

Social Network Structure's Influence on Organizational Ambidexterity

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Abstract

Due to future markets shifts as well as current market dynamics industries like the automotive industry OEMs have to be able to handle both exploration and exploitation simultaneously, a capability which is called 'organizational ambidexterity'. Using data from German and Austrian premium OEMs as well as leading-edge suppliers of the automotive industry present work sheds light on the questions what important drivers like external and internal ties of an unit may enhance explorative or exploitative behavior? And does a balance of these drivers enhance organizational ambidexterity? The paper shows how important these drivers are and how absorptive capacity as context factor influences the relationship between the drivers and organizational ambidexterity.

1. Introduction

In the current turbulent business world, being able to handle both future market shifts as well as current market dynamics is of critical importance for organizations. Especially in industries like the automotive industry the necessity for this duality became evident with the revival of the electric drivetrain in the last years. Original Equipment Manufacturers (OEMs) have to be able to do both exploit their current knowledge with regards to combustion engines as well as develop new knowledge with regards to the electrification of the drivetrain. The increasing prices of fossil fuels, a growing demand for more sustainable means of transportation and recent successes of start-up firms force incumbent OEMs to leave their traditional path of innovation and acquire or develop entirely new knowledge. The topic of knowledge in organizations has received a great deal of attention in the literature for the last two decades [1]. For both researchers and practitioners much of this interest is driven by the recognition of knowledge as a

critical factor for companies in creating competitive success over time [2, 3]. Recently the knowledge stocks of incumbent automotive manufacturers began to depreciate at a higher rate [4] and the knowledge environment around automobile manufacturers became more turbulent. The leading organizations need to not only exploit their current knowledge bases, but also participate in new knowledge flows if they want to continue to succeed [5]. As the knowledge necessary for radical innovation may lie outside a firm's traditional core competencies, a common strategy for addressing this problem is to form alliances with other firms and external institutions. Inter-firm cooperation can be extremely effective in increasing the circulation of tacit knowledge, and in creating possibilities for firms or units to acquire knowledge outside their boundaries [6]. A key difference between the automotive industry's more stable knowledge environment of the past and the current turbulent knowledge environment is related to the relative importance of explorative and exploitative learning processes [7]. In turbulent knowledge environments, exploration becomes more important. One can observe that incumbents in mature industries like the automotive industry have problems with the management of turbulent knowledge environments. Nevertheless, in order to outperform both other incumbents and also new competitors, OEMs have to learn to excel at both exploitation and exploration. As exploitation and exploration have completely different requirements concerning the network structure of an organizational unit OEMs oftentimes set up units dedicated solely to exploratory innovation. Still, the knowledge generated through those exploration units has to be integrated at some point into the existing knowledge stock of the company or unit. In the end, OEMs have to be able to handle both exploration and exploitation simultaneously, a capability which is called 'organizational ambidexterity'. Past research on organizational ambidexterity has mainly focused on the

question of how organizations address exploitation and exploration internally [8]. Nevertheless, literature on exploration and explorative innovation emphasizes the importance of the external acquisition of new knowledge [9, 5]. Social network theory on the other hand has shown that social network characteristics affect knowledge transfer and integration [10, 11]. Atuahene-Gima and Murray [12] and Lin et al. [13] extended this work in order to include the notion of organizational ambidexterity.

OEMs in the automotive industry need to pursue a two-pronged innovation approach. While they need to continue to incrementally improve and exploit current technology they also need to tap into new forms of knowledge and use it in order to come up with radical innovations in new fields (e.g. electric mobility) to prepare for the challenges of the long-term future. This need for both exploitation as well as exploration forces organizations and their units to become ambidextrous. Recently, one can also observe manifestations of this duality in practice with regards to exploration in the field of battery technology: Almost all OEMs try to gain new knowledge by setting up horizontal and vertical cooperation and generally source for new knowledge outside their firm's boundaries, because they do not have enough knowledge with regards to battery technology inside their company. This is one indication that exploration may require a company to move beyond its boundaries. The problem is that having access to this knowledge is not enough, but there is also the need for integration of this knowledge into the organization. Obstfeld [11] described that having a network rich in structural holes, which OEMs try to create right now with means of cooperation, generates an 'action problem', as a network rich in structural holes has greater capacity to generate new ideas, but has a lower capacity to implement them.

The present work aims to shed light on the following questions: First, how do external and internal ties influence the processes of exploitation and exploration? Second, does absorptive capacity as context factor moderate the relationship of external and internal ties on the processes of exploitation and exploration? Third, does a balance of internal and external ties support ambidexterity? And fourth, does absorptive capacity moderates the relationship of the balance of internal and external ties on ambidexterity? Present study contributes to research on organizational ambidexterity by investigating the influence of the social network structure on enabling exploitative and explorative knowledge processes leading to organizational ambidexterity. Moreover, the data was derived from organizational units involved in technological innovation in the automotive industry.

2. Theoretical Foundations and Hypotheses

2.1. Research Context: Organizational Units of the Automotive Industry Involved in Technological Innovation

Abernathy's [87] study of the auto industry indicated that sustained performance was rooted in a firm's ability to (1) move down a particular learning curve as well as (2) create new learning curves. More recently the automotive industry was challenged by the revival of the electric car and was forced to create new learning curves. New knowledge and competencies have become necessary and a shift from mainly incremental to radical innovation was induced. The leading German automotive manufacturers excel at incremental innovation since decades, but seem to have problems with radical innovation in the field of electric drivetrains. Understandably, the transition from combustion engines to electric drivetrains is a huge challenge for automotive manufacturers as well as for their suppliers. The question arises why it is problematic for the incumbent automotive manufacturers to innovate in radically new fields and what the causes are that make leaving the current path of innovation so difficult. In general, with regards to the development of new products, firms face an important strategic dilemma as exploiting existing competencies may provide short-term success, but competence exploitation can become a hindrance to the firm's long-term viability by stifling the exploration of new competencies and the development of radical innovations [7]. The two types of learning processes that affect New Product Development (NPD) are exploitation and exploration. March [7] defines exploitation as the refinement and extension of existing competencies, technologies, and paradigms and exploration as experimentation with new alternatives that have returns that are uncertain, distant, and often negative. Although many firms are adept at exploiting existing capabilities, they appear to falter in simultaneously developing new ones [72]. Leonard-Barton [81] aptly terms this phenomenon the 'capability-rigidity paradox', while the essence of the capability-rigidity paradox is that competence exploitation tends to crowd out competence exploration. Past research finds exploitation to drive out exploration [75], path dependencies to strengthen either exploration or exploitation, and the simultaneity of exploration and exploitation (i.e. ambidexterity) to result in higher performance for firms. Thus, the key to resolving the capability-rigidity paradox may be organizational factors and designs that can ensure simultaneous investments in both the exploitation of existing product innovation capabilities and the

exploration of new ones. Furthermore, it is known since a few decades that outside sources of knowledge are oftentimes a critical factor in the innovation process [55: 128]. Research has shown the vital importance of extra-organizational ties for innovation. Chesbrough [9], through his open innovation paradigm, also refers to the importance of external ideas for the innovation process and even suggests that the traditional internal Research and Development (R&D) is no longer the strategic asset, it once was. On the contrary, some researchers have warned about the risk of overestimating the role played by external knowledge sources arguing that in many industries, innovation efforts are not only made by firms themselves but are also generated in-house. The study of Freel [82] shows that a firm's internal resources are the main determinants of their innovation performance, and that the creation of external networks has only a limited impact. From a more integrative perspective, some works point out that external and internal knowledge acquisition can be complementary activities in an organization's innovation strategy. These authors make clear that the effect of external knowledge sources on innovation performance, although important, depends on internal capabilities of the firm. Rothwell [83], for example, highlights that links to external scientific and technical knowledge sources are effective only if the organization is well prepared and open to external ideas, and has skilled scientific and technical staff. In line with this thoughts, Cohen and Levinthal's [55] concept of 'absorptive capacity' has gained evermore influence in recent years. This concept places special emphasis on an organization's pre-existing knowledge in the tasks of identifying, assimilating, and exploiting external knowledge. On the basis of this concept, it has been argued that not only do the organization's internal efforts to create new knowledge encourage the use of external knowledge sources but they also increase the firm's ability to exploit these sources efficiently in the development of new products and processes [84]. Thus, the greater the internal capabilities of the firm, the greater are the effect of external knowledge on innovation performance. However, Vega-Jurado [84] state that the above argument lacks sound empirical foundation as only few empirical analyses of these relationships have produced mixed findings. For instance, Cassiman and Veugelers [85] found that internal R&D and external knowledge acquisition were complementary with respect to influencing innovation performance, whereas Laursen and Salter [86] found evidence of a substitution effect between internal R&D and external knowledge search activities. The innovation networks within the automotive industry may be streamlined for incremental innovation and therefore hinder radical

innovation in new fields. Especially in the area of drivetrains research in the automobile industry concentrated on continuous improvement of the combustion engine and not on radically changing the powertrain of the car. Of course, there was exploration of new technologies, but this explorative research seems to have been too detached from the core business of the OEMs in order to be integrated effectively. The creation of ambidextrous organizational units being able to handle both exploration and exploitation simultaneously represents one possible solution to this problem. These units would be able to move down particular learning curves as well as generate new ones, while making sure that the explorative innovation results can be effectively integrated in the knowledge stock of the organization.

2.2. The Effects of Internal and External Ties on Exploration and Exploitation

On the one hand, internal ties comprise all ties within a company or organization. This includes intra-unit and inter-unit ties. Internal ties are personal linkages between people and comprise both formal and informal modes [28]. Although research has shown inter-firm or inter-unit relations to affect knowledge transfer and learning [29, 30, 31], the impact of social network relations among individuals within units on exploratory and exploitative innovation remains rather unclear [32]. Connectedness increases opportunities for informal hall talk and the accessibility of knowledge sources within an organization [33]. It helps a range of individuals to combine knowledge and develop new knowledge underlying exploratory innovation [34, 35]. In addition, Subramaniam and Youndt [36] argue that social relations assist in establishing legitimacy and in enabling adoption of exploratory innovation. Beyond a moderate level, however, a social network focused on internal ties may limit access to divergent perspectives and to alternative ways of doing things [37]. As well developed internal networks diffuse strong norms within the company and establish shared behavioral expectations, they reduce deviant behavior, limit search scope, and increase selective perception of alternatives [16]. Knowledge accumulation tends to be path-dependent, companies that have well-developed knowledge bases in a certain research trajectory, perceive it difficult adapting to new knowledge or using knowledge seemingly unrelated to their current knowledge, which limits the flexibility of those companies. The concentration on relations within the unit and within the company, therefore, will eventually constrain the departure from existing knowledge and decrease a unit's exploratory innovation [32]. For exploitative innovation, on the other hand, organizational units need to efficiently draw on and

refine prevailing knowledge within the company [36]. Internal ties permit individuals to develop a deep understanding to further refine and improve existing products, processes, and markets [38]. Moreover, internal relations enable unit members to share experiences with regard to how to implement certain improvements [39]. Therefore, internal ties facilitate improving existing knowledge resources and increase a unit's exploitative innovation.

On the other hand, the role of external ties as a driver of information exchange can be significant in the technological context [40]. Direct ties to other firms can have three substantial benefits: knowledge sharing, complementarity and scale [21].

A tie between two organizations can also constitute a communication channel between the focal organization and many indirect contacts [41, 42, 43]. The organization's partners bring the knowledge and the expertise from their interaction with other partners to the relationship with the focal organization and vice versa [44, 45]. Research has shown that the extent to which organizations are indirectly tied to external sources is positively correlated with innovativeness [21, 46]. In most cases, innovation is an information-intensive activity both with regards to the collection of information and the processing of information [21]. Single organizations can only pursue a limited amount of technologies and research trajectories, but the network can increase the scope of information for a single firm.

On the one hand, external ties can be used as a mechanism to gain information. Firms can gain information on the success or failure of other research initiatives and profit from a 'second-mover advantage'. Promising technological directions and technological dead ends can be identified at an early stage, when the company or unit is connected to its external environment. An external network can also be used as an information processing or screening mechanism [47]. Every additional node an organization or unit has access to, can process, absorb, filter and classify new technological developments and information. Though external ties, a company's or organizational unit's attention can be directed towards relevant developments in different technology areas. Alternatively, units can activate their external network to identify sources of information about a problem at hand. Units with more external ties are exposed to more information than units having fewer connections to external sources of knowledge [21]. Traditionally, firms in the automotive industry also closely cooperate with their suppliers, in order to jointly develop products and to innovate [48]. Von Hippel [49, 50] found that customers improve innovations oftentimes on their own and identify new ideas, so ties to

customers also are an important source of innovation. Furthermore, researchers observe that firms with ties to universities produce more patents and have lower R&D costs than those lacking such ties [46]. New knowledge flows out of universities much more readily than it does from commercial organizations. On the one hand, universities transfer knowledge to the organizations through research within the faculty. On the other hand through students, bringing knowledge with them to the organizations through human capital. Therefore, the following is hypothesized:

H₁: A unit's internal ties are positively related to exploitation.

H₂: A unit's external ties are positively related to exploration.

2.3. Absorptive Capacity as a Moderator of the External Tie—Exploration Relationship and the Internal Tie—Exploitation Relationship

The concept of 'absorptive capacity', introduced by Cohen and Levinthal [55], places special emphasis on an organization's pre-existing knowledge in the tasks of identifying, assimilating, and exploiting external knowledge. On the basis of this concept, it has been argued that not only do the organization's internal efforts to create new knowledge encourage the use of external knowledge sources but they also increase the firm's ability to exploit these sources efficiently in the development of new products and processes [84]. Thus, the greater the internal capabilities of the firm, the greater are the effect of external knowledge on innovation performance. This insight shows why a balance between internal and external ties might be beneficial. Those firms with higher levels of absorptive capacity can manage external knowledge flows more efficiently, and stimulate innovative outcomes [5]. At the same time, access to external know-how may leverage the efficiency of internal R&D activities, at least if a firm is willing to accept external ideas and knowledge, overcoming the 'not invented here' (NIH) syndrome [56]. Logically, establishing ties to external information and knowledge sources is not enough. As strict structuralist position assumes that specification of a network implies that organizational units automatically take advantage of the opportunities afforded by such a network. This structuralist view is evident in a large portion of the literature on social and knowledge networks. Taking this problem into account, past research has found that external knowledge needs to be absorbed and integrated, in order to realize its full potential [55, 2, 57]. The capability to integrate external knowledge depends on a combination of external ties and internal absorptive capacity [8]. Researchers of different fields point out

the area of conflict between the acquisition and the integration of external knowledge. Research in the field of absorptive capacity for example says that even though both internal knowledge processing and external knowledge acquisition are necessary, the extreme dominance of one of the two is debilitating [55, 58]. The logic behind absorptive capacity is the question of how much new external knowledge an organization can process at all [59]. Even though an organization or unit is perfectly integrated in a network and therefore exposed to ample external knowledge, this does not mean that the organization or unit can also absorb the multifarious external knowledge. Exposure to external knowledge creates a real option value or an opportunity structure. Whether the external knowledge can be integrated, depends on the unit's absorptive capacity. Cohen and Levinthal [55] describe absorptive capacity as the capability of an organization or unit to recognize the value of novel, external information, absorb it and use it for commercial ends. Therefore it is hypothesized:

H₃: Absorptive capacity moderates the relationship between external ties and exploration such that the positive impact of external ties will be stronger for units with absorptive capacity.

H₄: Absorptive capacity moderates the relationship between internal ties and exploitation such that the positive impact of internal ties will be stronger for units with absorptive capacity.

2.4. Supporting Ambidexterity by Balancing Internal and External

Following March [7] organizational adaptation requires both exploitation and exploration to achieve persistent success therefore companies need to balance exploration and exploitation. Notwithstanding their radically different dynamics, companies must learn to excel at both tasks. Adaptive systems that engage in exploration to the exclusion of exploitation are likely to find that they suffer the costs of experimentation without gaining many of the benefits. They exhibit too many undeveloped new ideas and too little distinctive competence [7]. Conversely, systems that engage in exploitation to the exclusion of exploration are likely to find themselves trapped in suboptimal stable equilibriums [7].

Raisch et al. [8] stated that ambidexterity may be supported by social networks that contrast internal and external ties. Cummings [60] found out that effective work groups engage in external knowledge sharing—the exchange of information, know-how, and feedback with customers, organizational experts, and others outside of the group. In his paper, Cummings [60] argues that the value of external knowledge sharing

increases when work groups are more structurally diverse. A structurally diverse work group is one in which the members, by virtue of their different organizational affiliations, roles, or positions, can expose the group to unique sources of knowledge. This would be equivalent with the definition of structural holes. Accordingly, external ties are more valuable when there are also structural holes. Therefore, it is hypothesized that there is a positive effect of the balance between internal and external ties on organizational ambidexterity. That is, because if members of structurally diverse organizational units engage in external knowledge sharing, the ambidexterity of the organizational unit will improve because of this active exchange of knowledge through unique external sources [60]. External ties are especially valuable when people within an organizational unit are structurally diverse (i.e. the organizational unit has a lot of structural holes), because the information from external sources is non-redundant. Furthermore, internal ties create value as effective sharing of tacit knowledge and goal-oriented collaboration can take place.

H₅: The balance of external and internal ties is positive related to ambidexterity.

H₆: Absorptive capacity moderates the relationship between the balance of internal and external ties and ambidexterity such the positive impact of balance of internal and external ties will be stronger for units with absorptive capacity.

H₇: Absorptive capacity is positive related to ambidexterity.

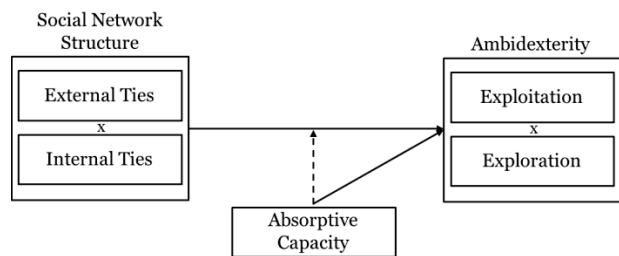


Figure 1. The research model

3. Method

3.1. Sample and Procedure

Because of the simultaneous necessity of both radical and incremental innovations as well as the significant transition and change the industry is going through currently, the automotive industry was chosen as context for this study. The data was obtained from an online survey sent out to experts of the automotive

industry working in innovative organizational units in Germany and Austria that are responsible for innovation tasks. The recipients mostly work for big premium OEMs as well as leading-edge suppliers of the automotive industry and were identified either through personal contact or through a targeted search using social networking platforms. The sample comprised 231 participants of which N = 130 qualified for statistical analysis due to completeness. 52% (N = 67) of the respondents work for an organizational unit that exists for more than 10 years. 6% (N = 8) worked in a unit that is 8-10 years old. 9% (N = 12) in a unit that is 6-8 years old, 14% (N = 18) in a unit that is 4-6 years old, 10% (N = 13) in a unit that is 2-4 years old, and 9% (N = 12) in a unit that is 0-2 years old. Concerning the number of employees working in the organizational unit of the participants, 60% (N = 77) of the units have more than 50 employees. 9% (N = 12) have 41-50 employees, 6% (N = 8) have 31-40 employees, 9% (N = 12) have 21-30 employees, 6% (N = 8) have 11-20 employees, and 10% (N = 13) have less than 10 employees. With regards to the size of the company, 72% (N = 94) of the participants work for a company with more than 10,000 employees. 6% (N = 8) of the participants work for a company with 1,001-10,000 employees, 12% (N = 15) work for a company with 101-1,000 employees and 10% (N = 13) work in a company with less than 100 employees.

3.3. Measures

Dependent Variables. The exploitation items were adapted from Zahra et al. [61] and adjusted to the context. The items were rates on a seven-point Likert-type scale accounting for Cronbach's α of .95. The exploration items were also adapted from Zahra et al. [61] and adjusted to the context. The items were rates

on a seven-point Likert-type scale accounting for a Cronbach's α of .93.

Independent Variables. The items for external ties were derived from Escribano [5]. Survey participants were asked if the employees in their organizational unit were well connected to external sources of knowledge (suppliers, clients or customers, competitors, universities, other research institutes, specialized journals or meetings). This question referred to formal as well as to informal connections. The items for internal ties were derived from Jaworski and Kohli [33]. Survey participants were asked e.g. if there is ample opportunity for informal 'hall talk' among employees or employees feel comfortable calling other organizational units within the company to gain information and knowledge each other when the need arises. All items were rated on a seven-point Likert-type scale with anchors of "fully disagree" and "fully agree". The measures showed very good reliabilities with Cronbach's $\alpha = .94$ and $\alpha = .89$ respectively. The items for absorptive capacity were derived from Zahra and George [58]. Items were measured on a seven-point disagree/agree scale. The measures showed good reliabilities with Cronbach's $\alpha = .94$

Control Variables. Data on age of the organizational unit, size of the organizational unit, and size of the company was obtained from the online survey.

4. Results

Table 1 shows means, standard deviations and correlations for study variables. Table 2 shows the results of the regression analysis on exploitation.

Table 1. Means, standard deviations and correlations for study variables

Variable	N	Mean	SD	1	2	3	4	5	6	7	8
1 Exploration	130	4.13	1.68								
2 Exploitation	130	5.32	1.63	.71 ****							
3 Ambidexterity	130	23.91	11.81	.94 ****	.78 ****						
4 Unit Age	130	4.45	1.93	.34 ****	.53 ****	.37 ****					
5 Unit Size	130	4.72	1.92	.45 ****	.60 ****	.46 ****	.72 ****				
6 Company Size	130	3.32	1.23	.46 ****	.57 ****	.44 ****	.68 ****	.80 ****			
7 External Ties	130	4.57	1.66	.80 ****	.64 ****	.71 ****	.41 ****	.46 ****	.46 ****		
8 Internal Ties	130	5.24	1.41	.73 ****	.67 ****	.66 ****	.41 ****	.37 ****	.41 ****	.85 ****	
9 Balance of Internal and External Ties	130	25.94	11.74	.77 ****	.56 ****	.70 ****	.36 ****	.36 ****	.37 ****	.95 ****	.91 ****

* p < .1, ** p < .05, *** p < .01, **** p < .001;

Table 2. Regression for Exploitation

	Exploitation					
	Model 1		Model 2		Model 3	
	β	SE	β	SE	β	SE
Intercept	2.52	(.34)	.59	(.37)	1.36	(.47)
Unit Age	.13	(.09)	.04	(.07)	.06	(.07)
Unit Size	.28	(.11) **	.16	(.09)	.16	(.09)
Company Size	.27	(.16) *	.05	(.13)	.01	(.12)
External Ties			.04	(.12) **	.73	(.56)
Internal Ties			.32	(.14) ****	-.65	(.52)
External*Absorptive					-.17	(.12)
Internal*Absorptive					.21	(.11) *

N=130

* p < .1, ** p < .05, *** p < .01, **** p < .001;

Hypotheses 1, regarding the positive effect of a unit's internal ties and exploitation could be supported ($\beta = .32$, $p < .05$) and hypothesis 2, regarding the positive effect of a unit's external ties and exploration could be supported ($\beta = .42$, $p < .001$). Hypothesis 3 predicted a moderating effect of absorptive capacity on the

positive relationship between external ties and exploration. Table 2 reveals that there is no significant moderation effect of absorptive capacity ($\beta = .02$, n.s.) on the relationship between external ties and exploration.

Table 3. Regression for Exploration

	Exploration					
	Model 1		Model 2		Model 3	
	β	SE	β	SE	β	SE
Intercept	1.94	.39	-.17	.36	.80	.37
Unit Age	-.02	.10	-.13	.07	-.13	.05
Unit Size	.22	.13 *	.10	.09	.11	.07
Company Size	.38	.19 **	.08	.12	.11	.10
External Ties			.42	.11 ****	.21	.44
Internal Ties			.11	.13	-.37	.41
External*Absorptive					.02	.10
Internal*Absorptive					.07	.08

N=130

*p < .1, **p < .05, ***p < .01, ****p < .001;

Hypothesis 4 states that absorptive capacity positively moderates the relationship between internal ties and exploitation. Table 1 shows statistical support for this hypothesis. Absorptive capacity ($\beta = .21$, $p < .10$) indeed positively moderates the relationship between internal ties and exploitation. According to hypothesis 5, there is a

positive effect of the balance between internal and external ties on ambidexterity. Table 3 reveals that there is no correlation between the balance of internal and external ties ($\beta = -.12$, n.s.) and ambidexterity. Hypothesis 6 states that the effect of the balance between internal and external ties on ambidexterity is positively moderated by absorptive capacity. Table 3

shows that there is no support ($\beta = .01$, n.s.). According to Hypothesis 7, there is a direct relationship between absorptive capacity and ambidexterity. Table 3 shows that absorptive capacity ($\beta = 7.83$, $p < .001$) is indeed significantly positively correlated with ambidexterity.

Table 4. Regression for Ambidexterity

	Ambidexterity					
	Model 1		Model 2		Model 3	
	β	SE	β	SE	β	SE
Intercept	8.64	(2.74)	-19.27	(2.32)	-14.78	(6.10)
Unit Age	.29	(.71)	-.56	(.36)	-.58	(.36)
Unit Size	1.59	(.88) *	.98	(.44) **	1.12	(.44)
Company Size	1.96	(1.31)	.56	(.66)	.64	(.66)
Balance Int./Ext.			-.12	(.09)	-.11	(.38)
Absorptive Capacity			7.83	(.90) ****	6.57	(2.41)
Balance Int./Ext.*Absorptive					.01	(.08)

N=130

* $p < .1$, ** $p < .05$, *** $p < .01$, **** $p < .001$;

5. Discussion

Based on the suggestions from the reviews and articles cited above, as well as the literature on organizational ambidexterity, the findings of the present study lead to three main conclusions.

First, ‘exploitation’ and ‘exploration’ are correlated with adverse social network structure elements of an organizational unit. This means that the social network structure indeed is important and necessarily different for the performance of diverse innovation tasks. For exploitative tasks the unit needs internal ties, whereas for explorative tasks external ties are seen to be decisive.

Second, ‘absorptive capacity’ is positively moderating the effect of ‘internal ties’ on ‘exploitation’. This means that the more absorptive capacity a unit develops, the better it can use the internal connections within the company and profit from the knowledge inside the company to exploit current technologies.

Third, the balance of internal and external ties has no effect on ambidexterity. This may lead to the conclusion that ambidexterity may be too complex a concept to reach it by only combining the elements that lead to ‘exploitation’ and ‘exploration’ separately—the constituting factors of ambidexterity. One could also raise the critical argument that it is simply impossible to drive ambidexterity within one unit. However, the present study also identified ‘absorptive capacity’ as directly and positively correlated to ‘ambidexterity’. This may point to one

key to reaching ambidexterity on the unit level—the development of absorptive capacity.

In the context of managerial practice, the findings discussed above have some clear implications. The goal was to show that those organizations that can effectively balance internal and external ties also have advantages in coping with evolutionary and revolutionary technological change, due to their capability of handling both exploitation and exploration. This would mean that the social network of an organizational unit is closely related to the successful application of an ambidextrous strategy with regards to innovation. The present study found support for that.

Managers can influence the innovation strategy and direction of their unit by influencing whether the unit either forms internal or external ties. In more turbulent phases of the knowledge environment, managers should try to build a network with more external ties. It is rather intuitively understandable that a network needs to be extended beyond firm boundaries, especially in phases of change when new knowledge is necessary. Indeed, if the network can create a strong identity and coordinating rules, then it will be superior to an approach relying on single firms’ capabilities at creating and recombining knowledge due to the diversity of knowledge that resides within a network [39]. In phases that are less turbulent and where more incremental innovation is important, managers should try to strengthen the ties between unit members and also make sure that the unit members are well connected within the company. Dense ties between network partners are also likely to help in curbing opportunism [15, 88, 38]. In closed networks, in which ego’s partners are connected to each other, information about one actor’s opportunistic acts diffuses rapidly to other related actors, and sanctions for deviant behavior are more easily imposed [88]. This strengthening of ties can be done by team building events, unit meetings and group discussions. The connectedness within the company can be increased by cross-unit projects, presentations by other units and also informal meetings (company cafés and cafeterias).

While it is necessary to be able to steer the innovation tasks within a unit, in today’s competitive context, organizational units may need to be able to simultaneously pursue exploration and exploitation to sustain long-term value creation. Managers need to recognize the potential benefits from juxtaposing opposing forces of short-run improvement and long-run innovation. They should move away from the traditional either-or logic for improvement or innovation and manage the paradox to turn seemingly contradictory forces into synergies. ‘Absorptive

capacity' was identified as a major key to ambidexterity. So, one major task for managers to reach organizational ambidexterity may be to develop absorptive capacity.

It is important to mention that the optimal network structure for organizational ambidexterity does not guarantee that the organizational unit will become ambidextrous. This would be a strict structuralist view on how units might become ambidextrous. It is rather the case that the right structure is necessary, but not sufficient to reach organizational ambidexterity. Besides having the right structure, there are other factors in favor of organizational ambidexterity. Gibson and Birkinshaw [89] mention that the more a unit's context is characterized by an interaction of stretch, discipline, support, and trust, the higher the level of ambidexterity.

Managers should also motivate people to use external knowledge. The automotive industry is a conservative industry that hires bright engineers and business people. The manager's major job is to integrate these available parts into effective solutions that deliver value. One needs to be trained to be able to do that, because with university education you get trained to making a new contribution to the field of your training. This encourages specialization at the expense of developing broader integrative skills [9]. Companies who compete to hire these specialists will need to invest in substantial training to cultivate and nurture T-shaped managers (Hansen and Oetinger, 2001). The goal is to develop a culture that seeks out and rewards those managers with integration skills, to make the most out of both internal and external ideas. This is the key talent to fight for in a world of open innovation. Managers should also build their unit in a way that the employees taken together cover a broad knowledge field. Not only the single person should be T-shaped, but your unit taken together should be equipped with knowledge in very different fields. This is important, because the more different the knowledge bases of your employees are, the higher the chance that they can combine different but valuable pieces together to build something new. In a world of open innovation, where there are a wealth of useful ideas and smart people, the ability to integrate these available parts into effective solutions that deliver value is tremendously important [9].

Managers should also think about the fact that most firms may be motivated solely by knowledge creation [6]. In their decision making, they pay no attention to effects on, or consequences of, network position or structure. This insight implicates that managers can also generate an advantage for their organizations, when they think about the network structure of their

unit and force new beneficial connections or cut old unrewarding ones.

Also companies have to go from structural differentiation to ambidexterity (Jansen et al. 2009). Companies cannot only rely on special units to pursue exploratory innovation. First of all, these units are oftentimes seen as alien elements within the organization. Second of all, the knowledge these units create may be of high value, but in order to incorporate this knowledge into the products and processes of the organization the executing units must fully understand the knowledge created in a detached unit. This often causes problems of integration and is seen as a major problem with regards to structural ambidexterity.

Future research may build upon the results of this study in a number of ways. More research is needed to investigate the influence of the social network structure on ambidexterity. Future research should extend the findings of the present study by considering different industry contexts, different measurements of the social network structure and also include the geographic features of the social network structure. Some other factors might prevent units from becoming ambidextrous despite the balance of internal and external ties. There might be other factors besides absorptive capacity that are necessary for units to become ambidextrous. The assignment of future research is to find those influencing factors.

6. References

- [1] Carlile, P.R., "A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development", *Organization Science*, 2002, pp. 442-455.
- [2] Kogut, B., and Zander, U., "Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology", *Organization Science*, 1992, pp. 383-397.
- [3] Nonaka, I., and Takeuchi, H., *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*, Oxford University Press, USA, 1995.
- [4] Hagel Iii, J., Brown, J.S., and Davison, L., *The Power of Pull: How Small Moves, Smartly Made, Can Set Big Things in Motion*, Basic Books (AZ), 2010.
- [5] Escribano, A., Fosfuri, A., and Tribó, J.A., "Managing External Knowledge Flows: The Moderating Role of Absorptive Capacity", *Research Policy*, 38(1), 2009, pp. 96-105.
- [6] Cowan, R., Jonard, N., and Zimmermann, J., "Bilateral Collaboration and the Emergence of

- Networks", *Management Science*, 53(7), 2007, pp. 1051-1067.
- [7] March, J.G., "Exploration and Exploitation in Organizational Learning", *Organization Science*, 1991, pp. 71-87.
- [8] Raisch, S., Birkinshaw, J., Probst, G., and Tushman, M.L., "Organizational Ambidexterity: Balancing Exploitation and Exploration for Sustained Performance", *Organization Science*, 20(4), 2009, pp. 685-695.
- [9] Chesbrough, H., Vanhaverbeke, W., and West, J., *Open Innovation: Researching a New Paradigm*, OUP Oxford, 2008.
- [10] Hansen, M.T., "The Search-Transfer Problem: The Role of Weak Ties in Sharing Knowledge across Organization Subunits", *Administrative science quarterly*, 44(1), 1999, pp. 82-111.
- [11] Obstfeld, D., "Social Networks, the Tertius Iungens Orientation, and Involvement in Innovation", *Administrative science quarterly*, 50(1), 2005, pp. 100.
- [12] Atuahene-Gima, K., and Murray, J.Y., "Exploratory and Exploitative Learning in New Product Development: A Social Capital Perspective on New Technology Ventures in China", *Journal of International Marketing*, 15(02), 2007, pp. 1-29.
- [13] Lin, Z., Yang, H., and Demirkan, I., "The Performance Consequences of Ambidexterity in Strategic Alliance Formations: Empirical Investigation and Computational Theorizing", *Management Science*, 53(10), 2007, pp. 1645-1658.
- [14] Granovetter, M.S., "The Strength of Weak Ties", *American Journal of Sociology*, 1973, pp. 1360-1380.
- [15] Coleman, J.S., "Social Capital in the Creation of Human Capital", *American Journal of Sociology*, 1988, pp. 95-120.
- [16] Uzzi, B., "Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness", *Administrative science quarterly*, 1997, pp. 35-67.
- [17] Reagans, R., and Mcevily, B., "Network Structure and Knowledge Transfer: The Effects of Cohesion and Range", *Administrative science quarterly*, 48(2), 2003, pp. 240-267.
- [18] Uzzi, B., and Spiro, J., "Collaboration and Creativity: The Small World Problem", *American Journal of Sociology*, 111(2), 2005, pp. 447-504.
- [19] Paulus, P.B., and Nijstad, B.A., *Group Creativity: Innovation through Collaboration*, Oxford University Press, USA, 2003.
- [20] Amabile, T.M., Barsade, S.G., Mueller, J.S., and Staw, B.M., "Affect and Creativity at Work", *Administrative science quarterly*, 50(3), 2005, pp. 367.
- [21] Ahuja, G., "Collaboration Networks, Structural Holes, and Innovation: A Longitudinal Study", *Administrative science quarterly*, 45(3), 2000, pp. 425-455.
- [22] Burt, R.S., *Structural Holes: The Social Structure of Competition*, Harvard Univ Pr, 1995.
- [23] Zaheer, A., and Mcevily, B., "Bridging Ties: A Source of Firm Heterogeneity in Competitive Capabilities", *Strategic Management Journal*, 20(12), 1999, pp. 1133.
- [24] Reagans, R., and Zuckerman, E.W., "Networks, Diversity, and Productivity: The Social Capital of Corporate R&D Teams", *Organization Science*, 2001, pp. 502-517.
- [25] Uzzi, B., "The Sources and Consequences of Embeddedness for the Economic Performance of Organizations: The Network Effect", *American sociological review*, 1996, pp. 674-698.
- [26] Burt, R.S., "Structural Holes and Good Ideas", *American Journal of Sociology*, 110(2), 2004, pp. 349-399.
- [27] Hargadon, A., and Sutton, R.I., "Technology Brokering and Innovation in a Product Development Firm", *Administrative science quarterly*, 1997, pp. 716-749.
- [28] Tsai, W., "Knowledge Transfer in Intraorganizational Networks: Effects of Network Position and Absorptive Capacity on Business Unit Innovation and Performance", *Academy of Management journal*, 2001, pp. 996-1004.
- [29] Dhanaraj, C., Lyles, M.A., Steensma, H.K., and Tihanyi, L., "Managing Tacit and Explicit Knowledge Transfer in Ijvs: The Role of Relational Embeddedness and the Impact on Performance", *Journal of International Business Studies*, 35(5), 2004, pp. 428-442.
- [30] Hansen, M.T., "Knowledge Networks: Explaining Effective Knowledge Sharing in Multiunit Companies", *Organization Science*, 2002, pp. 232-248.
- [31] Uzzi, B., and Lancaster, R., "Relational Embeddedness and Learning: The Case of Bank Loan Managers and Their Clients", *Management Science*, 2003, pp. 383-399.
- [32] Jansen, J.J.P., Van Den Bosch, F.a.J., and Volberda, H.W., "Exploratory Innovation, Exploitative Innovation, and Performance: Effects of Organizational Antecedents and Environmental Moderators", *Management Science*, 2006, pp. 1661-1674.
- [33] Jaworski, B.J., and Kohli, A.K., "Market Orientation: Antecedents and Consequences", *The Journal of marketing*, 1993, pp. 53-70.
- [34] Atuahene-Gima, K., "The Effects of Centrifugal and Centripetal Forces on Product Development

- Speed and Quality: How Does Problem Solving Matter?", *The Academy of Management Journal*, 2003, pp. 359-373.
- [35] Mcfadyen, M.A., and Cannella Jr, A.A., "Social Capital and Knowledge Creation: Diminishing Returns of the Number and Strength of Exchange", *The Academy of Management Journal*, 2004, pp. 735-746.
- [36] Subramaniam, M., and Youndt, M.A., "The Influence of Intellectual Capital on the Types of Innovative Capabilities", *The Academy of Management Journal*, 2005, pp. 450-463.
- [37] Nahapiet, J., and Ghoshal, S., "Social Capital, Intellectual Capital, and the Organizational Advantage", *Academy of management review*, 1998, pp. 242-266.
- [38] Rowley, T., Behrens, D., and Krackhardt, D., "Redundant Governance Structures: An Analysis of Structural and Relational Embeddedness in the Steel and Semiconductor Industries", *Strategic Management Journal*, 21(3), 2000, pp. 369-386.
- [39] Dyer, J., and Nobeoka, K., "Creating and Managing a High Performance Knowledge-Sharing Network: The Toyota Case", 2002,
- [40] Powell, W.W., Koput, K.W., and Smith-Doerr, L., "Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology", *Administrative science quarterly*, 1996, pp. 116-145.
- [41] Mizuchi, M.S., "Similarity of Political Behavior among Large American Corporations", *American Journal of Sociology*, 1989, pp. 401-424.
- [42] Haunschild, P.R., "Interorganizational Imitation: The Impact of Interlocks on Corporate Acquisition Activity", *Administrative science quarterly*, 1993, pp. 564-592.
- [43] Gulati, R., "Social Structure and Alliance Formation Patterns: A Longitudinal Analysis", *Administrative science quarterly*, 1995, pp. 619-652.
- [44] Gulati, R., and Gargiulo, M., "Where Do Interorganizational Networks Come From? 1", *American Journal of Sociology*, 104(5), 1999, pp. 1439-1493.
- [45] Gulati, R., Nohria, N., and Zaheer, A., "Strategic Networks", *Strategische Unternehmensplanung—Strategische Unternehmensführung*, 2006, pp. 293-309.
- [46] Owen-Smith, J., and Powell, W.W., "Knowledge Networks as Channels and Conduits: The Effects of Spillovers in the Boston Biotechnology Community", *Organization Science*, 2004, pp. 5-21.
- [47] Leonard-Barton, D., "Interpersonal Communication Patterns among Swedish and Boston-Area Entrepreneurs", *Research Policy*, 13(2), 1984, pp. 101-114.
- [48] Teece, D.J., "Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy", *Research Policy*, 15(6), 1986, pp. 285-305.
- [49] Hippel, E., "Von (1988) the Sources of Innovation", New York, 1988,
- [50] Von Hippel, E., *Democratizing Innovation*, the MIT Press, 2005.
- [51] Csikszentmihalyi, M., *Creativity: Flow and the Psychology of Discovery and Invention*, Harper perennial, 1997.
- [52] Allen, T.J., "Managing the Flow of Technology: Technology Transfer and the Dissemination of Technological Information with the R&D Organization", 1977,
- [53] Nerkar, A., and Paruchuri, S., "Evolution of R&D Capabilities: The Role of Knowledge Networks within a Firm", *Management Science*, 2005, pp. 771-785.
- [54] Rodan, S., and Galunic, C., "More Than Network Structure: How Knowledge Heterogeneity Influences Managerial Performance and Innovativeness", *Strategic Management Journal*, 25(6), 2004, pp. 541-562.
- [55] Cohen, W.M., and Levinthal, D.A., "Absorptive Capacity: A New Perspective on Learning and Innovation", *Administrative science quarterly*, 1990, pp. 128-152.
- [56] Katz, R., and Allen, T.J., "Investigating the Not Invented Here (Nih) Syndrome: A Look at the Performance, Tenure, and Communication Patterns of 50 R & D Project Groups", *R&D Management*, 12(1), 1982, pp. 7-20.
- [57] Kogut, B., "The Network as Knowledge: Generative Rules and the Emergence of Structure", *Strategic Management Journal*, 21(3), 2000, pp. 405-425.
- [58] Zahra, S.A., and George, G., "Absorptive Capacity: A Review, Reconceptualization, and Extension", *Academy of management review*, 2002, pp. 185-203.
- [59] Lichtenthaler, U., "Absorptive Capacity, Environmental Turbulence, and the Complementarity of Organizational Learning Processes", *The Academy of Management Journal ARCHIVE*, 52(4), 2009, pp. 822-846.
- [60] Cummings, J.N., "Work Groups, Structural Diversity, and Knowledge Sharing in a Global Organization", *Management Science*, 2004, pp. 352-364.
- [61] Zahra, S.A., Ireland, R.D., and Hitt, M.A., "International Expansion by New Venture Firms: International Diversity, Mode of Market Entry, Technological Learning, and Performance", *Academy of Management journal*, 2000, pp. 925-950.

- [62] Tiwana, A., "Do Bridging Ties Complement Strong Ties? An Empirical Examination of Alliance Ambidexterity", *Strategic Management Journal*, 29(3), 2008, pp. 251-272
- [63] Carroll, G.R., and Teo, A.C., "On the Social Networks of Managers", *Academy of Management Journal*, 1996, pp. 421-440.
- [64] Hill, C.W.L., and Rothaermel, F.T., "The Performance of Incumbent Firms in the Face of Radical Technological Innovation", *Academy of Management Review*, 28(2), 2003, pp. 257-274.
- [65] Christensen, C.M., "The Innovator's Dilemma", When new Technologies Cause Great Firms to Fail. Harvard Business School Press, Boston, 1997, pp. 977(2010),
- [66] Leifer, R., *Radical Innovation: How Mature Companies Can Outsmart Upstarts*, Harvard Business Press, 2000.
- [67] Foster, R.N., and Kaplan, S., "Creative Destruction: Why Companies That Are Built to Last Underperform the Market and How to Successfully Transform Them. New York: Currency", in (Editor, 'ed.'eds.): *Book Creative Destruction: Why Companies That Are Built to Last Underperform the Market and How to Successfully Transform Them*. New York: Currency, Doubleday, 2001
- [68] Markides, C., "Strategic Innovation in Established Companies", *Sloan Management Review*, 39(Spring), 1998, pp. 31-42.
- [69] Michl, T., Gold, B., and Picot, A., "The Spin Along Approach: Ambidextrous Corporate Venturing Management", *International Journal of Entrepreneurship and Small Business*, 15(1), 2012, pp. 39-56.
- [70] Nadler, D., Tushman, M., and Nadler, M.B., *Competing by Design: The Power of Organizational Architecture*, Oxford University Press, USA, 1997.
- [71] Bradach, J.L., "Using the Plural Form in the Management of Restaurant Chains", *Administrative Science Quarterly*, 1997, pp. 276-303.
- [72] O'Reilly, C.A., and Tushman, M.L., "The Ambidextrous Organization", *Harvard Business Review*, 82(4), 2004, pp. 74-83.
- [73] Govindarajan, V., and Trimble, C., *Ten Rules for Strategic Innovators: From Idea to Execution*, Harvard Business Press, 2005.
- [74] Weick, K.E., *Making Sense of the Organization*, John Wiley Profession, 2000.
- [75] Benner, M.J., and Tushman, M.L., "Exploitation, Exploration, and Process Management: The Productivity Dilemma Revisited", *Academy of Management Review*, 28(2), 2003, pp. 238-256.
- [76] Burgelman, R.A., "Strategy as Vector and the Inertia of Coevolutionary Lock-In", *Administrative Science Quarterly*, 47(2), 2002, pp. 325-357.
- [77] Rothaermel, F.T., and Deeds, D.L., "Exploration and Exploitation Alliances in Biotechnology: A System of New Product Development", *Strategic Management Journal*, 25(3), 2004, pp. 201-221.
- [78] Adler, P.S., and Borys, B., "Two Types of Bureaucracy: Enabling and Coercive", *Administrative Science Quarterly*, 1996, pp. 61-89.
- [79] Hansen, M.T., and Von Oetinger, B., "Introducing T-Shaped Managers. Knowledge Management's Next Generation", *Harvard Business Review*, 79(3), 2001, pp. 106.
- [80] Jansen, J.J.P., Tempelaar, M.P., Van Den Bosch, F.a.J., and Volberda, H.W., "Structural Differentiation and Ambidexterity: The Mediating Role of Integration Mechanisms", *Organization Science*, 20(4), 2009, pp. 797-811.
- [81] Leonard-Barton, D. 1992. Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development. *Strategic Management Journal*, 13(S1): 111-125.
- [82] Freel, M. S. 2003. Sectoral patterns of small firm innovation, networking and proximity. *Research Policy*, 32(5): 751-770.
- [83] Rothwell, R. 1992. Successful Industrial Innovation: Critical Factors for the 1990s. *R&D Management*, 22(3): 221-240.
- [84] Vega-Jurado, J., Gutierrez-Gracia, A., & Fernandez-de-Lucio, I. 2009. Does External Knowledge Sourcing Matter for Innovation? Evidence from the Spanish Manufacturing Industry. *Industrial and Corporate Change*, 18(4): 637-670.
- [85] Cassiman, B., & Veugelers, R. 2006. In Search of Complementarity in Innovation Strategy: Internal R&D and External Knowledge Acquisition. *Management Science*, 52(1): 68-82.
- [86] Laursen, K., & Salter, A. 2006. Open for Innovation: the Role of Openness in Explaining Innovation Performance among U.K. Manufacturing Firms. *Strategic Management Journal*, 27(2): 131-150.
- [87] Abernathy, W. J. 1978. *The Productivity Dilemma. Roadblock to Innovation in the Automobile Industry*. Baltimore: Johns Hopkins U. P.
- [88] Walker, G., Kogut, B., & Shan, W. 1997. Social Capital, Structural Holes and the Formation of an Industry Network. *Organization Science*, 8(2): 109-125.
- [89] Gibson, C. B., & Birkinshaw, J. 2004. The Antecedents, Consequences, and Mediating Role of Organizational Ambidexterity. *Academy of Management Journal*, 47(2): 209-226.