

**HOW TO INFLUENCE MANAGERS' AMBIDEXTERITY: THE EFFECT OF THE
FORMAL ORGANIZATION STRUCTURE AND INFORMAL RELATIONSHIPS AND THE
MODERATING ROLE OF HIERARCHICAL LEVELS**

Tom J.M. Mom*

RSM Erasmus University
Department of Strategic Management and Business Environment
Erasmus University Rotterdam
P.O. Box 1738, 3000 DR Rotterdam, The Netherlands
Tel: +31 (0)10 408 2005; Fax: +31 (0)10 408 9013; E-mail: tmom@rsm.nl

Frans A.J. Van Den Bosch

RSM Erasmus University
Department of Strategic Management and Business Environment
Erasmus University Rotterdam
P.O. Box 1738, 3000 DR Rotterdam, The Netherlands
Tel: +31 (0)10 408 2005; Fax: +31 (0)10 408 9013; E-mail: fbosch@rsm.nl

Henk W. Volberda

RSM Erasmus University
Department of Strategic Management and Business Environment
Erasmus University Rotterdam
P.O. Box 1738, 3000 DR Rotterdam, The Netherlands
Tel: +31 (0)10 408 2005; Fax: +31 (0)10 408 9013; E-mail: hvolberda@rsm.nl

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*Corresponding author.

How to influence managers' ambidexterity: The effect of the formal organization structure and informal relationships and the moderating role of hierarchical levels

ABSTRACT

Current literature argues that firm and business unit ambidexterity originate to a large extent in the ambidextrous behavior of their managers. However, insight into what drives variations in managers' ambidexterity is limited, as existing studies focus on how firm and business unit level ambidexterity can be influenced. Based on insights from coordination mechanisms, learning, and strategy process literatures, this paper delivers a contribution by investigating the effect of the formal organization structure and managers' informal relationships on managers' ambidexterity. Furthermore, we investigate the moderating role of managerial hierarchical levels, i.e. how the effects of the formal structure and informal relationships differ between business unit and operational managers. Hypotheses and results indicate that the formal organization structure and informal relationships differently affect managers' ambidexterity. Moreover, significant differences exist regarding these effects across hierarchical levels.

Based on a sample of 458 managers of three large multi-unit firms, results on the formal organization structure indicate that managers' decision making authority positively relates to managers' ambidexterity, whereas formalization of managers' tasks has no significant relationship with managers' ambidexterity. Moreover, decision making authority significantly relates to operational managers' ambidexterity, but does not relate to business unit managers' ambidexterity. Regarding the informal relationships, results indicate that cross-functional interfaces and managers' connectedness to other organization members positively relate to managers' ambidexterity. Moreover, the positive relationship between both informal mechanisms and ambidexterity is larger for business unit managers as compared to operational managers.

Keywords: ambidexterity, manager level, coordination mechanisms, hierarchical level effects

Current literature investigates exploration, exploitation, and ambidexterity at the business unit and firm level of analysis (Gibson & Birkinshaw, 2004; He & Wong, 2004; Lubatkin et al., 2006; Tushman & O'Reilly, 1996). However, there is a lack of conceptually and empirically validated understanding about ambidexterity at the individual level of analysis. Gupta et al. (2006), therefore, suggest as 'some of the more promising directions for future research' investigating 'exploration and exploitation at the micro level' (Gupta et al., 2006: 703). This paper addresses this gap in the literature by investigating managers' ambidexterity. Ambidextrous managers 'constantly look backward, attending to the products and processes of the past, while also gazing forward, preparing for the innovations that will define the future' (O'Reilly & Tushman, 2004: 74).

The relevance of investigating managers' ambidexterity is indicated by studies which argue that firm and business unit level ambidexterity is manifested in the specific decisions and actions of organization members. As Gibson and Birkinshaw (2004: 211) put it: 'although ambidexterity is a characteristic of a business unit as a whole, it *manifests itself in the specific actions of individuals throughout the organization*' (emphasis in original). Some studies explicitly indicate that ambidexterity of a firm originates in the ambidextrous behavior of their managers. Adler et al (1999), for instance, discuss a firm's inclination toward efficiency and/ or flexibility in terms of the extent to which managers engage in routine or non-routine activities. Sheremata (2000) discusses a firm's ability to become ambidextrous in terms of managers' creative and collective actions, whereas Rivkin and Siggelkow (2003) investigate a firm's ability to balance search and stability in terms of the impact of organization design elements on managers' decision making. In line with these authors, O'Reilly and Tushman (2004: 81) argue that 'one of the most important lessons is that ambidextrous organizations need ambidextrous senior teams and managers'. These studies illustrate that for understanding how to build ambidexterity in a firm or business unit, it matters to understand what drives variations in managers' ambidexterity.

To increase understanding about what drives variations in managers' ambidexterity, we investigate the influence of two generic types of coordination mechanisms; i.e. the formal organization structure and managers' informal relationships with other organization members. The importance of both types of coordination mechanisms is reflected in the literature on ambidexterity;

whereas some researchers have highlighted the importance of the formal organization structure for shaping ambidexterity within a firm or business unit (Benner & Tushman, 2003; Tushman & O'Reilly, 1996), others also illustrated the importance of more informal social relationships as expressed in organizational contextual arrangements (Gibson & Birkinshaw 2004; Jansen et al., 2006). Studies on coordination mechanisms, in which the distinction between the two types of mechanisms also plays a prominent role (Martinez & Jarillo, 1989), indicate, however, that different types of coordination mechanisms differently affect organization members' behavior (e.g. Daft & Lengel, 1986; Grant, 1996; Van de Ven et al, 1976). However, although arguments can be found in the literature on ambidexterity that both types of coordination mechanisms matter for building ambidexterity within a firm, much more remains to be understood about how organizations coordinate the development of ambidextrous behavior of their managers and whether and how the two different types of coordination mechanisms differently affect managers' ambidexterity (Benner & Tushman, 2003; Jansen et al., 2006; Rivkin & Siggelkow, 2003).

Studies on coordination mechanisms indicate that the formal organization structure and informal relationships possess different capacities for processing knowledge, and differently affect interactions between managers (e.g. Daft & Lengel, 1986; Martinez & Jarillo, 1989; Tushman & Nadler, 1978). Studies on strategy process research indicate that managers' needs and abilities regarding processing knowledge and developing interactions with other organization members differ across hierarchical levels (e.g. Burgelman, 1983; Bartlett & Ghoshal, 1993; Floyd & Lane, 2000). Hence, by combining insights from studies on coordination mechanisms and strategy process research, this paper investigates furthermore whether the effect of the formal organization structure and informal relationships on managers' ambidexterity is different across managerial hierarchical levels, i.e. across business unit and operational managers. Although previous research argues that coordination mechanisms matter for building ambidexterity within a firm, they ignore the fact that ambidextrous organizations might differentiate coordination mechanisms across managerial hierarchical levels.

Summarizing, this paper aims to deliver a contribution to the literature on ambidexterity by investigating ambidexterity at the manager level of analysis, i.e. its antecedents in terms of the formal

organization structure and informal relationships. Moreover, we investigate the moderating role of hierarchical level, i.e. whether the effects of the coordination mechanisms differ across hierarchical levels. In the next section, we elaborate the concept of managers' ambidexterity, examine the impact of the formal organization structure and informal relationships, and investigate moderating hierarchical level effects. After advancing the hypotheses, the methods section provides details about the sample, data collection, and the development and validation of the measurement instruments. Next, we present the empirical findings and conclude with a discussion of the results, implications, and issues for further research.

THEORY AND HYPOTHESES

Managers' Ambidexterity

Ambidexterity, which as a word is derived from ancient Greek (amphi; i.e. two-fold) and Latin (dexter; i.e. right-hand), refers in organizational literatures to a firm's, business unit's, or manager's ability to combine, within a certain period of time and/ or place, exploration and exploitation related activities (Lubatkin et al, 2006; O'Reilly & Tushman, 2004). Although existing studies use somewhat different approaches to define exploration and exploitation, the two are typically distinguished by different types of learning (Gupta et al., 2006, March, 1991). That is, the essence of exploration activities is increasing variety in experience, whereas the essence of exploitation activities is enhancing reliability in experience (e.g. Holmqvist, 2004).

Based on these approaches in previous research, we embrace the idea in this paper that the essence of managers' ambidexterity is a behavioral orientation toward combining activities which increase variety in their experience with activities which enhance reliability in their experience (Mom et al., 2007). Correspondingly, managers' ambidextrous behavior is associated with both broadening and deepening their knowledge base; i.e. being ambidextrous requires managers to acquire new knowledge or to depart from their existing knowledge base, *and* it requires them to acquire related

knowledge or to refine and use their existing knowledge base (cf. Katila & Ahuja, 2002; Levinthal & March, 1993; Sidhu et al., Taylor & Greve, 2006). Characteristics of ambidextrous managers can be found in the literature. They conduct, for example, both routine and non-routine activities (cf. Adler et al., 1999), they adopt a long-term and a short-term orientation (Duncan, 1976; Tushman & O'Reilly, 1996), they reconsider and elaborate on existing beliefs and decisions (cf. Ghemawat & Ricart I Costa, 1993; Rivkin & Siggelkow, 2003), they engage in competence definition and deployment activities (cf. Floyd & Lane, 2002), they divide their time between alignment oriented and adaptation-oriented activities (Gibson & Birkinshaw, 2004), or they attend to the products and processes of the past while also preparing for the innovations that will define the future (O'Reilly & Tushman, 2004).

Direct Impact of Formal Organization Structure and Informal Relationships on Managers' Ambidexterity

Previous research has indicated the importance of coordination mechanisms within firms for achieving integration by providing linkages (Cray, 1984; Van De Ven, Delbecq, & Koenig, 1976) or by shaping interactions (Faraj & Sproull, 2000; Gittell, 2002) between individuals, groups, or organization-units (Argote et al., 2003; Van de Ven et al., 1976). Traditionally, research on coordination focuses on the fit relationship between coordination mechanisms and contextual features such as characteristics of organization members' tasks and interdependencies between units (Gresov, 1989; Tushman & Nadler, 1978). Last decade, studies have increasingly investigated how various coordination mechanisms differently affect knowledge processes within firms such as knowledge acquisition, sharing, integration, and utilization (Brusoni, 2005; Faraj & Xiao, 2006; Grant, 1996; Kellog, Orlikowski, & Yates, 2006; Kogut & Zander, 1996; Tsai, 2002). It is only recently that studies indicate as a new theme of investigation how distinct coordination mechanisms differently affect specific types of learning within firms (Argote et al., 2003; Reagans et al., 2005). Below, we will investigate the relationship between the formal organization structure and informal relationships and managers' ambidexterity, based on different effects these two types of coordination mechanisms have on managers' variety increasing and reliability enhancing learning activities.

Formal organization structure. Although several elements have been identified constituting the formal organization structure, we examine two of its main elements, i.e. centralization/ decentralization and formalization (Jansen et al., 2006; Lin & Germain, 2003; Miller & Droge, 1986). We operationalize the decentralization/ centralization element by investigating *managers' decision making authority* (cf. Ghoshal et al., 1994; Jansen et al., 2006), i.e. the extent to which managers have decision making authority referring to how and which tasks they perform (Dewar et al., 1980). Increasing managers' decision making authority increases their sense of responsibility with respect to how they conduct their tasks and with respect to the performance of these tasks (Tushman & O'Reilly, 1996; Zmud, 1982). This stimulates their willingness to become aware and recognize a larger diversity of organizational, market, and technological opportunities and needs, and to become more sensitive to understanding how to act upon these different opportunities and needs (Miller, 1987; Pierce & Delbecq, 1977; Tushman & O'Reilly, 1996). For instance, studies indicate that increasing managers' decision making authority triggers them to not only focus on short term needs and associated benefits, but to also increasingly attend to opportunities that will define the future (Pierce & Delbecq, 1977; Zmud, 1982) and to the associated long term benefits (Miller, 1987; O'Reilly & Tushman, 2004). Related to this, others indicate that increasing managers' decision making authority increases their urge to seek solutions to problems both within and outside the framework of the existing strategy and beliefs (Ghemawat & Ricart I Costa, 1993; Sheremata, 2000).

Furthermore, increased decision making authority increases managers' self control and ownership of tasks and decisions (Hage & Aiken, 1967; Tushman & O'Reilly, 1996), which enables them to act upon the recognized diversity of opportunities and needs; to actively pursue a range of diverse goals (O'Reilly & Tushman, 2004: 81), i.e. to act ambidextrously. That is, as Gibson & Birkinshaw (2004: 211) put it, increased self control and ownership augments managers' ability 'to make their own choices as to how they divide their time between alignment- and adaptability-oriented activities', and it increases their aspiration to attain to both efficiency and flexibility related goals (Adler et al., 1999). Finally, due to increased decision making authority, managers have to rely more on their own skills and expertise, rather than on rules or the skills and expertise of superiors (Hage &

Aiken, 1967). This increases these managers' motivation to refine their existing skills and expertise, as well as to develop new skills and expertise (Crossan & Berdrow, 2003; McGrath, 2001; Floyd & Lane, 2000). These arguments suggest the following hypothesis:

Hypothesis 1 A manager's decision making authority will be positively related to this manager's ambidexterity

Formalization of managers' tasks, refers to the degree to which rules and codes describe a particular task, provide guides for decision making, provide guides for conveying decisions, instructions, and information, and the degree to which managers have to conform to the task description (Hage, 1965; Pugh et al., 1963). Increasing formalization of managers' tasks increases the possibility that these managers become less receptive to decision making stimuli which are not monitored by formal systems (Cyert & March, 1963). Hence, higher levels of formalization are associated with singleness of purpose (Pierce & Delbecq, 1977); it decreases the range of different opportunities and goals managers are likely to pursue (Hage, 1965; Miller, 1987). This is negatively associated with their level of ambidexterity; ambidextrous managers pursue a range of different goals (Tushman & O'Reilly, 1996) and 'have the ability to understand and be sensitive to the needs of very different kinds of business' (O'Reilly & Tushman, 2004: 81).

Moreover, for being able to pursue a range of different goals and to deal with associated conflicts (Floyd & Lane, 2000), ambidextrous managers need to cooperate and to 'combine their efforts' with other organization members (Birkinshaw & Gibson, 2004: 49; Duncan, 1976: 181). However, increasing formalization of tasks increases managers' sense of isolation resulting from associated difficulties to comprehend the relationship of their tasks to a larger purpose (Organ & Greene, 1981). This may result in a reduced motivation to cooperate and combine efforts with others (Hage & Aiken, 1969; Pierce & Delbecq, 1977). Increasing formalization of managers' tasks also necessitates them to develop more expertise in a limited area (Hage, 1965); it augments these managers' level of specialization and their depth of knowledge within the confines of the formalized tasks (Daft & Lengel, 1986; Zander & Kogut, 1995). This reduces these managers' ability to act

ambidextrously; it reduces their ability to act outside the narrow confines of their jobs (Adler et al., 1999), and it makes it more difficult for them to broaden their range of skills (Daft & Lengel, 1986); i.e. to be ‘more generalist’ rather than ‘more specialist’ (Birkinshaw & Gibson, 2004). These arguments suggest the following hypothesis:

Hypothesis 2 *Formalization of a manager’s tasks will be negatively related to this manager’s ambidexterity*

Informal relationships. Informal relationships comprise a more voluntary and personal mode of coordination as compared to the formal organization structure (Ghoshal et al., 1994). We examine the impact of two key types of informal relationships; i.e. relations as reflected in managers’ participation in cross-functional interfaces, and relations as reflected in managers’ connectedness to other organization members (Galbraith, 1973; Ghoshal et al., 1994; Jansen et al., 2006; Martinez & Jarillo, 1989; Tsai, 2002).

Cross functional interfaces encompass integration mechanism such as liaison personnel, task forces, and teams (Galbraith, 1973; Gupta & Govindarajan, 2000). They typically allow for immediate feedback, and dense, reciprocal, and personal interactions between managers of different functions, units, and hierarchical levels (Daft & Lengel, 1986; Egelhoff, 1991; Galbraith, 1973). These characteristics of cross-functional interfaces enable managers to enter into debate with people with different backgrounds promoting horizontal knowledge exchange and non-routine information processing, which allows managers to broaden their experience by acquiring knowledge which is unrelated to their own knowledge base (Egelhoff, 1991; Ghoshal & Bartlett, 1988; Gupta & Govindarajan, 2000; Jansen et al., 2005). Moreover, cross-functional interfaces reduce equivocality surrounding new tasks, problems, and situations that managers encounter by increasing their ability to deal with multiple or conflicting interpretations about new situations and to clarify and better define ambiguous problems (Daft & Lengel, 1986). These arguments indicate that cross functional interfaces increase managers’ ability to increase variety in experience. Furthermore, cross functional interfaces also offer opportunities for managers to enhance reliability in experience by acquiring knowledge

which is related to their own knowledge base. They serve, for instance, as mechanisms to exchange best practices or knowledge and information on related technologies, processes, products, or markets, allowing managers to increase, refine, or improve their expertise in a limited or specialized area (Henderson & Cockburn, 1994; Jansen et al., 2005). Besides stimulating horizontal knowledge exchange, cross functional interfaces have been found to enhance vertical knowledge flows as well (Gupta & Govindarajan, 2000; Ghoshal & Bartlett; 1988), allowing managers to acquire knowledge across hierarchical levels. This allows them to increase the depth of their knowledge base, as vertical flows of knowledge within firms are typically of narrow scope, i.e. closely related and even restricted to the recipient's specialized areas of expertise (Winter and Szulanski, 2001), rather unambiguous; i.e. they possess a clear and proven understanding of cause-effect relationships (Egelhoff, 1991), and their relevance with respect to improving the recipient's current activities is normally well-known (Schulz, 2003). Base on these arguments, we suggest the following hypothesis:

Hypothesis 3 Participation in cross-functional interfaces by managers has a positive relationship with managers' ambidexterity

Connectedness refers to the number of direct contacts a manager has with other organization members across hierarchical levels and organizational units, and to the density of this network of contacts (Jaworski & Kohli, 1993). Connectedness increases managers' opportunity to increase variety in experience by combining, acquiring, and developing new knowledge; it informs managers about the existence and location of diverse knowledge residing in various places in the network (Hansen, 2002; Nahapiet & Ghoshal, 1998). The dense and direct contacts also help to increase understanding of rather ambiguous, complex, and unrelated knowledge (Daft & Lengel, 1986; Egelhoff, 1991; Hansen, Podolny, & Pfeffer, 2001). Furthermore, by encouraging collaboration within the organization, connectedness can help managers to establish legitimacy for deviating and revolutionary ideas (Subramaniam & Youndt, 2005). Regarding the impact of connectedness on managers' reliability in experience: frequent contacts and a dense network, i.e. a high level of connectedness, promote trust among network members and facilitate the rapid diffusion of norms,

perspectives, and interpretations (Coleman, 1988; Rowley, 1997). Furthermore, it enables managers to develop a deep understanding to further refine and improve existing products, processes and markets, and it permits them to share experiences with regard to how to implement certain improvements (Dyer & Nobeoka, 2000; Hansen et al., 2001; Jansen et al., 2006; Rowley et al., 2000). Therefore, dense networks provide a means for improving, refining, and increasing reliability in experience and the depth of knowledge acquired from other network members. Accordingly, the following hypothesis is suggested:

Hypothesis 4 Connectedness of managers to other organization members has a positive relationship with managers' ambidexterity

Moderating Role of Hierarchical Level

Studies indicate that new ideas, insights, and initiatives, more often originate from operational level managers than from higher level managers, because operational managers are directly confronted with new technological developments, unexpected problems, and changing market conditions and customer demands (Branzei et al., 2004; Burgelman, 1983b; Sheremata, 2000; Van de Ven, 1980). Consequently, operational managers can be a major source of new organizational learning, entrepreneurship, or strategic renewal (Bartlett & Ghoshal, 1993; Burgelman, 1983; Floyd & Lane, 2000; Kimberly, 1979; Quinn, 1985).

The formal structure enables higher levels of management, such as business unit managers, to steer the activities of operational managers (Burgelman, 1983; Chandler, 1962; Floyd & Lane, 2000). For instance, from a 'traditional structural perspective' (cf. Bartlett & Ghoshal, 1993: 24), centralization of decision making authority and formalization of tasks is used to ensure that operational managers engage into exploitation rather than exploration activities. Based on top managers' decisions, middle management puts into place the formal structural elements to control operational managers and to ensure that they execute the chosen direction and exploit existing capabilities (Chandler, 1962; Prahalad & Hamel, 1990). Other studies, for instance on corporate

entrepreneurship and strategic renewal, also indicate the importance of the organization structure for influencing operational managers' activities. They indicate the value of decentralized decision making and low levels of formalization of tasks to stimulate operational managers to engage into exploration related activities such as experimenting with new technologies, initiating autonomous initiatives, and finding novel solutions to emerging problems (Bartlett & Ghoshal, 1993; Burgelman, 1983; Burns & Stalker, 1961; Floyd & Lane, 2000; Sheremata, 2000).

Based on these arguments, we assume that changes in the formal organization structure will affect operational level managers' exploration and exploitation activities more as compared to business unit managers' activities, which suggests the following hypotheses:

Hypothesis 5a Hierarchical level moderates the relationship between managers' decision making authority and managers' ambidexterity, such that the effect of managers' decision making authority is larger for operational managers as compared to business unit managers

Hypothesis 5b Hierarchical level moderates the relationship between formalization of managers' tasks and managers' ambidexterity, such that the effect of formalization of managers' tasks is larger for operational managers as compared to business unit managers

Informal relationships. Studies on strategy process research indicate that business unit managers' exploration and exploitation related activities, such as those associated with competence definition and deployment processes or autonomous and induced strategies, essentially focus on establishing interactions and building relationships between different hierarchical levels, organization units, functions, and different communities (Bower, 1970; Burgelman, 1993; Floyd & Lane, 2000; Floyd & Wooldridge, 1992). Hence, Floyd and Lane (2000: 164-165) conclude that the 'number of potential interactions, therefore, are greater for middle managers than for top- or operating level managers'. One of the main characteristics of cross-functional interfaces and connectedness is that they allow for establishing interactions and building relationships across internal organizational

boundaries; vertical, horizontal, and lateral (Martinez & Jarillo, 1989; Galbraith, 1973). We assume, therefore, that cross-functional interfaces and connectedness have greater capacity for influencing middle managers' ambidextrous behavior as compared to operational managers' ambidextrous behavior.

Another argument supporting this assumption is related to the fact that business unit managers, more than managers of other hierarchical levels, are confronted with different meanings, goals, conflicts, interpretations, and priorities of different organization members (Floyd & Lane, 2000; Friedman & Podolny, 1992; Miles & Perreault, 1976; Whetten, 1978). A key characteristic of cross-functional interfaces and connectedness is that they allow for dense and high levels of reciprocal personal interactions between organization members (Coleman, 1988; Daft & Lengel, 1986; Galbraith, 1973). Because of these kinds of personal interactions, cross-functional interfaces and connectedness especially serve business unit managers, by helping them to effectively deal with different meanings, goals, conflicts, interpretations, and priorities of different organization members. For instance, they engender trust and increase understanding of others' values and behavior (Coleman, 1988), they facilitate the construction of shared commitments, allowing negotiating differences in goals and interest between communities (Gitell, 2002; Kellog et al., 2006), and they foster the development and use of a shared language and the appreciation of different perspectives of other organization members (Daft & Lengel, 1986; Kellog et al., 2006). Based on the arguments above, the following hypotheses are suggested:

Hypothesis 6a Hierarchical level moderates the relationship between cross-functional interfaces and managers' ambidexterity, such that the effect of cross-functional interfaces is larger for business unit managers as compared to operational managers

Hypothesis 6b Hierarchical level moderates the relationship between connectedness of managers to other organization members and managers' ambidexterity, such that the effect of connectedness to other organization members is larger for business unit managers as compared to operational managers

METHODS

Sample and Data Collection

We followed previous quantitative studies on managers' activities by drawing the data for our study from a survey which has been administered to a large number of business unit and operational level managers of a rather small number of firms (e.g. Ghoshal et al. 1994; Hales & Tamangani, 1996; Ireland et al., 1987; Walsh, 1988). More precisely, to test the hypotheses, we collected data from 458 managers of three large multi-unit firms operating in the electronics industry (Firm A), financial services sector (Firm B), and the accountancy and professional services sector (Firm C). Regarding the selection of these firms, the goal of this study compelled us to examine managers whose firms are simultaneously confronted with pressures to explore and with pressures to exploit. The literature indicates that several challenges within all three firms' industries make them an interesting context to investigate managers' ability to be ambidextrous. Changes regarding technologies, competition, regulation, and customer demands, force managers of firms in the electronics, financial services, and the accountancy and financial advisory industries, to explore (Banker et al., 2005; Flier et al., 2001; Greenwood et al., 2005; Henisz & Macher, 2004; Sarvary, 1999). At the same time, an increased pressure to focus on efficiency and cutting costs, increasing importance of economies of scale, and short-term competitive pressures, force managers of firms in these industries to conduct exploitation activities (Banker et al., 2005; Flier et al., 2001; Greenwood et al., 2005; Henisz & Macher, 2004; Sarvary, 1999).

The electronics firm ranks among the top 10 on the Fortune Global 500 (2006) in terms of total revenue in the electronics industry. Research in this firm was carried out in one of the three divisions of the firm's semiconductor group. The selected division employs over 7,000 employees and has R&D and production facilities in the Americas, Asia, and Europe. It consists of a headquarters, a production support unit, and two groups of business units. Regarding the first group, one of the business units concentrates on the innovative part of the automotive industry, the other focuses on

niche products. The second group is comprised of three business units which relate to general application, standard, and interface products for various industries. The financial services firm ranks among the top 25 on the Fortune Global 500 (2006) in terms of total revenue in the banking industry. The firm is a broad-based financial service provider, offering products and services related to asset management, insurance, leasing, private banking, mortgages, and corporate and investment banking. The firm employs over 55,000 employees. Its branches operate in geographically distinct areas and have autonomy with respect to types of products and services they offer. Two main business units and an operations unit can be distinguished across the branches, each comprised of several sub-units. The retail business unit focuses on the private market; the whole-sale business unit targets the business market. The operations unit focuses on different aspects of the firm's internal operations. Research in this firm was carried out in five of its branches. The third firm is one of the "Big Four" international accountancy and professional services firms. Research in this firm was carried out in one of its national member firms, which employs over 6,000 employees. The member firm consists of a headquarters, a support unit, and two groups of business units. The first group is comprised of three business units which provide services on accounting & auditing, taxes, and legal issues. Regarding the second group, one business unit provides consulting services related to strategy, operations, and ICT, whereas the other business unit focuses on financial advisory services.

After having pre-tested the survey, the survey was administered in each of these firms, in consultation with corporate top management, to a selection of business unit and operational managers covering all organization units. Business unit managers had at least two levels of supervisors under their responsibility and no more than two reporting levels below top executives. Operational managers report to business unit managers or to levels below these managers (cf. Ireland et al., 1987: 474). At firm A, the survey was sent to 225 managers, at firm B to 213 managers, and at firm C to 585 managers. Chi-square tests ($p < .05$; $\alpha = .05$) indicate that the hypotheses that the distribution of these managers over the organization units and hierarchical levels corresponds to the distribution of all managers within each firm, can not be rejected. This indicates that bias due to the sampling procedure may not be a problem. To ensure confidentiality, we agreed not to reveal the names of the respondents and to return the completed surveys to us without inference of corporate top management. We

received 125, 165, and 191 completed surveys of managers from firm A, B, and C respectively, corresponding to a response rate of 56%, 77%, and 33%. List-wise deletion of cases with missing values reduced the final sample size to 458; i.e. 110, 161, and 187 managers of firm A, B, and C respectively. This sample included 152 business unit and 306 operational managers. We examined differences between respondents and non-respondents to test for non-response bias. Chi-square tests indicate that the hypothesis that the distribution of the respondents over the organizational units and hierarchical levels corresponds to the population's distribution, cannot be rejected ($p < .05$; $\alpha = .05$). We also compared early and late respondents in terms of demographic characteristics and model variables. No significant differences (t -test; $p < .05$) appeared, indicating that non-response bias is not a problem.

Measures and Validation

Dependent variable. As appropriate scales at the individual level were not available in the literature, we constructed a scale to measure managers' ambidexterity. Scales of firm or business unit ambidexterity, as used in existing studies, are constructed by combining measures of exploration and exploitation (Gibson & Birkinshaw, 2004; He & Wong, 2004; Lubatkin et al., 2006). Following this practice, we started by developing seven managers' exploration activity items and seven managers' exploitation activity items based on the features by which March (1991: 71) characterizes the constructs of exploration and exploitation. Detailed procedures about the scale's development entailing interviews and pre-testing are explicated by Mom et al (2009). The exploration scale determines the extent to which a manager engaged in exploration activities last year, while the exploitation scale determines the extent to which the manager engaged in exploitation activities last year. Exploratory factor analyses with Varimax rotation with all 14 items, based on the survey data, revealed that two summated scales could be constructed; one exploration scale with the seven exploration items ($\alpha = .90$) and one exploitation scale with the seven exploitation items ($\alpha = .87$). Eigenvalues for each factor were greater than 3.5, all items loaded on their appropriate factors at greater than .66, and no item cross-loading was greater than .16.

Researchers have typically combined exploration and exploitation measures to assess ambidexterity; either by subtracting (He & Wong, 2004), summing (Lubatkin et al., 2006), or multiplying (Gibson & Birkinshaw, 2004) the two measures. Taking the absolute difference between exploration and exploitation as a measure of ambidexterity, as the subtracting method does, stresses that ambidexterity refers to equal levels of exploration and exploitation, but fails to address the issue that ambidexterity actually refers to conducting *high* levels of both activities. Consequently, we did not use the subtracting method to measure managers' ambidexterity. Instead, in our study on individual level ambidexterity, we followed Gibson & Birkinshaw's (2004: 211) approach by assessing managers' ambidexterity by computing the multiplicative interaction between managers' exploration activities and managers' exploitation activities. The Appendix shows all items and scales of the study.

Independent and moderating variables. This study's measures of the elements of the formal organization structure and informal relations were based on existing scales. To measure decision making authority, we used a four item scale based on Dewar et al. (1980), which assesses the extent to which a manager has decision making authority referring to the performance of his or her tasks ($\alpha = .91$). To assess the extent of formalization of a manager's tasks, this study used a four item scale from Desphande and Zaltman (1982), which measures the extent to which a manager's tasks are being defined by rules, procedures, or regulations ($\alpha = .89$). To measure participation in cross-functional interfaces, this study used a scale on the basis of Nadler and Tushman (1987) and Gupta and Govindarajan (2000) which assesses the extent to which a manager participates cross-unit and cross-hierarchical integrative mechanisms, asking each manager to what extent he or she (1) coordinates work across internal organizational boundaries, (2) works in temporary task forces, and (3) works in permanent teams. The final measure is constructed as a weighted average of the three items, where the first item is given a weight of 1, the second item a weight of 2, and the last item a weight of 3 (cf. Gupta & Govindarajan, 2000). To measure connectedness, a four-item scale, based on Jaworski and Kohli (1993) was used, assessing the extent to which managers are networked or connected to other organization members ($\alpha = .90$).

To analyze the moderating effect of hierarchical level, we created two dummy variables corresponding to the two hierarchical management levels. Prior to the creation of the squared and interaction terms in the regression models, we mean centered the independent variables to reduce multi-collinearity (Aiken & West, 1991).

Control Variables. To control for contextual factors of an organization unit and environmental effects, we created dummy variables reflecting the business units of the three firms and their operations or support units. No dummy has been included for the support unit of Firm C, making this unit the reference unit. Regarding the effects of contextual factors of an organization unit, Gibson and Birkinshaw (2004) showed that such factors impact upon the level of ambidexterity within the unit. Several authors argue that environmental effects, like environmental dynamism, impact upon exploration and exploitation (Levinthal & March, 1993; Lewin et al., 1999). Sidhu et al. (2004), for instance, showed that the greater environmental dynamism, the greater an organization's exploration orientation. We also included as control variable one dummy variable for hierarchical level, not only in the interaction regression models but also in the main effects regression models, as some authors expect that managers at higher hierarchical levels, such as business unit managers, are more ambidextrous than organization members at lower hierarchical levels, such as operational managers (e.g. Benner & Tushman, 2003; O'Reilly & Tushman, 2004).

Validation. We conducted exploratory and confirmatory factor analyses including all items of this study's constructs, i.e. those of measuring exploration, exploitation, and the four coordination mechanisms, to assess construct validity of the measures. Results of the exploratory factor analysis (extraction method: principal component analysis; rotation method: varimax with Kaiser normalization), indicate that the measures were appropriately constructed; eigenvalues for each factor were greater than 1, all items loaded on their appropriate factors at greater than .64, and no item cross-loading was greater than .35, supporting the six factor solution. We used EQS to conduct an integrated confirmatory factor analysis on all items. We allowed each item to load only on the factor for which it was a proposed indicator. Results indicate that the six factor model fits the data well (NFI = .92, CFI = .96, RMSEA < .05). Moreover, a comparison of a one-factor model with a two-factor model for

every pair among the factors shows a significant improvement in fit for each of the six pairs ($\Delta\chi^2$ significant at $p < .001$) providing evidence of discriminant validity (Bagozzi & Phillips, 1982).

ANALYSIS AND RESULTS

INSERT TABLE 1 ABOUT HERE

Table 1 shows the descriptive statistics and correlations for all variables. Some of the coordination mechanisms significantly relate to each other. Interestingly, cross functional interfaces ($r = .19$; $p < .01$) and connectedness ($r = .31$; $p < .01$) positively relate to decision making authority. This may indicate that informal relationships are difficult to combine with a mechanistic structure, but can readily be formed within an organic structure, i.e. when decision making authority is high. Regarding the control variables for hierarchical level, a t-test ($p < .001$) shows that business unit managers (mean = 23.45) are significantly more ambidextrous than operational managers (mean = 21.10). To examine multicollinearity, we calculated variance inflation factors (VIF) in each of the regression equations. VIF factors are between 3.69 and 1.06, which is below the rule-of-thumb cut-off of 10 (Hair et al, 1998); issues of multicollinearity seem not to be a problem.

Tests of Main Effects

INSERT TABLE 2 ABOUT HERE

We used hierarchical regression analysis of managers' ambidexterity on the coordination mechanisms to test the hypotheses. Table 2 shows the main effects referring to hypotheses 1, 2, 3, and 4. Model 1 of Table 2 reports the baseline model in which hierarchical level and organization unit dummies were included as control variables. This model indicates that business unit managers are more ambidextrous than operational managers, and that managers of the organization units of firm B are more ambidextrous than those of the reference group, i.e. managers of the support unit of firm C. In model 2, we introduced the coordination mechanisms to assess those variables main effects on managers' ambidexterity. *Hypothesis 1* proposed a positive relationship between managers' decision making authority and managers' ambidexterity. This hypothesis supported; the linear coefficient for decision making authority in model 2 is positive and significant ($\beta = .16, p < .001$). *Hypothesis 2* proposed a negative relationship between formalization of tasks and managers' ambidexterity. This Hypothesis is not supported; the coefficient for formalization of tasks is positive and not significant ($\beta = .04, ns$). Regarding the impact of the two coordination mechanisms reflecting informal relationships on managers' ambidexterity, model 2 shows that cross-functional interfaces ($\beta = .27, p < .001$) and connectedness ($\beta = .21, p < .001$) positively and significantly relate to managers' ambidexterity, supporting both *Hypothesis 3 and Hypothesis 4*.

Tests of Moderating Role of Hierarchical Level

INSERT TABLE 3 ABOUT HERE

In the section below, we will first assess whether significant interaction effects exist of hierarchical level on the relationship between the coordination mechanisms and managers' ambidexterity. Subsequently, we will investigate for each coordination mechanism the interaction effect. Model 2 of Table 2 serves as the base-line model to test for interaction effects. Model 3 of

Table 3 adds the interaction effects with respect to managers' decision making authority to Model 2 of Table 2. The significant improvement of fit of Model 3 indicates that significant interaction effects exist of hierarchical level on the relationship between decision making authority and managers' ambidexterity (Jaccard & Turrisi, 2003). The fit of Model 4 does not significantly increase, hence, no significant interaction effects exist between hierarchical level on the relationship between formalization of tasks and managers' ambidexterity. As the fit of models 5 and 6 significantly increase, significant interaction effects exist of hierarchical level on the relationship between the two informal relationships coordination mechanisms and managers' ambidexterity.

Models 6A and 6B of Table 3 are the full models which give insight into the exact nature of the significant interaction effects. Operational managers are the reference group in Model 6A and business unit managers are the reference group in Model 6B.

Models 6A and 6B show that *decision making authority* significantly and positively relates to operational managers' ambidexterity (Model 6A: $\beta = .27, p < .001$), but not significantly relates to business unit managers' ambidexterity (Model 6B). Furthermore, the effect of decision making authority on operational managers' ambidexterity is significantly larger than the effect on business unit managers' ambidexterity (β interaction term in Model 9A = $.18, p < .001$; β interaction term in Model 9B = $-.27, p < .001$). Consequently, *Hypothesis 5A* is supported; the effect of decision making authority on managers' ambidexterity is larger for operational managers as compared to business unit managers.

Hypothesis 5B is not supported; the fit of Model 4 did not significantly increase. Consequently, the interaction terms of hierarchical level and formalization in Models 6A and 6B are not significant; there is no significant interaction effect between hierarchical level on the relationship between formalization of tasks and managers' ambidexterity.

Models 6A and 6B show that *cross-functional interfaces* significantly and positively relate to operational managers' ambidexterity (Model 6A: $\beta = .19, p < .001$) and to business unit managers' ambidexterity (Model 6B: $\beta = .34, p < .001$). Furthermore, the effect of cross-functional interfaces on business unit managers' ambidexterity is significantly larger than the effect on operational managers' ambidexterity (β interaction term Model 6A = $.08, p < .10$; β interaction term Model 6B = $-.13, p <$

.10). Consequently, *hypothesis 6A* is supported; the effect of cross-functional interfaces on managers' ambidexterity is larger for business unit managers as compared to operational managers.

Models 6A and 6B show that *connectedness to other organization members* significantly and positively relates to operational managers' ambidexterity (Model 6A: $\beta = .12, p < .05$) and to business unit managers' ambidexterity (Model 6B: $\beta = .32, p < .001$). Furthermore, the effect of connectedness on business unit managers' ambidexterity is significantly larger than the effect on operational managers' ambidexterity (β interaction term Model 6A = $.12, p < .05$; β interaction term Model 6B = $-.17, p < .01$). Consequently, *hypothesis 6B* is supported; the effect of connectedness on managers' ambidexterity is larger for business unit managers as compared to operational managers. Figures 1 to 3 show the three significant interaction effects graphically.

INSERT FIGURES 1, 2 AND 3 ABOUT HERE

Post Hoc Analysis

To assess the robustness of our findings, we repeated tests for all hypotheses using the summing method for calculating ambidexterity (cf. Lubatkin et al., 2006). We found similar results; however, as expected from the results from the CFA, using the summing method for ambidexterity decreased the explanatory power of the regression equations. Hence, although the multiplying and summing method for calculating ambidexterity produced similar results, applying the multiplying method allowed for explaining more variance of managers' ambidexterity.

DISCUSSION AND CONCLUSION

In the growing body of literature on ambidexterity, arguments can be found that ambidextrous organizations need ambidextrous managers (e.g. O'Reilly & Tushman, 2004: 81). However, insight into what ambidexterity is at the manager level of analysis, and into what drives variations in managers' ambidexterity is very limited due to the fact that current research on ambidexterity barely addresses the individual level of analysis (Gupta et al., 2006: 703). This paper delivers a contribution by furthering understanding on both issues by: (1) conceptualizing and operationalizing managers' ambidexterity, (2) developing and testing hypotheses on the influence of the formal organization structure and managers' informal relationships on managers' ambidexterity, and (3) by investigating how the effects of the formal structure and informal relationships differ across managerial hierarchical levels.

Managers' Ambidexterity

In some studies, ambidextrous managers are viewed as those who 'manage organizational separation through a tightly integrated senior team' (O'Reilly & Tushman, 2004: 76). Such managers create ambidextrous firms by implementing different processes, structures, and cultures, while at the same time, maintaining tight links across units at the senior executive level (Benner & Tushman, 2003). Correspondingly, Lubatkin et al. (2006) show that top management team's behavioral integration relates to organizational ambidexterity. However, existing studies have not investigated ambidextrous behavior of managers at lower hierarchical levels, because of their focus on senior managers. Attention in the ambidexterity literature for ambidextrous behavior of organization members which reside at lower hierarchical levels than top management can, for instance, be found in the study of Gibson & Birkinshaw (2004), who argue that a business unit's ambidexterity manifests itself in the ambidextrous behavior of its organization members. Their study stresses the importance of investigating ambidexterity at the individual level of analysis, but its hypotheses and empirical data are at the business unit level. Hence, their study allows devoting further research to increase insight into managers' ambidexterity, and into what drives variations in their ambidextrous behavior.

Building on previous research on exploration, exploitation, and ambidexterity (e.g. Beckman, 2006; Bontis et al., 2002; Gupta et al., 2006; Holmqvist, 2004; Levinthal & March, 1993; March, 1991; McGrath, 2001; Mom et al., 2007; Taylor & Greeve, 2006), this paper contributes to the discussion above by conceptualizing managers' ambidexterity as a behavioral orientation of managers toward combining activities which increase variety in their experience with activities which enhance reliability in their experience. Discussion exists whether exploration –conceptualized in this paper as variety increasing activities–, can be combined with exploitation –reliability enhancing activities. Although March (1991: 72) argues that a trade-off exists between exploration and exploitation at several levels, studies recently show that exploration and exploitation are not mutually exclusive at the firm-level (He & Wong, 2004; Lubatkin et al., 2006) or business unit-level (Gibson & Birkinshaw, 2004).

Regarding the individual level, Gupta et al. (2006) question the possibility of individuals to be ambidextrous. They argue that, at the individual level, exploration and exploitation should be conceptualized as the mutually exclusive ends of a continuum, and hence that at this level 'ambidexterity is simply not an option' (Gupta et al, 2006: 698). Based on insights from the learning literature, we argued that managers' exploration and exploitation activities are characterized by different types of learning, and hence, that managers can be ambidextrous. Our data also illustrates that managers actually can conduct both exploration and exploitation activities within a particular time period. This may be illustrated by the results of the exploratory and confirmatory factor analyses which show that exploration and exploitation are two distinct latent factors of a second order construct; managers' ambidexterity. If exploration and exploitation would be the extremes of a single continuum, than factor analyses would indicate only one single latent factor. Incorporating the time dimension at the individual level corresponds to Gibson & Birkinshaw's (2004: 211) assertion that organization members' ambidextrous behavior is about how they 'divide their time' between exploration and exploitation activities.

The impact of the Formal Organization Structure and Informal Relationships on Managers' Ambidexterity

To investigate differences in managers' ambidexterity, this paper investigates the influence of the formal organization structure and informal relationships on managers' ambidexterity. The importance of both types of coordination mechanisms, and different effects they may have on managers' behavior, is not only reflected in the empirical literature on coordination mechanisms (cf. Martinez & Jarillo, 1989), but also in the literature on ambidexterity (Benner & Tushman, 2003; Gibson & Birkinshaw 2004; Jansen et al., 2006; Mom et al., 2009; Tushman & O'Reilly, 1996). The paper furthers theoretical and empirically validated understanding about variation in managers' ambidexterity by developing and testing hypotheses on the direct effects of formal structural and personal coordination mechanisms on managers' ambidexterity. Existing studies on firm or business unit level ambidexterity mostly put forward structural mechanisms for advancing ambidexterity (e.g. Benner & Tushman, 2003; Duncan, 1976), whereas others have illustrated the importance of more personal relationships (e.g. Birkinshaw & Gibson, 2004; Subramaniam & Youndt, 2005). Regarding individual level ambidexterity, the hypotheses of this paper indicate that both kinds of mechanisms matter for managers' ambidexterity. However, the empirical findings on the direct effects indicate that both types might not be equally effective. Instead, the findings emphasize the relatively large effect of the personal types of coordination mechanisms as compared to the formal structural types of mechanisms on managers' ambidexterity. This is in line with recent studies on learning and coordination, which indicate the importance of more informal and personal types of coordination for shaping knowledge and learning related processes and activities of organization members (e.g. Argote et al., 2003; Faraj & Xiao, 2006).

Interestingly, the hypothesis with regard to formalization of a manager's tasks (Hypothesis 2) was not confirmed. Our findings did not provide support for the predicted negative relation with a manager's ambidexterity. This may concur with recent insights that formalized routines may increase information flows to managers which may improve their overall quality and speed of decision making (Baum & Wally, 2003). Formalized rules and procedures may also include processes for effecting change (Adler & Borys, 1996), which corresponds to Adler's et al. (1999: 45) concept of 'metaroutines' that may enable organizations to become more ambidextrous by transforming non-

routine into more-routine tasks. As the effect of formalization on individuals' behavior may be contingent on its design, future studies could differentiate between types of formalization, such as enabling and coercive types (Adler & Borys, 1996).

The Moderating Role of Hierarchical Level

Studies on coordination mechanisms indicate that the formal organization structure and informal relationships possess different capacities for processing knowledge, and differently affect interactions between managers (e.g. Daft & Lengel, 1986; Martinez & Jarillo, 1989; Tushman & Nadler, 1978). Studies on strategy process research indicate that managers' needs and abilities regarding processing knowledge and developing interactions with other organization members differ across hierarchical levels (e.g. Burgelman, 1983; Bartlett & Ghoshal, 1993; Floyd & Lane, 2000). Based on insights from these literatures, this study hypothesized that managerial hierarchical levels moderate the relationship between the coordination mechanisms and managers' ambidexterity. In other words, we investigated how the effects of the formal structure and informal relationships on managers' ambidexterity, differ across managerial hierarchical levels.

The paper's results illustrate, regarding the formal organization structure that managers' decision making authority significantly relates to operational managers' ambidexterity, but not relates to business unit managers' ambidexterity. Regarding the informal relationships, results indicate that cross-functional interfaces and managers' connectedness to other organization members, positively relate to both business unit and operational managers' ambidexterity. However, the relationship between both informal mechanisms and ambidexterity is stronger for business unit managers as compared to operational managers. These results imply that for developing operational managers' ambidexterity other coordination mechanisms matter than for developing business unit managers' ambidexterity. Changing the organization structure would particularly influence operational managers' ambidexterity, but not business unit managers' ambidexterity. For business unit managers to become ambidextrous, informal relationships matter.

Limitations and Future Research

Studies on coordination mechanisms argue that firms typically combine formal and informal coordination mechanisms as the two may complement each other (e.g. Adler, 2001; Faraj & Xiao, 2006; Gupta, et al. 1994; Martinez & Jarillo, 1989). Our data indicates that cross functional interfaces and connectedness negatively relate to centralization, and hence positively relate to decentralization. This may indicate that informal relationships can readily be formed within an organic structure, but are more difficult to combine with a mechanistic structure. However, more research is needed to increase insight into whether organizations combine formal and informal coordination mechanisms to develop ambidexterity, and whether interaction effects exist between the formal organization structure and informal relationships on managers' ambidexterity.

The study involves cross-sectional, single informant data and uses perceptual scales highlighting issues of common method bias. Regarding the issue of common method bias, we performed Harman's one-factor test on items included in the regression models. If common method bias were a serious problem in the study, we would expect a single factor to emerge to account for most of the covariance in the dependent and independent variables (Podsakoff & Organ, 1986). We did not find such a single factor. The issue of common method bias could be addressed in future studies by measuring ambidexterity at the managerial level of analysis using objective measures.

Although a contribution of this paper is the development of scales which assess a manager's ambidexterity, and the validity and reliability analyses indicated that the scales were appropriately constructed, linking objective measures for ambidexterity to the scales as used in this study could increase insight into the scales' validity. Furthermore, conducting this research in other firms could also help to better assess the validity and reliability of the scales and help to increase the generalizability of the findings.

Existing literature indicates the relationship between top management team's behavioral integration and organizational ambidexterity (Lubatkin et al., 2006). Similarly, the relevance of this study's findings could be increased by examining the impact of business unit and operational managers' ambidextrous behavior on business unit or organizational ambidexterity. This could be

done by examining the relationship between managers' ambidextrous behavior and firms' or business units' exploratory and exploitative innovations (He & Wong, 2004; Jansen et al., 2006).

Despite these limitations, this paper furthers understanding of managers' ambidexterity, the impact of the formal organization structure and informal relationships, and the moderating role of hierarchical level. This benefits our insight into how ambidextrous firms coordinate the development of ambidextrous behavior of their managers. Both types of coordination mechanisms not only differently affect managers' ambidexterity, but significant differences regarding these effects across hierarchical levels exist as well.

REFERENCES

- Adler, P.S. 2001. Market, hierarchy, and trust: The knowledge economy and the future of capitalism. *Organization Science*. **12** 215-234.
- Adler, P.S., B. Goldoftas, D. Levine, D. 1999. Flexibility versus efficiency? A case study of model changeovers in the Toyota production system. *Organ. Sci.* **10** 43-68.
- Aiken, M., J. Hage. 1966. Organizational alienation: A comparative analysis. *Amer. Soc. Rev.* **31** 497-507.
- Aiken, L.S., S.G. West. 1991. *Multiple regression: Testing and interpreting interactions*. Sage, Newbury Park, CA.
- Amabile, T.M. 1993. Motivational synergy: Toward new conceptualizations of intrinsic and extrinsic motivation in the workplace. *Human Resource Management Rev.* **3** 185-201.
- Argote, L., B. McEvily, R. Reagans. 2003. Managing knowledge in organizations: An integrative framework and review of emerging themes. *Management Sci.* **49** 571-582.
- Bagozzi, R.P., L.W. Phillips. 1982. Representing and testing organizational theories: A holistic construct. *Admin. Sci. Quart.* **27** 459-489.
- Banker, R.D., H. Chang, R. Natarajan. 2005. Productivity change, technical progress, and relative efficiency change in the public accounting industry. *Management Sci.* **51** 291-304.
- Bartlett, C.A., S. Ghoshal. 1993. Beyond the M-form: Toward a managerial theory of the firm. *Strategic Management J.* 14(special issue) 23-46.
- Beckman, C.M. 2006. The influence of founding team company affiliations on firm behavior. *Acad. Management J.* **49** 741-758.
- Benner, M.J., M.L. Tushman. 2003. Exploitation, exploration, and process management: The productivity dilemma revisited. *Acad. Management Rev.* **28** 238-256.
- Bontis, N., M. Crossan, J. Hulland. 2002. Managing an organizational learning system by aligning stocks and flows. *J. Management Stud.* **39** 437-469.
- Bower, J.L. 1970. *Managing the resource allocation process*. Harvard Business School Press, Boston.

- Branzei, O., T.J. Ursacki-Bryant, I. Vertinsky, W. Zhang. 2004. The transformation of green strategies in Chinese firms: Matching corporate environmental responses and individual principles. *Strategic Management J.* **25** 1075-1095.
- Brusoni, S. 2005. The limits to specialization: Problem solving and coordination in 'modular networks. *Organ. Stud.* **26** 1885-1907.
- Burgelman, R.A. 1983. A process model of internal corporate venturing in the diversified major firm. *Admin.Sci. Quart.* **28** 223-244.
- Burns, T., G.M. Stalker. 1961. *The management of innovation*. Tavistock, London.
- Cardinal, L.B. 2001. Technological innovation in the pharmaceutical industry: The use of organizational control in managing research and development. *Organ. Sci.* **12** 19-36.
- Chandler, A.D. 1962. *Strategy and structure: Chapters in the history of the American industrial enterprise*. The Massachusetts Institute of Technology Press, Cambridge.
- Cohen, J., P. Cohen, S.G. West, L. S. Aiken. 2003. *Applied Multiple Regression/ Correlation Analysis for the Behavioral Sciences*, 3rd ed. Lawrence Erlbaum Associates, Mahwah, NJ.
- Coleman, J.S. 1988. Social capital in the creation of human capital. *Amer. J. Sociology.* **94** 95-120.
- Cray, D. 1984. Control and coordination in multinational corporations. *J. Internat. Bus. Stud.* **15** 85-98.
- Daft, R.L., R.H. Lengel. 1986. Organizational information requirements, media richness and structural design. *Management Sci.* **32** 554-571.
- Damanpour, F. 1991. Organizational innovation: A meta-analysis of effects of determinants and moderators. *Acad. Management J.* **34** 555-590.
- Desphande, R., G. Zaltman. 1982. Factors affecting the use of market research information: A path analysis. *J. Marketing Res.* **19** 14-31.
- Dewar, R.D., D.A Whetten, D. Boje. 1980. An examination of the reliability and validity of the Aiken and Hage scales on centralization, formalization, and task routines. *Admin. Sci. Quart.* **25** 120-128.
- Duncan, R.B. 1976. The ambidextrous organization: Designing dual structures for innovation. R.H. Kilmann, L.R. Pondy, D. Slevin, eds. *The Management of Organization Design*. North-Holland, New York, 167-188.

- Dyer, J.H., K. Nobeoka. 2000. Creating and managing a high-performance knowledge-sharing network: The Toyota case. *Strategic Management J.* **21** 345-367.
- Egelhoff, W.G. 1991. Information-processing theory and the multinational enterprise. *J. Internat. Bus. Stud.* **22** 341-368.
- Faraj, S., L. Sproull. 2000. Coordinating expertise in software development teams. *Management Sci.* **46** 1554-1568.
- Faraj, S., Y. Xiao. 2006. Coordination in fast-response organizations. *Management Sci.* **52** 1155-1169.
- Flier, B., F.A.J. Van Den Bosch, H.W. Volberda, C.A. Carnevale, N. Tomkin, L. Melin, B.V. Quélin, M.P. Kriger, M.P. 2001. The changing landscape of the European financial services sector. *Long Range Planning.* **34** 179-207.
- Floyd, S.W., P.J. Lane. 2000. Strategizing throughout the organization: Managing role conflict in strategic renewal. *Acad. Management Rev.* **25** 154-177.
- Floyd, S.W., B. Wooldridge 1992. Middle management involvement in strategy and its association with strategic type: A research note. *Strategic Management J.* **13** 153-167.
- Friedman, R.A., J. Podolny. 1992. Differentiation of boundary spanning roles: Labor negotiations and implications for role conflict. *Admin. Sci. Quart.* **37** 28-47.
- Galbraith, J.R. 1973. *Designing complex organizations*. Addison-Wesley, Reading, M.A.
- Ghemawat, P., J. Ricart I Costa. 1993. The organizational tension between static and dynamic efficiency. *Strategic Management J.* **14** 59-73.
- Ghoshal, S., H. Korine, G. Szulanski. 1994. Interunit communication in multinational corporations. *Management Sci.* **40** 96-110.
- Gibson, C.B., J. Birkinshaw. 2004. The antecedents, consequences, and mediating role of organizational ambidexterity. *Acad. Management J.* **47** 209-226.
- Gittell, J.H. 2002. Coordinating mechanisms in care provider groups: Relational coordination as a mediator and input uncertainty as a moderator of performance effects. *Management Sci.* **48** 1408-1426.
- Grant, R.M. 1996. Toward a knowledge-based theory of the firm. *Strategic Management J.* **17** 109-122.

- Greenwood, R., S.X. Li, R. Prakash, D.L. Deephouse. 2005. Reputation, diversification, and organizational explanations of performance in professional services firms. *Organ. Sci.* **16** 661-673.
- Gresov, C. 1989. Exploring fit and misfit with multiple contingencies. *Admin. Sci. Quart.* **34** 431-453.
- Gupta, P.P., M.W. Dirsmith, T.J. Fogarty. 1994. Coordination and control in a government agency: Contingency and institutional theory perspectives on GAO audits. *Admin. Sci. Quart.* **39** 264-284.
- Gupta, A.K., V. Govindarajan. 2000. Knowledge flows within multinational corporations. *Strategic Management J.* **21** 473-496.
- Gupta, A.K., K.G. Smith, C.E. Shalley. 2006. The interplay between exploration and exploitation. *Acad. Management J.* **49** 693-706.
- Hage, J. 1965. An axiomatic theory of organizations. *Admin. Sci. Quart.* **10** 289-320.
- Hage, J., M. Aiken. 1967. Program change and organizational properties a comparative analysis. *Amer. J. Sociology.* **72** 503-519.
- Hair, J. F., R.E. Anderson, R.L. Tatham, W.C. Black. 1998. *Multivariate data analysis*. Prentice Hall, Upper Saddle River, NJ.
- Hales, C., Z. Tamangani. 1996. An investigation of the relationship between organizational structure, managerial role expectations and managers' work activities. *J. Management Stud.* **33** 731-756.
- Hall, R.H., N.J. Johnson, J.E. Haas. 1967. Organizational size, complexity, and formalization. *Amer. Sociological Rev.* **32** 903-912.
- Hansen, M.T. 2002. Knowledge networks: Explaining effective knowledge sharing in multiunit companies. *Organ. Sci.* **13** 232-248.
- Hansen, M.T., J.M. Podolny, J. Pfeffer. 2001. So many ties, so little time: A task contingency perspective on the value of social capital in organizations. *Soc. Capital Organ.* **18** 21-57.
- He, Z.L., P.K. Wong. 2004. Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. *Organ. Sci.* **15** 481-494.
- Henderson, R., I. Cockburn. 1994. Measuring Competence? Exploring Firm Effects in Pharmaceutical Research. *Strategic Management J.* **15** 63-84.

- Henisz, W.J., J.T. Macher. 2004. Firm- and country-level trade-offs and contingencies in the evaluation of foreign investment: The semiconductor industry, 1994-2002. *Organ. Stud.* **15** 537-54.
- Holmqvist, M. 2004. Experimental learning processes of exploitation and exploration. An empirical study of product development. *Organ. Sci.* **15** 70-81.
- Ireland, R.D., M.A. Hitt, R.A. Bettis, D. A. De Porras. 1987. Strategy formulation processes: Differences in perceptions of strength and weakness indicators and environmental uncertainty by managerial level. *Strategic Management J.* **8** 469-485.
- Jaccard, J., R. Turrisi. 2003. *Interaction Effects in Multiple Regression*, 2nd ed. Sage, Thousand Oaks, CA.
- Jaworski, B.J., A.K. Kohli. 1993. Market orientation: Antecedents and consequences. *J. Marketing.* **57** 53-70.
- Jansen, J.J.P., F.A.J. Van Den Bosch, H.W. Volberda. 2005. Managing potential and realized absorptive capacity: How do organizational antecedents matter?. *Acad. Management J.* **48** 999-1015.
- Jansen, J.J.P., F.A.J. Van Den Bosch, H.W. Volberda. 2006. Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. *Management Sci.* **52** 1661-1674.
- Katila, R., G. Ahuja. 2002. Something old, something new: A longitudinal study of search behavior and new product introduction. *Acad. Management J.* **45** 1183-1194.
- Kellog, K.C., W.J. Orlikowski, J. Yates. 2006. Life in the trading zone: Structuring coordination across boundaries in postbureaucratic organizations. *Organ. Sci.* **17** 22-44.
- Kimberly, J.R. 1979. Issues in the creation of organizations: Initiation, innovation, and institutionalization. *Acad. Management J.* **22** 437-457.
- Kogut, B., U. Zander. 1996. What firms do? Coordination, identity, and learning. *Organ. Sci.* **7** 502-518.
- Levinthal, D.A., J.G. March. G. 1993. The myopia of learning. *Strategic Management J.* **14** 95-112.

- Lewin, A.Y., C.P. Long, T.N. Carroll. 1999. The coevolution of new organizational forms. *Organ. Sci.* **10** 535-550.
- Lin, X., R. Germain. 2003. Organizational structure, context, customer orientation, and performance: Lessons from Chinese state-owned enterprises. *Strategic Management J.* **24** 1131–1151.
- Lubatkin, M.H., Z. Simsek, Y. Ling, J.F. Veiga. 2006. Ambidexterity and performance in small- to medium-sized firms: The pivotal role of top management team behavioral integration. *J. Management.* **32** 646-672.
- March, J.G. 1991. Exploration and exploitation in organizational learning. *Organ. Sci.* **2** 71-87.
- March, J.G., H.A. Simon. 1958. *Organizations*. John Wiley, New York.
- Martinez, J.L., J.C. Jarillo. C. 1989. The evolution of research on coordination mechanisms in multinational corporations. *J. Internat. Bus. Stud.* **20** 489-514.
- McGrath, R.G. 2001. Exploratory learning, innovative capacity, and managerial Oversight. *Acad. Management J.* **44** 118-131.
- Miles, R.H., W.D. Perreault. 1976. Organizational role conflict: Its antecedents and consequences. *Organ Behavior Human Performance.* **17** 19-44.
- Miller, D., C. Droge. 1986. Psychological and traditional dimensions of structure. *Admin. Sci. Quart.* **31** 539–560.
- Mom, T.J.M., F.A.J. Van Den Bosch, H.W. Volberda 2007. Investigating managers' exploration and exploitation activities: The influence of top-down, bottom-up, and horizontal knowledge inflows. *Journal of Management Studies*, **44** 910-931.
- Mom, T.J.M., F.A.J. Van Den Bosch, H.W. Volberda 2009. Understanding variation in managers' ambidexterity: Investigating direct and interaction effects of formal structural and personal coordination mechanisms. *Organization Science*, forthcoming.
- Nadler, D.A., M.L. Tushman. 1987. *Strategic Organization Design*. Scott Foresman, New York.
- Nahapiet, J., S. Ghoshal. 1998. Social capital, intellectual capital, and the organizational advantage. *Acad. Management Rev.* **23** 242-266.
- O'Reilly, C.A., M.L. Tushman. 2004. The ambidextrous organization. *Harvard Bus .Rev.* **82**(4) 74-81.

- Pierce, J.L., A.L. Delbecq. 1977. Organization structure, individual attitudes and innovation. *Acad. Management Rev.* **2** 27-37.
- Podsakoff, P.M., D.W. Organ. 1986. Self-reports in organization research: Problems and prospects. *J. Management.* **40** 308-338.
- Prahalad, C.K., G. Hamel. 1990. The core competence of the corporation. *Harvard Business Rev.* **68**(3) 79-93.
- Pugh, D.S., D.J. Hickson, C.R. Hinings, K.M. Macdonald, C. Turner, T. Lupton. 1963. A conceptual scheme for organizational analysis. *Admin. Sci. Quart.* **8** 289-315.
- Quinn, J.B. 1985. Managing innovation: Controlled chaos. *Harvard Bus. Rev.* **63**(3) 73-84.
- Reagans, R., L. Argote, D. Brooks. 2005. Individual experience and experience working together: Predicting learning rates from knowing who knows what and knowing how to work together. *Management Sci.* **51** 869-881.
- Rivkin, J.W., N. Siggelkow. 2003. Balancing search and stability: Interdependencies among elements of organizational design. *Management Sci.* **49** 290-311.
- Rowley, T.J. 1997. Moving beyond dyadic ties: A network theory of stakeholder influences. *Acad. Management Rev.* **22** 887-910.
- Rowley, T.J., D. Behrens, D. Krackhardt. 2000. Redundant governance structures: An analysis of structural and relational embeddedness in the steel and semiconductor industries. *Strategic Management J.* **21** 369-386.
- Sarvary, M. 1999. Knowledge management and competition in the consulting industry. *California Management Rev.* **41**(2) 95-107.
- Schulz, M. 2003. Pathways of relevance: Exploring inflows of knowledge into subunits of multinational corporations. *Organ. Sci.* **14** 440-459.
- Shepard, H.A. 1967. Innovation-resisting and innovation-producing organizations. *J. Bus.* **40** 470-477.
- Sheremata, W.A. 2000. Centrifugal and centripetal forces in radical new product development under time pressure. *Acad. Management Rev.* **25** 389-408.
- Sidhu, J.S., H.W. Volberda, H.R. Commandeur. 2004. Exploring exploration Orientation and its determinants: Some empirical evidence. *J. Management Stud.* **41** 913-932.

- Subramaniam, M., M.A. Youndt. 2005. The influence of intellectual capital on the types of innovative capabilities. *Acad. Management J.* **48** 450-463.
- Taylor, A., H.R. Greve. 2006. Superman or the fantastic four? Knowledge combination and experience in innovative teams. *Acad. Management J.* **49** 723-740.
- Thompson, J.D. 1967. *Organizations in action*. McGraw-Hill, New York:
- Tsai, W. 2002. Social structure of “coopetition” within a multiunit organization: Coordination, competition, and Intraorganizational Knowledge Sharing. *Organ. Sci.* **13** 179-190.
- Tushman, M.L., D.A. Nadler. 1978. Information processing as an integrating concept in organizational design. *Acad. Management Rev.* **3** 613-624.
- Tushman, M.L., C.A. O’Reilly. 1996. Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Rev.* **38**(4) 8-30.
- Van De Ven, A. 1980. Problem solving, planning, and innovation. Part II. Speculations for theory and practice. *Human Relations.* **33** 757-779.
- Van De Ven, A., A.L. Delbecq, R. Koenig. 1976. Determinants of coordination modes within organizations. *Amer. Sociological Rev.* **41** 322-338.
- Walsh, J.P. 1988. Selectivity and selective perception: An investigation of managers’ belief structures and information processing. *Acad. Management J.* **31** 873-896.
- Weick, K. E. 1979. *The social psychology of organizing*. Addison-Wesley, Reading, M.A.
- Whetten, F.R. 1978. Coping with incompatible expectations: An integrated view of role conflict. *Admin. Sci. Quart.* **23** 254-271.
- Winter, S.G., G. Szulanski. 2001. Replication as Strategy. *Organ. Sci.* **12** 730-734.
- Zander, U., B. Kogut. 1995. Knowledge and the speed of the transfer and imitation of organizational capabilities: An empirical test. *Organ. Sci.* **6** 76-92.
- Zollo, M., S.G. Winter. 2002. Deliberate learning and the evolution of dynamic capabilities. *Organ. Sci.* **13** 339-351.

Table 1. Means, Standard Deviations, and Correlations

	Mean	St. dev.	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Managers' Ambidexterity	21.88	7.19													
2 Decision making authority	4.15	1.62	.41												
3 Formalization of tasks	3.86	1.38	.06	-.05											
4 Cross functional interfaces	4.40	1.29	.40	.19	.00										
5 Connectedness	4.56	1.38	.39	.31	-.02	.31									
6 Hierarchical level: Business unit managers	.33	.47	.15	.09	-.15	.02	-.00								
7 Retail business unit of firm A	.13	.34	-.14	-.20	.04	.01	-.04	-.11							
8 Wholesale business unit of firm A	.13	.34	-.04	-.12	-.03	.04	.04	-.10	-.15						
9 Operations unit of firm A	.09	.28	-.08	.06	.03	.07	.05	-.07	-.12	-.12					
10 Business unit group 1 of firm B	.08	.27	.20	.25	.07	.02	.13	.05	-.12	-.12	-.09				
11 Business unit group 2 of firm B	.11	.31	.27	.21	.17	.15	.08	-.05	-.13	-.14	-.11	-.10			
12 Production support unit of firm B	.05	.22	.19	.20	.09	-.04	.07	-.08	-.09	-.09	-.07	-.07	-.08		
13 Business unit group 1 of firm C	.26	.44	-.16	-.19	-.11	-.09	-.13	.26	-.23	-.23	-.18	-.18	-.21	-.14	
14 Business unit group 2 of firm C	.08	.27	-.07	.01	-.21	-.15	.02	.02	-.11	-.11	-.09	-.09	-.10	-.07	-.17

N = 458. All correlations above |.11| are significant at $p < .01$, All correlations above |.08| are significant at $p < .05$ (2-tailed)

Table 2^a. Results of Hierarchical Regression Analyses for Managers' Ambidexterity: Main Effects

	Model 1		Model 2	
	b (s.e.)	β	b (s.e.)	β
Intercept	20.05 (1.15)		21.26 (1.02)	
Main Effects				
Decision making authority			.69 (.19)	.16 ***
Formalization of tasks			.20 (.22)	.04
Cross-functional interfaces			1.52 (.21)	.27 ***
Connectedness			1.11 (.21)	.21 ***
Control Variables				
Hierarchical level: business unit managers	3.02 (.66)	.20 ***	2.46 (.60)	.16 ***
Retail business unit of firm A	-1.32 (1.40)	-.06	-1.71 (1.24)	-.08
Wholesale business unit of firm A	.45 (1.40)	.02	-.55 (1.24)	-.03
Operations unit of firm A	-.65 (1.52)	-.03	-2.57 (1.34)	-.10 †
Business unit group 1 of firm B	5.54 (1.55)	.21 ***	2.83 (1.40)	.11 *
Business unit group 2 of firm B	6.58 (1.46)	.28 ***	3.53 (1.31)	.15 **
Production support unit of firm B	7.27 (1.73)	.23 ***	5.01 (1.56)	.16 **
Business unit group 1 of firm C	-1.69 (1.29)	-.10	-1.50 (1.14)	-.09
Business unit group 2 of firm C	-1.10 (1.57)	-.04	-.98 (1.41)	-.04
R-squared		.22		.41
Adjusted R-squared		.21		.39
F improvement of fit		14.17 ***		35.81 ***

^a Centered data; Unstandardized coefficients are reported, with standard errors in parentheses, as well as standardized coefficients.

N = 458; † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 3^a. Results of Hierarchical Regression Analyses for Managers' Ambidexterity: Interaction Effects

	Model 3		Model 4		Model 5		Model 6A		Model 6B	
	b (s.e.)	β	b (s.e.)	β	b (s.e.)	β	b (s.e.)	β	b (s.e.)	β
Intercept	22.38 (1.04)		22.94 (1.06)		22.94 (1.05)		23.05 (1.04)		24.23 (1.13)	
Main Effects										
Decision making authority	1.06 (.23)	.24 ***	1.02 (.23)	.23 ***	1.14 (.23)	.26 ***	1.22 (.23)	.27 ***	-.23 (.30)	-.05
Formalization of tasks	.20 (.20)	.04	.37 (.25)	.07	.38 (.25)	.07	.38 (.25)	.07	.23 (.34)	.04
Cross-functional interfaces	1.45 (.22)	.26 ***	1.41 (.22)	.25 ***	1.04 (.25)	.19 ***	1.08 (.25)	.19 ***	1.92 (.45)	.34 ***
Connectedness	1.09 (.21)	.21 ***	1.07 (.21)	.21 ***	.91 (.21)	.18 ***	.61 (.25)	.12 *	1.68 (.39)	.32 ***
Interaction Effects										
Centralization * business unit-level	1.21 (.31)	.15 **	1.07 (.36)	.14 **	1.30 (.36)	.16 ***	1.45 (.37)	.18 ***		
Centralization * operational-level									-1.45 (.37)	-.27 ***
Formalization * business unit-level			-.09 (.42)	-.01	-.20 (.42)	-.02	-.15 (.41)	-.02		
Formalization * operational-level									.15 (.41)	.02
Cross-f. interfaces * business unit-level					1.39 (.46)	.14 **	.84 (.52)	.08 †		
Cross-f. interfaces * operational-level									-.84 (.52)	-.13 †
Connectedness * business unit-level							1.08 (.46)	.12 *		
Connectedness * operational-level									-1.08 (.46)	-.17 *
Control Variables^b										
Hierarchical level: business unit managers	2.57 (.59)	.17 ***	1.28 (.76)	.08 †	1.08 (.76)	.07	1.18 (.75)	.08		
Hierarchical level: operational managers									-1.18	-.08
R-squared		.44		.44		.46		.46		.46
Adjusted R-squared		.42		.42		.44		.44		.44
F improvement of fit		11.84 **		.51		8.99 **		5.46 *		5.46 *

^a Centered data; Unstandardized and standardized coefficients are reported, standard errors in parentheses; N = 458; † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

^bTo save place, coefficients for the unit dummy variables are not reported in Table 3

Figure 1: The Moderating Effect of Hierarchical Level on the Relation between Managers' Decision Making Authority and Managers'

Ambidexterity

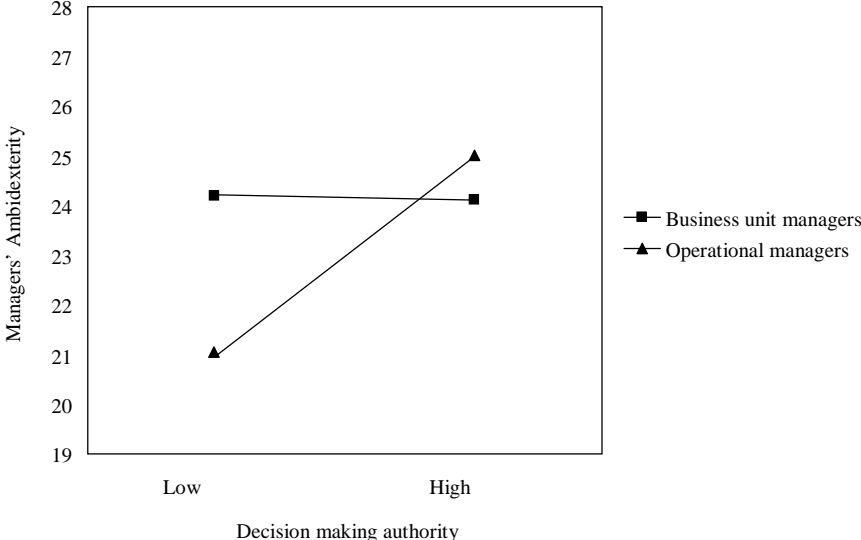


Figure 2: The Moderating Effect of Hierarchical Level on the Relation between Managers' Participation in Cross functional Interfaces and Managers' Ambidexterity

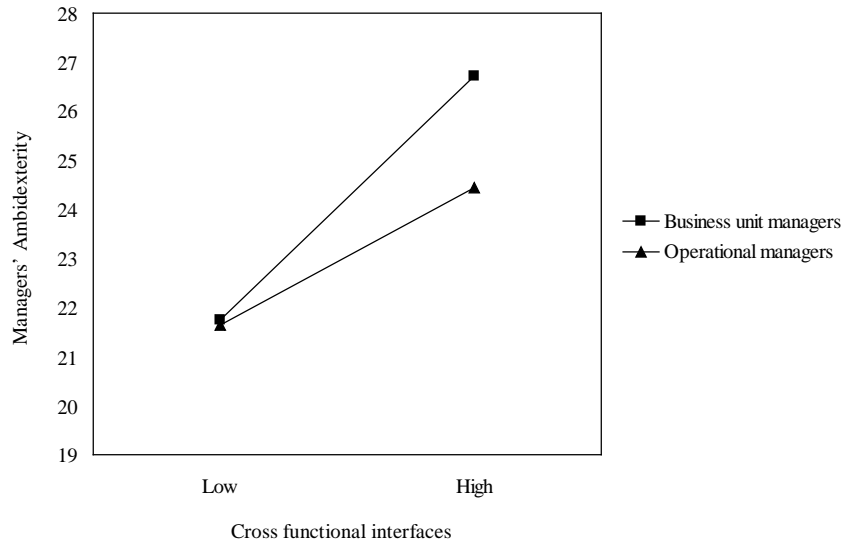
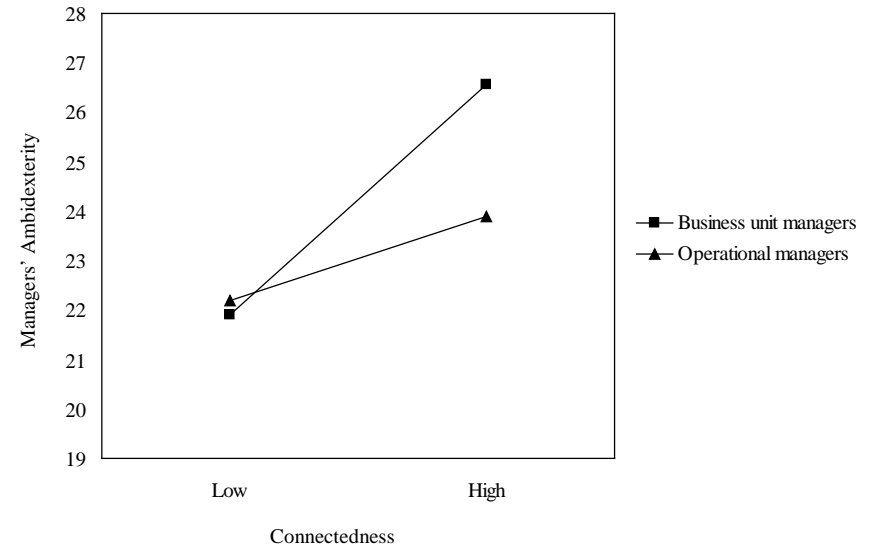


Figure 3: The Moderating Effect of Hierarchical Level on the Relation between Managers' Connectedness to other Organization Members and Managers' Ambidexterity



Appendix. Measures and Items at the Manager Level*

Managers' Ambidexterity

Exploration activities

To what extent did you, last year, engage in work related activities that can be characterized as follows:

Searching for new possibilities with respect to products/ services, processes or markets

Evaluating diverse options with respect to products/ services, processes or markets

Focusing on strong renewal of products/ services or processes

Activities of which the associated yields or costs are currently unclear

Activities requiring quite some adaptability of you

Activities requiring you to learn new skills or knowledge

Activities that are not (yet) clearly existing company policy

Exploitation activities

To what extent did you, last year, engage in work related activities that can be characterized as follows:

Activities of which a lot of experience has been accumulated by yourself

Activities which you carry out as if it were routine

Activities which serve existing (internal) customers with existing services/ products

Activities of which it is clear to you how to conduct them

Activities primarily focused on achieving short-term goals

Activities which you can properly conduct by using your present knowledge

Activities which clearly fit into existing company policy

Appendix. (CONTINUE)

Decision making authority (reversed) (based on Dewar et al., 1980)

I can undertake little action, until my supervisor approves a decision

If I want to make my own decisions, I will be quickly discouraged

I have to ask my supervisor before I do almost everything

Any decision I make has to have my supervisor's approval

Formalization of tasks (based on Desphande & Zaltman, 1982)

Whatever situation arises, I have procedures to follow in dealing with it

I have to follow strict operational procedures at all times

Rules occupy a central place in my work related activities

There is a written job description for going about my tasks

Cross functional interfaces (based on Gupta & Govindarajan, 2000; Nadler & Tushman, 1987)

I coordinate work across internal organizational boundaries

I work in temporary task forces

I work in permanent teams

Connectedness (based on Jaworski & Kohli, 1993)

There are many opportunities for me to talk to individuals from all kinds of different organizational units

I very frequently have contact with people, regardless of rank or position

The personal network I have throughout the organization, can be called 'extensive'

I feel very comfortable calling others, regardless of rank, position, or organizational unit, when the need arises

*All items were measured on a seven-point scale (1 = 'to a very small extent' or 'strongly disagree' to 7 = 'to a very large extent' or 'strongly agree').