning processes, aspirations for the transformative learning process play a key role in strategic innovation. Strategic innovation benefits from aspirations that transforming knowledge is interrelated with changing existing combinative capabilities.

Departing from existing configurations in combinative capabilities suggests that absorptive capacity also involves the unlearning of capabilities. Adding to Todorova and Durisin's (2007, p. 777) argument that "...firms often fail to identify and absorb valuable new external knowledge, because they are hampered by their embedded knowledge base, rigid capabilities, and path dependent managerial cognition...", rigidities exist specifically in how knowledge is systematised, coordinated, and socialised. We propose that firms reconfigure their combinative capabilities. For example, exploratory and transformative learning processes benefit from decreased formalisation and more interdisciplinary routines for knowledge systematisation, cross-functional interfaces, job rotation, and an umbrella strategy for knowledge coordination, as well as increased cognitive diversity and more dense social linkages. While these reconfigurations essentially depart from past experiences, relying on initial systematisation capabilities would promote exploitative learning process.

The results support the argument that the socialisation of knowledge influences all three learning processes (Jansen et al., 2005), and not only the impact of potential on realised absorptive capacity, as proposed by Zahra and George

(2002). This line of argumentation is not restricted to the socialisation of knowledge, but also includes its systematisation and coordination. Furthermore, our findings support the feedback process perspective on absorptive capacity (Lane et al., 2006; Todorova & Durisin, 2007), and depart from the linear approach to absorptive capacity (Jansen et al., 2005; Zahra & George, 2002). Proposition 4 suggests that combinative capabilities enhance exploratory and transformative learning. Theory-building should elaborate how combinative capabilities facilitate these learning processes. Thus, the following is proposed:

**Proposition 4.** Combinative capabilities enhance exploratory and transformative learning.

### Managerial implications

The practical implications hinge on the ability of our findings to yield viable managerial recommendations. In general, our findings offer managerial guidance for determining the relative importance of learning processes and combinative capabilities for strategic innovation. Managers should become aware of the fact that innovation results from exploratory, assimilative, transformative, and exploitative learning processes. Managers should emphasise all learning processes equally. Concentrating only on one of the learning processes does not lead to innovation. Traditional innovation originates from interactions between exploratory, assimilative, and exploitative learning processes, whereas exploratory, transformative, and exploitative learning processes trigger strategic innovation. Specifically, transformative learning processes seem to play a key role when it comes to achieving new business models, radical leaps in customer value, and uncontested markets associated with strategic innovation. Exploratory and transformative learning processes benefit from changes in combinative capabilities. Specific managerial recommendations refer to increasing coordination capabilities through implementing cross-functional interfaces, enhancing participation in decision-processes, and increasing job rotation. These learning processes seem to benefit from modifying decision-processes from vertically-centralised toward more horizontal and decentralised decision-making. Departing from rigor, highly formalised and routine-based organisational actions for systemising knowledge contribute to exploratory and transformative learning processes. In order to enhance exploitative learning process, managers should rely on strong formalisation and routinisation when it comes to systemising knowledge. Exploratory and exploitative learning processes, and specifically transformative learning process benefit from enhanced socialisation capabilities. Valuable guidelines for enhancing socialisation capabilities refer to increasing gender and role diversity, and connectedness to different external knowledge sources.

Furthermore, our findings offer managerial guidance for assessing initiatives aimed at strategic innovation. By comparing their own absorptive capacity, learning processes and combinative capabilities with our chronological description of Alpha and Beta, managers can evaluate the appropriateness of strategic innovation initiatives. By assessing similarities to and differences from their own initiative,

managers can assess how knowledge is acquired, assimilated, transformed, and exploited, and the state of coordination, system and socialisation capabilities.

Managers should also be aware of the limitations of the first-mover strategy, and be more observant of their own knowledge network position. In order to achieve strategic innovation, a follower strategy and less central, but participative roles in the network contribute to exploratory and transformative learning processes. Furthermore, managers should emphasize strong integration between procedural and declarative knowledge, through the direct application of knowledge.

### Limitations of the study

Despite the managerial and theoretical implications, the study has its limitations. As with any qualitative research, we cannot ensure complete transferability of our findings (Lincoln & Guba, 1985). We chose the two cases for reasons of appropriateness, rather than of representativeness (Miles & Huberman, 1994). We applied various ways of improving the possibilities for transferability, such as similar company characteristics, but a contrasting degree of strategic innovation. We also provided a rich description of both case studies and all constructs from which other researchers and managers can evaluate the transferability to other research and managerial contexts. Nevertheless, the extent to which our results are transferable remains unclear. Future research should obtain additional qualitative data, so as to replicate and transfer our findings. Based on more comprehensive qualitative data, researchers may develop further hypotheses on the relationships between contextual variables, absorptive capacity, learning processes, combinative capabilities and strategic innovation, and test them empirically. For example, future research can rely on variance-based or component-based structural equation modelling to test our propositions empirically.

Compared to previous research using quantifiable measures for assessing innovation (Bosch et al., 1999; Lichtenthaler, 2009), we used only qualitative measures to capture three key elements of strategic innovation. Such qualitative measures may be subject to research bias. Future research should, therefore, develop more quantifiable measures for testing our findings through quantitative data. Finally, we rely intensively on Lichtenthaler's (2009) conceptualisations of learning processes for absorptive capacity. Even if this conceptualisation is based on a broad range of research (e.g., Camisón & Forés, 2010; Flatten et al., 2011; Kostopoulos, Papalexandris, Papachroni, & Ioannou, 2010; Lev et al., 2009), future research could benefit from alternative conceptualisations. Alternative conceptualisations should consider cognitive frames, mental models, and difference in culture behind the learning processes.

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