DYNAMIC CAPABILITIES AND COMPETENCE OBSOLESCENCE: EMPIRICAL DATA FROM RESEARCH-INTENSIVE FIMRS

WOLFGANG H. GÜTTEL*
Vienna University of Economics and Business Administration – Department of Management
University of Padua – Department of Technique and Management

STEFAN W. KONLECHNER
Vienna University of Economics and Business Administration
Department of Management

ABSTRACT

The dynamic capabilities approach focuses on a firm's ability to develop its resource base in order to meet environmental expectations. Therefore, it is closely interrelated to issues of balancing exploration and exploitation in organizational learning. Scholars argue that organizations can combine both learning modes by adapting ambidextrous organizational designs. Yet, owing to strategic contradictions, ambidextrous organizations are faced with perpetual tensions. This paper investigates dynamic capabilities in ambidextrous organizations that enable these organizations to cope with contradictory environmental demands and to preserve their ability to reconcile exploration and exploitation simultaneously. We use empirical data from research-intensive organizations to show which mechanisms organizations develop in order to enable ambidextrous learning and to prevent competence obsolescence. High order dynamic capabilities balance contradicting learning directions. They can be perceived as balancing routines and, thereby, they fulfill functions of conflict regulation, reflection and integration.

1 INTRODUCTION

Organizational life is characterized by the continuous need to adapt to a dynamic environment and to generate innovations in order to meet or to create future demands. Concurrently, organizations need to sustain stability and to preserve their identity in order to ensure steady performance based on operative routines. Moreover, on that level, small improvements are necessary to optimize existing processes and to replicate successful practices. Consequently, apart from operative routines, different and diverse change routines to enable various development activities and learning processes must exist. However, innovation and adaptation as well as replication and optimization represent modes of organizational development that follow different logics (March 1991, Gibson and Birkinshaw 2004).

The dynamic capabilities framework focuses on these issues, although scholars dedicate attention primarily to innovation and adaptation while topics of replication and

* Corresponding Author: Wolfgang H. Güttel, Vienna University of Economics and Business Administration, Department of Management - Institute for Human Resource Management, Althanstraße 51, A-1090 Vienna, Austria, Tel +43.1.31336.4330, Fax +43.1.31336.90.4330, E-mail wolfgang.guettel@wu-wien.ac.at

optimization have been widely ignored. Notable exceptions exist in the conceptualization of dynamic capabilities provided by Zollo and Winter (2002) and Winter (2003). However, even though high order (second order) dynamic capabilities have been introduced and discussed (Collis 1994, Zollo and Winter 2002, Winter 2003), little attention has been drawn on the basic contradiction between those two logics (innovation/adaptation and replication/optimization), which dominates the discourse about the trade-off between exploration/exploitation and represents the fundamental challenge in enabling ambidexterity. Individual and organizational competencies especially in ambidextrous organizations are threatened by obsolescence, if high order capabilities to govern the trade-off between exploration and exploitation are developed insufficiently or if they are even missing.

In this paper, we re-conceptualize the dynamic capabilities framework by introducing the functions of high order dynamic capabilities to balance various (explorative and exploitative) change routines (first order dynamic capabilities). Therefore, we draw on research on organizational ambidexterity and introduce the concept of ambidextrous learning – the balancing of contradicting learning modes – into the dynamic capabilities approach. Consequently, we pose the following research questions: *What causes the difference between companies with functional development forces (i.e. dynamic capabilities) and those with dysfunctional ones?* And, additionally: *How are dynamic capabilities – the organization's learning mechanisms – shaped in ambidextrous organizations to prevent obsolescence (ambidextrous learning)?*

2 DYNAMIC CAPABILITIES AS CHANGE ROUTINES AND AMBIDEXTERITY: THEORETICAL BACKGROUND

The Resource-based view of the firm (RBV) has become the dominant paradigm in strategic management over the past decades (Lippman and Rumelt 1982, Wernerfelt 1984, Barney 1991, Peteraf 1993). Its main proposition is that competitive advantage derives not from market conditions, but from internal characteristics of the firm. Internal firm characteristics that may lead to competitive advantage have been described as architectural knowledge (Henderson and Clark 1990), core-competences (Hamel and Prahalad 1990), combinative capabilities (Kogut and Zander 1992) and architectural competence (Henderson and Cockburn 1994). While routines have already been conceptualized as being the basis of organizational capabilities by some scholars (Nelson and Winter 1982, Grant 1991, Collis 1994, Winter 1995, 2003), more recently, questions about the character of a firm's resource and routine base and their progression in highly dynamic environments led to the development of the dynamic capabilities framework (Teece, Pisano and Shuen 1997, Eisenhardt and Martin 2000, Zollo and Winter 2002, Zahra, Sapienza and Davidsson 2006, Wang and Ahmed 2007).

Dynamic capabilities have been conceptualized as the firm's ability to "*integrate, build and reconfigure internal and external competencies to address rapidly changing environments*" (Teece et al. 1997: 516). Zollo and Winter (2002) criticize that the definition of Teece et al. (1997) implies a rapidly changing environment for the existence of dynamic capabilities. However, even firms in relatively stable environments integrate, build and reconfigure their capabilities. Hence, Zollo and Winter (2002: 340) define a dynamic capability as "*a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved*

effectiveness" and they argue that dynamic capabilities exist "*even in environments subject to lower rates of change*". Both definitions show a central contradiction within the dynamic capabilities approach and in organizational life: Optimization and replication vs. innovation and adaptation. Organizations need to use and to coordinate their processes (optimization, replication). Concurrently, organizations need to adapt existing capabilities (routines) and resources as well as to develop new opportunities (innovation, adaptation). However, Zollo and Winter (2002) differentiate between dynamic capabilities, which are described as being learned and stable patterns – and therefore represent high order routines – and operating routines, which are modified by those high order routines. Their work is therefore in line with the considerations of other scholars (Collis 1994, Zahra et al. 2006), who organize different capabilities hierarchically.

The operative core of organizations is based on first order (Collis 1994), zero-level (Winter 2003) or substantive (Zahra et al. 2006) capabilities. These routine-based capabilities are the foundation of a firm's activity (e.g. production processes, marketing and sales). As a changing environment with perceived opportunities and threats necessitates a constant development of operative routines, organizations develop (first order) dynamic capabilities (e.g. R&D, reengineering, innovation processes) that provide knowledge to change operative routines. First order dynamic capabilities (Zollo and Winter 2002) govern modifications of operative routines. They include routines in order to govern reengineering, restructuring, post-merger-integration as well as R&D (see Eisenhardt and Martin 2000, Wang and Ahmed 2007 for similar examples of (first order) dynamic capabilities). Therefore, routines "*pave the way for deliberate learning inside firms, thereby shaping the future development of the firm*" (Becker et al. 2005: 777). By contrast, ad-hoc problem solving can not be considered as a dynamic capability, as it exhibits no routinised quality. "*Ad hoc problem solving is not routine; in particular, not highly patterned and not repetitious. (...) it typically appears as a response to novel challenges from the environment or other relatively unpredictable events*" (Winter 2003: 992-993).

On a higher level (second or high order), dynamic capabilities govern the change of (first order) dynamic capabilities and operative routines (Collis 1994, Zollo and Winter 2002, Winter 2003, Zahra et al. 2006, Wang and Ahmed 2007). Second order dynamic capabilities influence high order organizational learning and determine the corridor of the organization's development. High order change is ensured as second order dynamic capabilities implicate experience accumulation, knowledge transfer and generation (Zollo and Winter 2002). Moreover, on the level of first order dynamic capabilities, conflicts on resource allocation, values and norms may arise from the fact that the intensity and direction of these change routines are antagonistic, as some of them follow an exploration while others follow an exploitation logic (Wang and Ahmed 2007: 37).

Gilbert (2006) indicates that competitive frames for development (similar to the distinction between exploration and exploitation) can exist within organizations and, consequently, there is a need to manage their coexistence (similar Smith and Tushman 2005: 526-527). He found out that a structural differentiation enables the coexistence of competitive frames. Frame integration was done by senior management teams and structural differentiated subunits (with opposing frames) could use modular interfaces for interaction. However, Gilbert (2006: 163) calls for further research in order to understand the function of such modular interfaces that concurrently facilitates separation (the coexistence of different frames) and integration (interaction).

In conclusion, organizations learn to balance contradictory logics through experience accumulation both on the level of operative routines and on the level of change routines. However, dynamic capabilities literature is silent in regard to the question, how diverse and opposed (first order) dynamic capabilities are balanced.

Nonetheless, considerations about the nature of dynamic capabilities are strongly connected to issues of organizational learning in general (Argote 1999) and questions of exploration and exploitation of organizational knowledge (March 1991, Gupta, Smith and Shalley 2006). There seems to be agreement on the fact that organizations need to balance exploitation and exploration in order to preserve short term efficiency and long term innovation. "*The basic problem confronting an organization is to engage in sufficient exploitation to ensure its current viability and, at the same time, to devote enough energy to exploration to ensure its future viability*" (Levinthal and March 1993: 105). On the one hand, it is argued that too much exploitation drives out exploration (Benner and Tushman 2002), which leads to organizational inertia (Hannan and Freeman 1977), core rigidities (Leonard-Barton 1992), and competency traps (Levitt and March 1988). On the other hand, too much exploration is said to lead to the neglect of improving and adapting existing routines (March 1991) and may prevent benefiting from economies of scale. Since organizations have to gain *and* sustain competitive advantage, the trade-off between exploitation and exploration activities is of crucial importance (Grant 1996).

Empirical results indicate that organizations may adopt structures (e.g. team structures, semistructures) or they may develop a culture (e.g. management awareness, common language, and shared background) that enable exploration and exploitation simultaneously (Tushman and O'Reilly 1996, Benner and Tushman 2002, Gibson and Birkinshaw 2004, He and Wong 2004, Smith and Tushman 2005, O'Conner and DeMartino 2006, Gilbert 2006, Taylor and Greve 2006, Beckman 2006, Lavie and Rosenkopf 2006, Miller, Meng and Calantone 2006). Such organizations are referred to as ambidextrous organizations.
Yet, owing to scarce resources and optimization activities of competitors, a firm's capacity to concurrently optimize exploration and exploitation concurrently is limited (March 1991). Path dependency (Teece et al. 1997 and similar Dierickx and Cool 1989, March 1991) leads to an idiosyncratic learning behavior that depends on market characteristics and prior experience accumulation. Consequently, the dynamic capabilities' characteristics reflect these developments and differ whether the organization follows an explorative or an exploitative learning mode. Eisenhardt and Martin (2000) identified different patterns of dynamic capabilities depending on market dynamics from a contingency perspective. In high velocity markets, organizations rely on simple rules in order to keep pace with a dynamic environment, whereas detailed routines and scripts are employed in moderately dynamic markets. However, Eisenhardt and Martin (2000) do not discuss cases in which organizations strive to combine exploration and exploitation in contextual ambidextrous organizational designs. We link issues of organizational ambidexterity to the dynamic capabilities framework. A similar linkage underlies Eisenhardt and Martin's (2000) framework tacitly and is mentioned rudimentarily in regard to exploration and exploitation by Wang and Ahmed (2007), He and Wong (2005), Smith and Tushman (2005) and Ancona et al. (2001) explicitly.

In this paper, we analyze the dynamic capabilities of organizations, which reconcile both explorative and exploitative learning permanently, what we will describe as *ambidextrous*

learning. Firms that perform applied R&D can be conceived as ideal types of ambidextrous organizations as they compete in basic research with an exploration mode and in development (i.e. pure commercial research and consulting projects) with an exploitation mode. Their trade-off between exploration and exploitation is inherent (even within teams and individuals; consequently we follow an orthogonal understanding of exploration and exploitation). Therefore, we do not focus on a punctuated equilibrium approach (Gersick 1991, Burgelman 2002), which proceeds on the assumption that organizations perform periods of exploration and exploitation in succession. Instead, we concentrate on the learning behavior of tightly-coupled ambidextrous (R&D-) organizations (Benner and Tushman 2003), which perform a business model that requires a concurrent balance on organizational, team and individual level (Brown and Eisenhardt 1997). Finding this balance has proved to be difficult since organizations need to establish mechanisms in order to cope with contradictory environmental demands and paradoxical situations (Poole and Van de Ven 1989, Smith and Tushman 2005). Yet, the constitution of dynamic capabilities in ambidextrous organizations, which are faced with paradoxical environmental demands, has still remained unclear.

3 METHODS

The research questions are answered empirically by using data from research-intensive firms. We applied a case study research design (Yin 1989, Creswell, 1998) and conducted semi-structured interviews to analyze configurations of dynamic capabilities in different organizations. An embedded case study (Yin 1989: 49) was conducted by analyzing different and highly independent business units within one large research-intensive organization. This approach enabled a distinction in regard to different forms of the units' learning behavior. Additionally, we focused on distinctions of different units and their idiosyncratic learning behavior within organizations in order to identify various characteristics of dynamic capabilities in different environmental contexts.

Subsequently, we utilized the data from the embedded case study to advance the theoretical framework, and to select further cases within other research-intensive organizations carefully. This was achieved by using literal replication (similar results for predictable reasons) and theoretical replication (different results for predictable reasons) logic (Yin 1989: 54). Consequently, new findings were used to ongoingly modify the framework (Eisenhardt 1989, Geisenhardt & Graebner 2007).

During the research process we were able to build ideal types of organizations depending on whether they focus primarily on exploration (exploration organizations/units), exploitation (exploitation organizations/units) or try to pursue both activities simultaneously (ambidextrous organizations/units). We accept that a certain combination of explorative and exploitative activities has to be assured in all organizations. However, we tried to identify the main focus of the organizations (unit of analysis) we studied. Exploration organizations ("Cutting edge organizations") on the one hand perform a high degree of internal learning dynamics and follow March's mode of exploration (March 1991). As a result, they dispose of exploration routines, which enable opportunity recognition and risky innovation activities. Exploitation organizations ("Recurrence organizations") on the other hand practice moderate internal learning dynamics, thereby meeting March's mode of exploitation (March 1991). They perform exploitation routines, as described by Zollo/Winter (2002) with their notion of first order dynamic capabilities in

the form of restructuring or reengineering competencies. Both configurations represent functional forms concerning learning behavior. In these cases, organizations have developed dynamic capabilities that enable adaptation to – high or low – market dynamics (as described in Eisenhardt/Martin 2000).

In addition to organizations with a clear focus either on exploration or on exploitation we found ambidextrous organizations. These organizations perform in high velocity markets (i.e. integration into the scientific community) and in moderately dynamic markets (i.e. consulting projects) concurrently. Accordingly, their dynamic capabilities exhibit a unique character in order to enable ambidextrous learning.

In the next step, we were able to distinguish between ambidextrous organizations with functional and with dysfunctional dynamic capabilities. We labeled dynamic capabilities as dysfunctional, when either explorative or exploitative activities were over-emphasized and high order routines (i.e. dynamic capabilities) to balance both learning logics did not fit perceived and explicitly formulated own demands or environmental expectations. Such organizations are vulnerable to competence obsolescence. The comparison between functional and dysfunctional dynamic capabilities allowed us to identify the internal constitution of dynamic capabilities in ambidextrous organizations.

In this paper, we focus on dynamic capabilities of ambidextrous organizations that successfully manage the trade off between the conflicting demands of exploration and exploitation. We explain structural arrangements and cultural values and norms that enable ambidexterity. Moreover, the functions of high order dynamic capabilities to govern various and contradicting first order dynamic capabilities and operative routines (i.e. the trade-off between exploration and exploitation) are explained. The data presented in this paper are part of a larger research project, where organizational capabilities of research-intensive firms in various industries are analyzed.

4 RESULTS

In this section, we present concrete findings of measures, practices and mechanisms that are used by organizations to enable organizational ambidexterity in functional configurations. Thereby, we answer the question of concrete organizational designs to cope with contradictory demands and to prevent competence obsolescence. Structural arrangements and specific cultural values and norms serve to stimulate and to regulate learning and development. Whilst we identified similar configurations in all of the analyzed ambidextrous organizations, concrete measures, which are used by the organizations, differed in their very detailed characteristics. In a second step we demonstrate, how high order dynamic capabilities are shaped in ambidextrous organizations and which functions they fulfill.

4.1 Enabling Ambidexterity

Organizations inhibit various development and change routines that enable concurrent explorative and exploitative activities. However, the question remains open, what is done by organizations in order to enable ambidexterity? Based on our empirical data, we describe in this section the concrete structural and cultural arrangements that are used by organizations to enable ambidexterity.

Ambidextrous organizations (or ambidextrous units of large organizations) are characterized by a close interaction between research (reference system: scientific community – work on new solutions) and services (reference system: commerce – repetitive application of approved solutions) with a tendency towards applied R&D. The challenge is to find the balance between research and services orientation. *Creating and using synergies* (a2, 43) between those two is described as the basic challenge in ambidextrous organizations.

> *In principle we have kind of independent research and we have kind of contract research, you know [...] the independent research follows the scientific logic, harmonized with the dimension of technology-politics, and contract research follows customer satisfaction as criterion. That means it is our aim to carry out projects in such a way that clients will be our client for a second time as well and not only for once. (a1, 37-43; on strategic planning)*

Ambidextrous learning is supported by *structural arrangements* in order to make a switch between explorative and exploitative learning on organizational, team and individual level feasible. The organizations we studied display structures that consist of complex formal rules. Organizational learning comprises routines, which enable the systematic acquisition of new knowledge from outside the organization. Employee's integration into the scientific community, participation in research networks and planned limited turnover rates serve as mechanisms to ensure innovation. However, the limitation of planned turnover stimulates experience accumulation which increases the organization's ability to replicate and to optimize their existing operative practices.

Often employees offer qualifications in both areas (research and services). Since the usage of existing solutions is necessary too, the development of a core staff who can realize learning experiences with new clients in a routine way is essential. Selection procedures exist in earlier career stages and the best are awarded a permanent employment contract (tenure position). The structure of the core staff is determined and controlled by the recruitment frequency. The organization gains flexibility through the employment of young experts and research assistants. Consequently, the organization can benefit from their specific knowledge temporarily (e.g. in certain projects). Similar as in organizations that focus solely on exploration, such an employment can serve as stepping stone for these young experts. The rather large part of flexible staff keeps the organization versatile and adaptable.

> *...in general there are only one-year-contracts to start with; afterwards he or she will get a tenure position. (a1, 488-490)*

> *...usually we send people back to the free hunting-grounds after they have completed their dissertation, because in research it simply is important to have a broad horizon. (a2, 300-302; on personnel selection and fluctuation)*

Specializations of employees in one area (research or services) may happen and present a potential area of conflict because it can lead to a lack of absorptive capacity in another area. It is one of the central challenges in ambidextrous organizations or units to cope with diversity, which demands for diverse governing mechanisms. A uniform specialization of

the employees can be balanced by working in project teams. Thus, job design and career management are important formalized decision artifacts in ambidextrous organizations. By means of these artifacts it first is stated if the expert has to be qualified in both areas (research and services) or not and second, it is decided if the focus may switch from exploration to exploitation (or vice versa) in the course of a career. Third, it can be defined if a team is to consist of employees with different professional specializations (i.e. focus on research or services) or with similar competence profiles (i.e. individual ambidexterity).

Organizations provide structures for teamwork and performance monitoring (on the individual and on the organizational level). Competence monitoring systems (in terms of intellectual capital statements, balanced score cards, strategic controlling indicators) are applied to determine the trade-off between exploitation and exploration on the organizational level (e.g. financial results are supplemented with indicators derived from the sphere of science). The anticipation of environmental developments (scenarios) enables the comparison of organizational capabilities and environmental requirements and supports decisions concerning the different development logics of exploration and exploitation. On the individual level target agreements (e.g. management by objectives (MbO)) and performance reviews are used to define the emphasis of individual employees on exploitation and/or exploration in order to preserve his or her ability to keep up with future requirements and to make sure that existing knowledge is used in current projects and passed on to colleagues. In comparison to exploration organizations, training off the job (e.g. soft-skills, project management) is of certain importance. However, training on-the-job and conference participation are seen as most important development activities for employees. Phases in which employees focus on research activities can be used for knowledge updating. Since there are two kind of governing logics, performance measurement takes place based on different criteria as well.

> *I believe that my employees rate their success on the following: on how they manage their talks at international conferences, on the acceptance of their papers in refereed journals, if they wrote a book or an article in a book. That means, they rate part of their success on their scientific performance […] The second part of their success, I believe, depends on how they manage to carry out projects, what approval they meet, the client satisfaction (a1, 583-589; on indicators for success – employee level)*

Performance monitoring activities on the individual level increase the pressure on individual development activities. The existence of strong *cultural values and norms* in terms of group pressure and competition regarding both learning and performance in all environments ensures high competitiveness in exploration and exploitation as well as the use of synergies between them. Ambidextrous organizations establish only a few rules (e.g. periodic and public performance reviews, team structures, dual engagements in exploration and in exploitation projects) and draw on social rules and group norms in order to keep the employees learning and performance standards high and ambidextrous. Individuals are basically free to decide when to engage in explorative or exploitative activities. Simple rules regulate the learning activities of individuals or the interplay of teams within these structural arrangements. Intrinsic motivation plays a crucial role in ambidextrous units, even though intrinsic motivation is not valued as being as substantial as in units that focus purely on explorative activities, where…

> *... all extrinsic motivation systems basically are alien to them [employees in exploration-focused units – ann.]. He says he wants to have his lab and an appropriate infrastructure and enough people with whom he can interact well. That's their motivation. (e1, 648-650; on intrinsic and extrinsic incentives)*

The main challenge in ambidextrous organizations is to find the appropriate relation between extrinsic and intrinsic motivation. This is achieved through goal setting processes in MbO-frameworks which are of high relevance in ambidextrous organizations because they allow for a time balance of different tasks for future planning periods (e.g. 70 % of the available man days are used for research and 30 % for services). Thereby, crowding-out and multi-tasking effects have to be taken into consideration. Particularly in the area for which science represents the reference environment a high level of intrinsic motivation exists. The organization defines the framework in terms of resources (e.g. time) and expected results and employees can deliberately decide on their activities. Cultural values and norms facilitate the explicit reflection of the "inherent" conflicting interests between explorative and exploitative activities and strive more for a balance of both than for a dominance of one of them.

Based on an organizational routines lens, we can conclude that organizations enable ambidexterity by formal design and cultural values and norm that align the organizations (exploitation) and, simultaneously, provide opportunities for innovation and discovery (exploration).

Organizational routines are *"(...) repetitive, recognizable pattern of interdependent actions involving multiple actors*" (Feldman & Pentland 2003: 96). A more detailed concretion of organizational routines is facilitated through the differentiation of "ostensive aspects" and "performative aspects" (Feldman & Pentland 2003, Pentland & Feldman 2005). "*The ostensive aspect is the ideal or schematic form of a routine. It is the abstract, generalized idea of a routine, or the routine in principle. The performative aspect of the routine consists of specific actions, by specific people, in specific places and times. It is the routine in practice*" (Feldman & Pentland 2003: 101). The abstract generalized idea of a routine (ostensive aspect) can be perceived as rule-system (Becker 2005: 818) or grammar (Pentland & Rueter 1994, Pentland 1995). The concrete application (performative aspect) of the rule is the observable routine (routines as interpreted rules; Reynaud 1996 2005). General rules (ostensive aspects) are valid beyond a singular concrete application (performative aspects) even if the concrete application diverges from the general rule.

Ambidextrous organizations use clear performance targets and in the structuring of cooperation, ostensive and performative aspects of organizational routines are basically congruent. In other domains, the concrete performance of routines leads to a constant reconfiguration of ostensive aspects of routines (Feldman & Pentland 2003, Pentland & Feldman 2005). The values and norms of the organization's culture comprise high standards in regard to performance (similar to Tushman and O'Reilly's (1996: 27) findings on ambidextrous organizations) as well as to the integration into the scientific community. Both domains influence the ostensive aspects of the organization's routines. As long as employees meet both objectives, only a limited amount of structuring (ostensive aspects) exists in order to guide employees' behavior (performative aspects). Organizations use team- and project-based working structures that constitute the formal arrangement. Brown and Eisenhardt (1997) and Verona and Ravasi (2003) show that project-based structures

combined with high performance standards promote the combination of knowledge components dispersed within the firm. Furthermore, the integration into the scientific community acts as a way to exchange knowledge continuously with the external environment. Brown and Eisenhardt (1997: 28) used the term "semistructures", when they explained their findings of successful innovation activities: "*By semistructures we mean organizations in which some features are prescribed or determined (e.g. responsibilities, project priorities, time intervals between projects), but other aspects are not. Semistructures exhibit partial order, and they lie between the extremes of very rigid and highly chaotic organization*". Consequently, structural arrangements need to balance contradictory learning activities by enabling such a loose-tight relationship.

Moreover, through to the use of group work, individual performance and the fit to group expectations (ostensive aspects) are visible. Formal and social control can sanction deviant behavior on the basis of formal (hierarchical) or social rules (Ouchi 1979, 1980, O'Reilly & Chatman 1996). However, as individual employees need to allocate resources and attention between explorative and exploitative activities, MbO is a means to signalize that an individual employee's effort has to address diverse performance targets. The latter is realized through participation in other projects or through a partial integration into external scientific networks. Therefore, our results correspond to Tushman and O'Reilly's (1996: 26-27) empirical findings on the culture of ambidextrous organizations, where strong social control exist within a loose-tight relationship. Some areas were characterized by strong social control (tight) whereas in others only noncommittal norms were present (loose).

4.2 Governing Ambidexterity

Ambidextrous organizations use structural arrangements and cultural values and norms to enable explorative and exploitative learning concurrently. However, owing to contradictory environmental demands and learning modes, the question remains open, how (high order) dynamic capabilities are shaped that govern ambidexterity in terms of moderating the trade-off between exploration and exploitation? Ambidextrous organizations deal deliberately with decisions in regard to their relation between exploration and exploitation. Consequently, we conceive a balancing routine as the main high order dynamic capability of ambidextrous organizations that is responsible for the governance of ambidexterity. For this purpose, organizations use formal decision making routines (e.g. strategic planning, budgeting) and social practices (e.g. leadership behavior, which is based on norms that incorporate values for a concurrent participation on explorative and exploitative activities) to balance antagonistic tendencies. Therefore, balancing decisions do predominately not follow an ad-hoc modus and exhibit the characteristics of routines (i.e. ostensive and performative aspects as well as some artifacts in terms of decision rules, standard operating procedures and supportive infrastructures). Thus, ambidextrous organizations accumulate experience on the trade-off between exploration and exploitation in their balancing routines. Our cases indicate that high order dynamic capabilities dispose of three functions to govern diverse change routines (i.e. first order dynamic capabilities, which themselves govern explorative and exploitative learning activities): *systematic reflection*, *conflict regulation*, and *integration*.

Ambidextrous organizations *systematically reflect* on the internal consistence of their capabilities' development in relation to environmental expectations. Systematic reflection can be perceived as the first balancing function of high order dynamic capabilities.

Organizations develop assumptions about an adequate allocation of resources to exploitative and explorative activities (e.g. through strategic planning within the top management team). The organization learns by making decisions about emphasizing on exploration or on exploitation on the basis of this competence reflection and by anticipation of environmental developments, which enable the comparison of organizational capabilities and environmental requirements. Compared to pure exploration and pure exploitation organizations, resource allocation decisions in ambidextrous organizations are critical for the maintenance of ambidexterity. Exploitative activities (replication of consulting projects, optimization etc.) are necessary to provide sufficient financial resources in order to fund exploration, which is necessary to preserve an accepted integration within the scientific community. In exploration organizations, general funding is provided by central stakeholders or organizations develop routines to arrange funding through application at competitive scientific funding institutions. Consequently, in these organizations even funding strategies display an explorative character. In exploitation organizations, the replication of existing operative routines (e.g. consulting projects that are based on methodical templates or standardized laboratory tests) is the main source for funding as business firms or administrative institutions pay for these services. In contrast to exploration and exploitation organizations, ambidextrous organizations dispose of multifarious objectives. Therefore, strategic practices in ambidextrous organizations concentrate on exploration (e.g. long-term development in the sphere of science) and on exploitation (e.g. optimization of operative activities). Moreover, strategic controlling techniques are used to support these practices. Additionally, strategic planning provides a formal basis to manipulate conflicts, which result from trade-off decisions between exploration and exploitation. By communicating decisions about the allocation of resources explicitly (e.g. in mission statements, strategic plans, MbO), an organization may gain legitimacy from its internal and external environment.

Decisions on exploration or exploitation can cause conflicts regarding resource allocation, heedfulness or contradicting expectations from formal leaders and other group members. *Conflict regulation* is the second balancing function of high order dynamic capabilities. Therefore, ambidextrous organizations rely on structural arrangements as well as on cultural values and norms to reduce the potential level of conflict resulting from contradicting learning modes. The latter can be recognized in the top management's awareness of the existence and necessity of contradicting learning modes as all interviewees were able to describe the perceived strategic challenge in detail without being explicitly asked for. As a result, trade-off decisions on exploration and exploitation are integral part of strategic planning and related activities. In order to transform strategic aims to the individual level, ambidextrous organisations use MbO (or equivalents like budget decisions) at all levels to signalize expectations about the trade-off between exploration and exploitation both for learning and for operative activities to its employees. Owing to that practice, conflicts in the daily business were reduced as there was transparency of the "business model" (the relationship between exploration and exploitation) on all hierarchical levels. A similar practice is not necessary in exploration or exploitation organizations as the main organizational objectives are clearly defined.

In an equal manner, on the one hand semistructures and the extensive use of project based working structures provide means to stabilize and to align the organization's activities, which are essential even for replication and for optimization. On the other hand, these structural arrangements reduce the potential for conflicts by comprising space for

explorative development through few and flexible structures and the employee's integration in different projects (with exploitative and explorative activities). Consequently, the organization becomes flexible to enable exploration but structured enough to provide a stable performance in their exploitation (replication) activities. On individual level, ambidextrous organizations provide career structures that facilitate a dual development. The potential for conflicts decreases as these career structures facilitate an understanding of different activities and learning modes. Especially in exploitation organizations as well as in ambidextrous organizations with dysfunctional dynamic capabilities, a lack of understanding for the necessity of exercising also explorative activities results in envy and conflicts. Ambidextrous organizations may absorb these tensions by dual career structures and transform potential tensions into ex-tensions as individual employees can accumulate experience in both environments.

Conflict regulation is framed by cultural values and norms that comprise high performance and high learning standards both on individual and on group level. As long as individual employees and teams meet performance and learning objectives, the organizational culture provides the freedom to engage in explorative or exploitative activities. Moreover, as employees are engaged within both environments by participating in various projects, a strict separation into exploitation or exploitation subcultures which could cause conflicts is avoided. Nevertheless, as projects in ambidextrous organizations are dedicated to exploitation (e.g. consulting) and to exploration (e.g. research), a differentiation on project level is ensured in order to dispose of a clear focus either on exploitation or on exploration.

Integration is the final balancing function of high order dynamic capabilities in ambidextrous organizations. The participation in research networks enables the access to cutting-edge scientific knowledge. However, organizations need to develop mechanisms to transform scientific knowledge, generated through exploration, into applicable knowledge that is of use in exploitative activities. On the contrary, in operative activities (exploitation), ambidextrous organizations are able to identify immediate customer needs and the lack of appropriate solutions. Consequently, ambidextrous organizations develop mechanisms for a constant knowledge flow from exploitation to exploration and vice versa in order to use their knowledge to govern learning directions in explorative areas and to provide new solutions in exploitative areas. Thus, integration requires a shared context to interpret information and knowledge in a similar way. Moreover, strategic planning activities direct the efforts in concrete projects and integrate information generated within highly diverse environments. Hence, scientific projects deal with topics, which are relevant for exploitation use. Employees, who are experienced in operative business, participate in such projects. In a similar way, product and service development (e.g. the development of a new consulting method) is influenced by scientific results and provided by the same employees.

Furthermore, a common understanding in regard to performance and learning serves as a basis that collaboration in diverse project teams is possible without costly (especially in terms of time and performance deficits resulting from conflicts) team building activities. Simultaneously, teamwork in repeatedly changing project teams serves as a means of creating a shared context (similar frame of reference) as well as a common understanding and language, independent from employees' varied professional backgrounds. Where diversity in the employee's knowledge bases facilitates the absorption of externally generated knowledge (e.g. form scientific communities), a similar frame of reference is necessary in order to enhance internal knowledge transfer. Consequently, integration in

ambidextrous organizations is advanced through a high degree of internal absorptive capacity while maintaining external absorptive capacity.

In exploration organizations, cultural values and norms are derived from the relevant scientific community. In contrast, the relationship to other departments, which are connected to other scientific communities, is modest. There is only a limited necessity to integrate information and knowledge from other units. In contrast, exploitation organizations often lack the ability to integrate information and knowledge that is generated in operative business or in R&D.

5 DISCUSSION AND CONCLUSIONS

In conclusion, our paper makes four contributions to the existing literature. *First*, we specified the constitution of high order dynamic capabilities in ambidextrous organizations. Competencies in ambidextrous organizations are permanently endangered of becoming obsolete. High order dynamic capabilities may prevent competence obsolescence, as these capabilities are essential to build and to maintain a context (i.e. strategies, structures and measures as well as cultural values and norms) in order to balance opposed learning modes. Thus, we show how high order dynamic capabilities act as mechanism that balances conflicting learning modes within an organization. Therefore, we specify assumptions in regard to a (dynamic) capabilities' hierarchy made by Collis (1994), Zollo and Winter (2002) and Winter (2003) and we enrich the discussion about the functionality of dynamic capabilities. We indicate that *organizational ambidexterity is governed by high order dynamic capabilities, that can be perceived as balancing routines and, thereby, fulfill functions of conflict regulation, reflection and integration* (Figure 1).

Smith and Tushman (2005: 525) emphasize that ambidextrous organizations permanently need to resolve conflicts resulting from antagonistic modes of learning. While learning-by-doing is the dominant learning mode of exploration, disciplined problem solving is typically for exploitation (Smith & Tushman 2005: 522, Levitt & March 1988). Smith and Tushman (2005) focused on the role of leaders and teams in order to resolve conflicts (see also Miller, Meng & Calantone 2006, Taylor & Greve 2006 and Beckman 2006). In addition, He and Wong (2004) conceive continuous top management attention, the development of a – not specified – "synthesizing capability" and "ambidextrous organizational design" (e.g. semistructures) as a means to manage the tensions between exploration and exploitation. Our analysis concentrates on learning resulting from these constant conflicts. Such learning is enabled by high order dynamic capabilities, which fulfill the function of *conflict regulation*: a mode to govern conflicts resulting from diverse learning activities.

Zollo and Winter (2002: 344) stated that there can be a "*recursive and co-evolutionary relationship*" between exploration and exploitation. However, in order to use knowledge and information generated through exploration and exploitation, high order dynamic capabilities for *integration* are needed: a mode to enable the use of learning results derived from explorative and from exploitative activities. Thus, we specified Gilbert's (2006) broad assumption on a modular interface between structural differentiated subunits with competing frames. In our cases, integration is done on top-management, team and individual level where ambidextrous organizations take care of the development of a collective frame of reference (e.g. through teamwork, dual career development, diverse

team staffing, shared values and norms) in order to facilitate communication and learning continuously (similar to Savory's (2006) knowledge translation capability and Zahra and George's (2002) absorptive capacity, which are conceived as dynamic capabilities).

Organizations need to decide on the trade off between exploitation and exploration. However, decisions on either exploration or exploitation are path dependent and second order exploitation (i.e. the relationship between exploration and exploitation) results from prior exploration-exploitation experience (Lavie & Rosenkopf 2006: 814). Strategic considerations have to be taken in account. Schreyögg and Kliesch (2006) consider the organization's ability to gather information by competence reflection in a structured way as the main dynamic capability. It provides information concerning the necessary development direction of the resource base. Competence reflection can therefore be regarded as a cornerstone of ambidextrous learning: A complex set of routines embedded in a rule-system regulates the reflection of explorative and exploitative activities on the organizational as well as on the individual level. Moreover, it provides the basis for strategic decisions about future developments. Organizations need to perpetually reflect on the current balance of exploration and exploitation and on future developments. Consequently, high order dynamic capabilities for *reflection* are needed: a mode to balance the internal relationship of diverse learning activities (O'Reilly & Tushman 1996) in relation to environmental expectations (Eisenhardt & Martin 2000).

Moreover, we empirically specified the assumption of Gibson and Birkinshaw (2004: 210-211) that ambidextrous organizations possess meta-capabilities in order to govern both their operative and learning activities (to explore and to exploit). However, research-intensive ambidextrous organizations in our sample use both structural and contextual (cultural) modes to enable ambidexterity. Therefore, even in organizations that perform a contextual ambidexterity, structural arrangements are necessary to enable and to maintain ambidexterity. Consequently, we reformulate Gibson and Birkinshaw's (2004: 211) understanding of contextual ambidexterity.

Secondly, we present an empirical consolidation and extension of the contingency framework proposed by Eisenhardt and Martin (2000). In addition to the two configuration types mentioned in their framework, our findings indicate the existence of a hybrid configuration, which perform in high velocity and moderately dynamic markets simultaneously. This hybrid configuration corresponds to ambidextrous organizations, focusing on exploration and exploitation concurrently.

Thirdly, by discussing the role of dynamic capabilities in ambidextrous organizations, we shift attention to a relatively uninvestigated area. Up to now, empirical data for dynamic capabilities in ambidextrous organizations are missing. By the means of the dynamic capabilities framework, we show the interrelationship between complex rule systems in exploitation areas and the existence of only a few simple rules in exploration areas. We perceive these rule system characteristics typical for ambidextrous organizations as a means to integrate contradictory environmental expectations.

Fourth, dynamic capabilities literature is relatively silent in regard to concrete empirical results of dynamic capabilities' learning mechanisms (e.g. Zahra et al. 2006 distinguish between trial-and-error learning, experimentation, and improvisation or Zollo and Winter 2002 describe an abstract knowledge evolution cycle with different learning mechanisms).

We describe the impact of dynamic capabilities on organizational and individual learning empirically by explaining competence reflection, structural arrangements and cultural values and norms, which are used by ambidextrous organizations in order to enable explorative and exploitative learning concurrently.

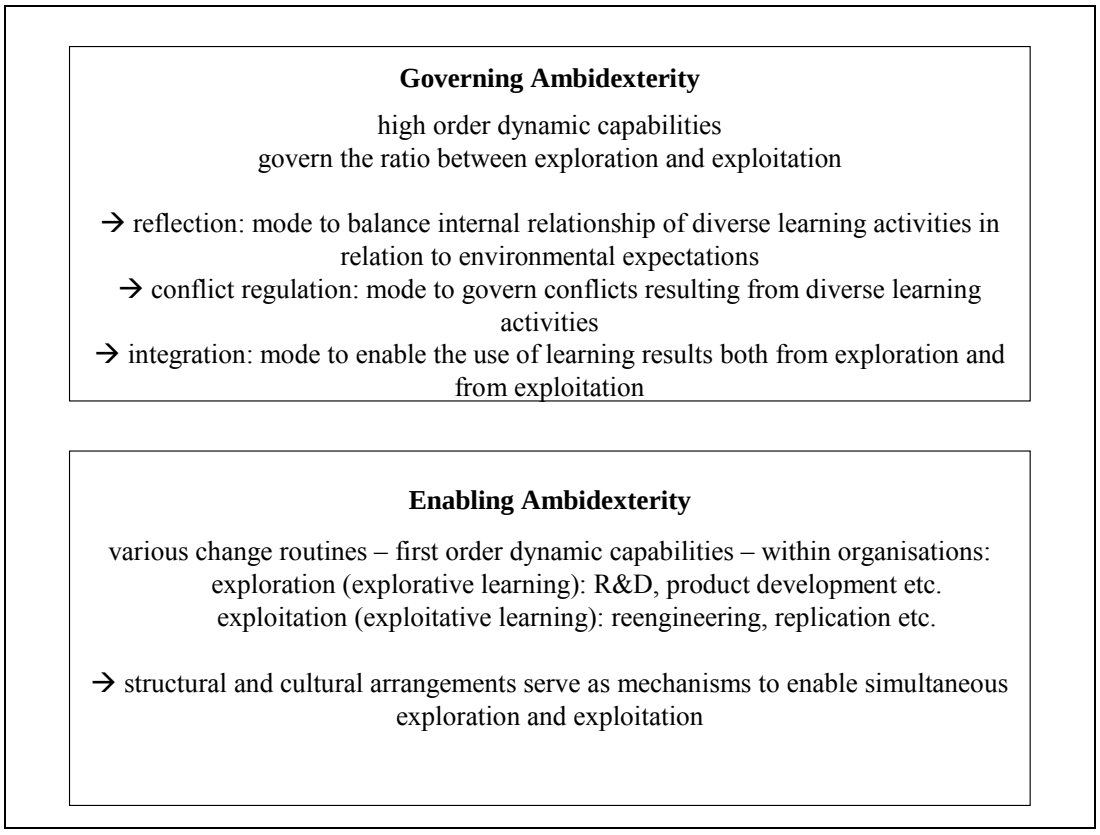

Figure 1: Dynamic Capabilities and Ambidexterity

Finally it has to be mentioned, that the presented results originate from a small sample of organizations in the R&D sector. The results may therefore not be statistically generalized, even though analytical generalization is possible up to a certain degree (Yin 1989). Further research is needed to analyze dynamic capabilities in ambidextrous organizations in other industries. Furthermore, the internal constitution of dynamic capabilities, which comprise various change and learning routines, has to be examined in greater detail. Moreover, the role of high order dynamic capabilities has to be taken into consideration as dynamic capabilities' research advances.

REFERENCES:

Ancona, D.G., Goodman, P.S., Lawrence, B.S. & Tushman, M.L. (2001) 'Time: A new research lens'. *Academy of Management Review*, 26, 645-663.

Argote, L. (1999) *Organizational learning: Creating, retaining and transferring knowledge*. Norwell MA: Kluwer Publ.

Barney, J. (1991) 'Firm resources and sustained competitive advantage'. *Journal of Management,* 17, 41-53.

Becker, M.C. (2005) 'A framework for applying organizational routines in empirical research: linking antecedents, characteristics and performance outcomes of recurrent interaction patterns'. *Industrial & Corporate Change*, 14(5), 817-846.

Becker, M.C., Lazaric, N., Nelson, R.R. & Winter, S.G. (2005) 'Applying organizational routines in understanding organizational change'. *Industrial & Corporate Change*, 14(5), 775-791.

Beckman, C.M. (2006) 'The influence of founding team company affiliations of firm behavior'. *Academy of Management Journal*, 49(4), 741-58.

Benner, M. & Tushman, M. (2002) 'Process management and technological innovation: A longitudinal study of the photography and paint industry'. *Administrative Science Quarterly*, 47, 676-706.

Benner, M & Tushman, M. (2003) 'Exploitation, exploration, and process management: the productivity dilemma revisited'. *Academy of Management Review*, 29, 238-256.

Brown, S. & Eisenhardt, K.M. (1997) 'The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations'. *Administrative Science Quarterly*, 42, 1-34.

Burgelman, R.A. (2002) 'Strategy as vector and the inertia of coevolutionary lock-in'. *Administrative Science Quarterly*, 47, 325-357.

Collis, D.J. (1994) 'Research note: How valuable are organizational capabilities?' *Strategic Management Journal*, 15 (Winter Special Issue), 143-152.

Creswell, J. (1998) *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks CA: Sage.

Dierickx, I.& Cool, K. (1989) 'Asset stock accumulation and sustainability of competitive advantage'. *Management Science*, 35, 1504-1511.

Feldman, M.S. & Pentland, P.T. (2003) 'Reconceptualizing Organizational Routines as a Source of Flexibility and Change'. *Administrative Science Quarterly*, 48, 94-118.

Eisenhardt, K.M. (1987) 'Building theories from case study research'. *Academy of Management Review*, 14, 488-511.

Eisenhardt, K.M. & Martin, J. (2000) 'Dynamic capabilities: What are they?' *Strategic Management Journal*, 21, 1105-1121.

Eisenhardt, K.M. & Graebner, M.E. (2007) 'Theory building from cases: Opportunities and challenges'. *Academy of Management Journal*, 50 (1), 25-32.

Gersick, C. (1991) 'Revolutionary change theories: A multi-level exploration of the punctuated equilibrium paradigm'. *Academy of Management Review*, 16, 10-36.

Gibson, C. & Birkinshaw, J. (2004) 'The antecedents, consequences, and mediating role of organizational ambidexterity'. *Academy of Management Journal,* 47, 209-226.

Gilbert, C.G. (2006) 'Change in the presence of residual fit: Can competing frames coexist?' *Organization Science*, 17(1), 150-167.

Grant, R. (1996) 'Prospering in dynamically-competitive environments: Organizational capability as knowledge integration'. *Organization Science,* 7, 375-387.

Gupta, A.K., Smith, K.G. & Shalley, C.E. (2006). 'The interplay between exploration and exploitation'. *Academy of Management Journal*, 49, 693-706.

Hannan, M. & Freeman, J. (1977) 'The population ecology of organizations'. *American Journal of Sociology*, 82, 929-964.

He, Z. & Wong, P. (2004) 'Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis'. *Organization Science,* 15, 481-494.

Henderson, R. & Clark, K. (1990) 'Architectural Innovation: The reconfiguration of existing product technologies and the failure of establishes firms'. *Administrative Science Quarterly*, 35(1), 9-30.

Henderson, R. & Cockburn, I. (1994) 'Measuring competence? Exploring firm effects in pharmaceutical research'. *Strategic Management Journal*, 15, 63-84.

Kogut, B. & Zander, U. (1992) 'Knowledge of the firm, combinative capabilities, and the replication of technology'. *Organization Science*, 3, 383-397.

Lavie, D. & Rosenkopf, L. (2006) 'Balancing exploration and exploitation in alliance formation'. *Academy of Management Journal*, 49(4), 797-818.

Leonard-Barton, D. (1992) 'Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development'. *Strategic Management Journal*, 13, 111-125.

Levinthal, D.A. & March, J.G. (1993) 'The Myopia of Learning'. *Strategic Management Journal*, 14(8), 95-112.

Levitt B. & March J.G. (1988) 'Organizational learning'. *Annual Review of Sociology*, 14, 319-340.

Lippman S. & Rumelt R. (1982) 'Uncertain imitability: An analysis of interfirm differences in efficiency under competition'. *The Bell Journal of Economics*, 13, 418-438.

March J.G. (1991) 'Exploration and exploitation in organizational learning'. *Organization Science*, 2, 71-87.

Miller K.D., Meng Z. & Calantone R.J. (2006) 'Adding interpersonal learning and tacit knowledge to March's exploration-exploitation model'. *Academy of Management Journal*, 49 (4), 709-22.

Nelson, R.R. & Winter, S.G. (1982) *An evolutionary theory of economic change*, Cambridge, MA: Harvard University Press.

O'Connor G.C. & DeMartino R. (2006) 'Organizing for radical innovation: An exploratory study of the structural aspects of RI management systems in large established firms'. *Journal of Product Innovation Management*, 23(6), 475-97.

Ouchi W.G. (1979) 'A conceptual framework for the design of organizational control mechanisms'. *Management Science*, 25, 833-848.

Ouchi W.G. (1980) 'Markets, bureaucracies, and clans'. *Administrative Science Quarterly*, 25, 129-141.

O'Reilly C.A. & Chatman J.A. (1996) 'Culture as social controls. Corporations, cults, and commitment'. *Research in Organizational Behavior*, 18, 157-200.

Pentland, B.T.& Feldman, M.S. (2005) 'Organizational routines as a unit of analysis'. *Industrial and Corporate Change*, 14, 793-815.

Peteraf, M. (1993) 'The cornerstones of competitive advantage: a resource-based view'. *Strategic Management Journal,* 14, 179-192.

Poole, M. & Van de Ven, A. (1989) 'Using paradox to build management and organization theory'. *Academy of Management Review*, 14, 562-578.

Prahalad, C.K. & Hamel, G. (1990) 'The core competence of the corporation'. *Harvard Business Review*, 68, 79-91.

Savory, C. (2006) 'Translating knowledge to build technological competence'. *Management Decision*, 44(8), 1052-1075.

Schreyögg, G. & Kliesch, M. (2006) 'Dynamic capabilities between routine and adhocracy: A closer look and a new perspective', paper presented at the *22nd EGOS Colloquium*, Bergen (Norway).

Smith, W. & Tushman, M. (2005) 'Managing strategic contradictions: A top management model for managing strategic innovations'. *Organization Science*, 16, 522-536.

Taylor, A. & Greve, H.R. (2006) 'Superman of the fantastic four? Knowledge combination and experience in innovative teams'. *Academy of Management Journal*, 49(4), 723-740.

Teece, D.J., Pisano, G. & Shuen, A. (1997) 'Dynamic capabilities and strategic management'. *Strategic Management Journal*, 18, 509-533.

Tushman, M. & O'Reilly, C. (1996) 'Ambidextrous organizations: Managing evolutionary and Revolutionary change'. *California Management Review*, 38, 8-30.

Verona, G. & Ravasi, D. (2003) 'Unbundling dynamic capabilities: An exploratory study of continuous product innovation'. *Industrial and Corporate Change*, 12, 577-606.

Wang, C.L. & Ahmed, P.K. (2007) 'Dynamic capabilities: A review and research agenda'. *International Journal of Management Reviews*, 9, 31-51.

Winter, S.G. (2003) 'Understanding dynamic capabilities'. *Strategic Management Journal*, 24 991-995.

Yin, R. (1989) *Case study research. Design and methods*. 2nd Ed., Thousand Oaks (CA): Sage.

Zahra, S.A. & George, G. (2002) 'Absorptive Capacity: A Review, Reconceptualization, and Extension'. *Academy of Management Review*, 27(2), 185-203.

Zahra, S.A., Sapienza, H.J. & Davidsson, P. (2006) 'Entrepreneurship and Dynamic Capabilities: A review, model and research agenda'. *Journal of Management Studies*, 43, 917-955.

Zollo, M. & Winter, S.G. (2002) 'Deliberate Learning and the Evolution of Dynamic Capabilities'. *Organization Science*, 13, 339-351.