

Ambidexterity in dyadic NPD relationships

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ABSTRACT

Prior research has suggested that organizational ambidexterity can ensure firms' long-term performance. Organizations are considered to be ambidextrous if they are able to exploit current products to create incremental innovations while simultaneously exploring new opportunities to engage in radical change. While there are various studies describing organizational solutions to achieve organizational ambidexterity, relatively little is known about the role of the individual rather than the firm to achieve organizational ambidexterity. With this current study, we seek to contribute to this literature of individual ambidexterity. We examine individual ambidexterity (i.e., an individual's ambidextrous orientation and experience) of two key actors in NPD projects, namely industrial designers and NPD project managers, and how these actors interact with each other during NPD projects. Based on prior literature, we develop a theoretical model and examine the relevance of this model by means of examining team cooperation within four NPD projects of a high tech multinational. Our findings suggest that the industrial designers and project managers involved in these projects have an ambidextrous orientation (tending towards both exploitative and explorative behavior), and most have experience in projects which can be described as ambidextrous. Our results also suggest that these actors are able to assess each other's individual's ambidexterity reasonably well and can cooperate well with each other. This, in turn, seems to have positive effects on project outcomes.

INTRODUCTION

Organizations are considered to be ambidextrous if they are able to exploit current products to create incremental innovations while simultaneously exploring new opportunities to engage in radical change (Andriopoulos and Lewis 2009). As suggested in prior research, organizational ambidexterity can create a context for successful new product development and ensure a firm's long-term performance (He and Wong 2004; Sheremata 2000). While there are various studies describing organizational solutions to achieve organizational ambidexterity (Gibson and Birkinshaw 2004; Gupta et al. 2006), relatively little is known about the role of the individual rather than the firm to achieve organizational ambidexterity. Studies that are available focus on top managers and their characteristics and strategies to achieve organizational ambidexterity (De Visser et al. 2011; Jansen et al. 2008; Mom et al. 2007, 2009). With this current study, we seek to contribute to this literature of individual

ambidexterity by focusing on two key actors within NPD projects: industrial designers and NPD project managers and the interaction between these two during a NPD project. We are particularly interested in this dyad because we assess that there may be substantial differences in their individual ambidexterity: while industrial designers may be more explorative in orientation, project managers may be more exploitative in orientation (Beverland 2005; Candi and Gemser 2010). We want to know whether industrial designers and NPD project managers indeed have differing ambidexterity characteristics and how they interact with each other during a NPD project. Moreover, we want to know to what extent their ambidexterity orientation and experience, their differences and interaction influence project outcomes.

In the next section we briefly summarize relevant literature on ambidexterity and provide our theoretical model. Subsequently we describe our method to collect empirical data and present the results from our case studies. Finally, we provide our conclusions, discuss the limitations of our research and give suggestions for future research.

THEORETICAL FRAMEWORK

Prior research has argued that firms must excel both at exploitative and exploratory innovation in order to prosper (Tushman and O'Reilly III 1996). However, the related knowledge management processes involve conflicts (March 1991). According to Atuahene-Gima (2005), exploitation refines and extends current knowledge, seeking greater efficiency to enable incremental innovation. Exploration, in contrast, involves the development of new knowledge, experimenting to foster the variation needed for radical innovation. Organizations are considered to be ambidextrous if they are able to exploit current products to create incremental innovations while simultaneously exploring new opportunities to engage in radical change (Andriopoulos and Lewis 2009). The simultaneous engagement in both processes can create a context for successful new product development (Sheremata 2000) and ensure a firm's long term performance (He and Wong 2004).

Extant literature stresses organizational solutions to achieve organizational ambidexterity. For example, organizations can create different departments for exploration and exploitation, or they can switch between periods of search and refinement (Gupta et al. 2006). Other studies claim that an environment should be created in which individuals can decide themselves how to divide their time between exploration and exploitation (Gibson and Birkinshaw 2004). Several aspects of an organizational culture may benefit organizational ambidexterity. For example, a company vision which emphasizes the benefits of exploitative and exploratory innovation and the synergies between them may aid organizational ambidexterity (Andriopoulos and Lewis 2009). Additionally, to manage the exploration-exploitation paradox, employees may also profit from a context that is disciplined, but at the same time provides workers with sufficient room to make their own decision (Gibson and Birkinshaw 2004). Jansen et al. (2006) add that an organizational culture where employees feel connected to each other helps to manage potential exploration-exploitation tensions. Less beneficial to organizational ambidexterity is a hierarchical culture (Jansen et al. 2006). Finally, firms' learning orientation enables organizations to achieve an ambidextrous orientation (Lin and McDonough III 2011). Learning about current and future customers and competitors, and disseminating this information throughout the organization helps firms to align the business to its current competences, while simultaneously building new ones (Atuahene-Gima 2005).

An emerging stream of literature emphasizes the role of the individual rather than the firm to explain organizational ambidexterity. Different authors have argued that top managers may have a large influence on firms' ambidextrous orientation because they set out the firms' strategic direction (Jansen et al. 2008; Smith and Tushman 2005; Tushman and O'Reilly III 1996). Prior research has shown that top management teams with a strong social culture, tight

connections and shared goals positively influence firms' ambidextrous orientation (Jansen et al. 2008; Jansen et al. 2009; Lubatkin 2006). In addition, Mom et al. (2009) state that ambidextrous top managers should be multi-taskers, they should be able to pursue conflicting goals and renew their existing knowledge and skills. De Visser et al. (2011) add that ambidextrous top managers combine an analytical and an intuitive cognitive style, which helps to enhance profits from both incremental and radical innovations. Moreover, internally and externally oriented leaders exploit their current competences while building new ones (Vidgen et al. 2011). Finally, managers who combine top down and bottom up knowledge flows are better at integrating the demands of exploration and exploitation (Mom et al. 2007).

Prior research thus suggests that characteristics of individual top managers and top management teams can influence ambidexterity at the organizational level (Jansen et al. 2008; Jansen et al. 2009; Lubatkin 2006). Less is known about whether lower level organizational members demonstrate ambidextrous behavior and how to optimize this behavior for an optimal degree of ambidexterity at the organizational level. Further, little is known about how dyads of actors influence ambidexterity at the organizational level. Initial attempts to investigate individual ambidexterity at lower levels than top management have been made by Gotsi et al. (2010) and Groysberg and Lee (2009). Gotsi et al. (2010) executed in-depth case studies to investigate how creative workers of product design consultancies can be stimulated to manage potential exploration – exploitation tensions. These authors propose that exploration and exploitation tasks should be temporally separated to help these individuals to manage the paradox. Additionally, highlighting their organization's dual identity (one that stresses exploration and exploitation tasks) is important to help them integrate the contradicting demands of both (Gotsi et al. 2010). Groysberg and Lee (2009) executed a large scale quantitative study concerning the performance of newly hired star security analysts in professional service firms. These authors found that employees that were hired to explore have both a short and long term drop in performance, while analysts that were hired to exploit suffer only shortly. According to these authors, analysts that were hired to exploit can build on a firm's current capabilities making it easier for them to effectively execute their job, as opposed to exploring analysts who need to build new capabilities for a firm on their own.

Research model

Figure 1 shows the research model that guides our study. The research model aims to explain performance on a project level rather than an organizational level. While studies on ambidexterity in general adopt an organizational perspective, it has also been observed that the simultaneous engagement in exploitative and explorative processes can create a fruitful context for successful new product development (Sheremata 2000). As noted earlier, we are interested in individual ambidexterity of two key actors in an NPD team: industrial designers and NPD project managers. The emphasis of our research lies at industrial designers' and NPD project managers' orientation at, and experience in, explorative/exploitative projects, and their impact on project performance.

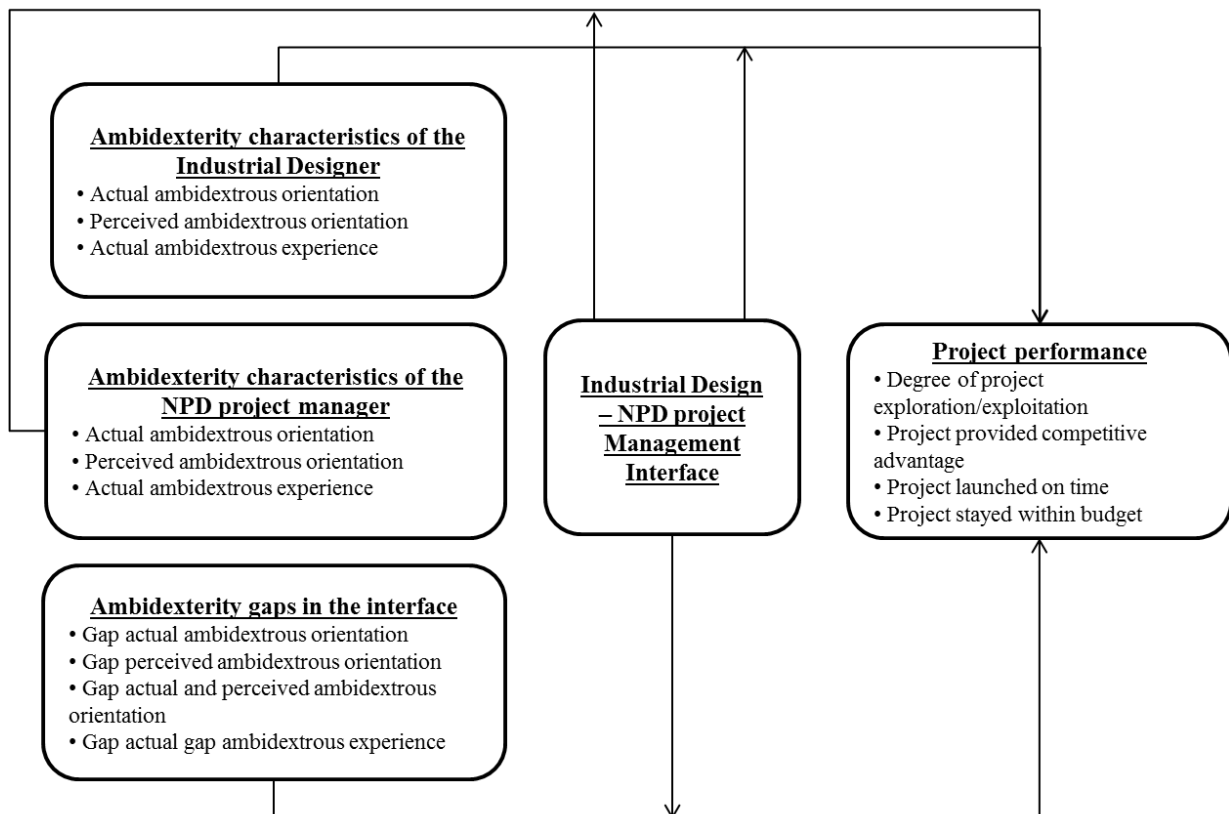


Figure 1. Research model

In this study, *ambidextrous orientation* is defined as individuals' intention to engage in radical or incremental innovation (cf. De Visser et al., 2011). We investigate not only an individuals' *actual* ambidexterity orientation but also an individual's *perceived* ambidexterity orientation. Actual ambidexterity orientation is the orientation as perceived by the individual herself, while perceived ambidexterity orientation is how the other actor in the dyad views the individual.

An individual's ambidextrous orientation (actual or perceived) may not represent an individual's past experience in explorative and exploitative projects due to the nature of assignments that an individual has worked on in the past. For example, while a designer may have a very explorative orientation, the assignments he has worked on in the recent past may be predominantly exploitative in nature. Therefore, in this study, we make an explicit distinction between ambidextrous orientation and ambidextrous experience. In this study, *ambidextrous experience* is defined as the degree to which an individual engaged in explorative and exploitative projects in the recent past (cf. Mom et al. 2007; 2009).

We assume that industrial designers and NPD project managers can differ in terms of their ambidextrous orientation and experience. The difference between these two is labeled as the 'ambidexterity gap' in the interface. We study four gaps in the interface:

- The actual ambidextrous orientation gap: difference between the designer's actual orientation and NPD project manager's actual orientation;
- The perceived ambidextrous orientation gap: difference between how the designer perceives the NPD project manager's orientation, and how the NPD project manager perceives the designer's orientation;

- The ambidextrous experience gap: difference between the designer’s experience and NPD project manager’s experience;
- The gap between an individual’s actual and perceived orientation: difference between the designer’s (NPD project manager’s) ambidextrous orientation, and his or her orientation as perceived by the NPD project manager (designer).

We also study the characteristics of the interface between the industrial designer and NPD project manager on project performance. We expect that the quality of the interface moderates the relationship between the designer (or project manager) and project performance. An interface that works well implies good collaboration and may positively affect the degree to which different types of knowledge from both parties are combined. As shown in prior research, to learn about the antecedents and consequences of explorative and exploitative innovation, paying attention to cross-functional interfaces is helpful (Jansen et al. 2009).

Finally, we include several indicators to measure different dimensions of project performance, namely the degree of project exploration/exploitation, competitive advantage achieved for the firm by introducing the new product and whether the project launched on time and within budget. With the degree of project exploration/exploitation, we intend to measure whether, from the point of view of the company, existing firm knowledge was refined or extended (exploitation of knowledge), or whether new knowledge was developed (exploration of knowledge). We are particularly interested in the determinants of specific trade-offs between the performance indicators. For example, what is the impact of a large ambidexterity orientation or experience gap between the designer and NPD manager on the on-time and on-budget measures versus the competitive advantage measures?

METHOD

To examine the relevance of relationships in our model, we collected empirical data from a high tech multinational organization. From now on, this organization will be called InfoConnect. InfoConnect delivers a variety of solutions in a business-to-business context, in a range of markets. Their solutions include products, services and product-service systems. InfoConnect invests in in-house R&D, employing over 2000 R&D staff, located worldwide. Considering that the company has a relatively large portfolio of products, services and PSS, and considering that the company in general works with multi-functional NPD teams, it was an ideal setting for collecting empirical data. We collected data on four new product or service development projects as launched on the market within the last 12 months. We focused on this time frame to reduce potential memory biases while still being able to assess (preliminary) project outcomes. Furthermore, we aimed to include projects that differed in terms of innovativeness (in relation to the other projects in the portfolio of InfoConnect). Four projects were chosen based on these criteria (see Table 1).

Project	Offering	Firm Innovativeness	Informants
GreenChoice	Product	High	Industrial Designer Project Manager
EffectiveMerge	Product	Average	Industrial Designer Function Manager
NextGen	Product	Low	Industrial Designer Function Manager
DocuShare	Service	High	Industrial Designer Project Manager

Table 1. Overview of cases

Scale	Examples of items	Number of questions	Sources
Ambidextrous orientation	My 'gut feeling' is just as good a basis to develop new offerings as careful analysis. I avoid engaging in development projects of which the odds are against market success. For me formal plans are more of a hindrance than a help when developing new offerings. For the NPD project manager, it is important that a new offering matches customers' current needs.	15	Allinson and Hayes (1996); Lubatkin (2006); Candi et al. (2010)
Ambidextrous experience	Offering X used radically different technology, compared to other offerings my firm had developed at that point in time. Offering X provided radically different functionality, compared to other offerings my firm had developed at that point in time. Offering X had a radically different appearance, compared to other offerings my firm had developed at that point in time.	7	Candi et al. (2010); Danneels and Kleinschmidt (2001)
Industrial design – NPI project management interface	In project X, the NPD project manager/designer and I had a friendly relationship. The NPD project manager/designer and I intentionally provided each other misleading information. The NPD project manager/designer and I searched for solutions that were agreeable to both of us.	13	Gemser et al. (2011); Leenders and Wierenga (2002)
Degree of project exploration/exploitation	Offering X used radically different technology, compared to other offerings my firm had developed at that point in time. Offering X provided radically different functionality, compared to other offerings my firm had developed at that point in time. Offering X had a radically different appearance, compared to other offerings my firm had developed at that point in time.	7	Candi et al. (2010); Danneels and Kleinschmidt (2001)
Project provided competitive advantage	Our client gained a considerable competitive advantage by means of offering X. When compared with competing offerings, offering X attained higher sales figures. When compared with competing offerings, the ergonomic quality of offering X was better.	9	Candi et al. (2010)
Project launched on time	The development of offering X took longer than expected. Offering X was developed more quickly than expected. The development of offering X adhered to the time schedule.	3	Bstieler (2005)
Project launched within budget	Offering X was more costly to develop than expected. The actual costs for offering X were lower than its estimated costs. Offering X stayed within the budget in terms of its projected costs.	3	Lewis et al. (2002)

Table 2. Questionnaire items

Data collection

Per sampled project, we have two informants: the industrial designer and the manager he or she collaborated with. Depending on the case, this can be a function manager or a project manager (see Table 1). At InfoConnect, a project manager, who is responsible that a particular project is delivered on time and within budget, manages a new product or service development project. Moreover, the project manager is head of the project committee, which makes the important decisions about an innovation project. The project committee itself consists of one project manager and different function managers and total system managers. The function managers are responsible for a particular functionality (e.g. a document management system, a hardware solution); the total system managers are responsible that the final solution in its totality (across functionalities) is reliable, fast, eco-friendly, etc. Both function managers and total system managers lead their own team of people who need to execute the assignment and who may be service developers, software engineers, mechanical engineers, and industrial designers. The tasks of the industrial designers include a wide range of activities: interaction design, product design but also graphic design and packaging design. Data was collected by means of structured questionnaires. The scales in the questionnaire were all adopted or adapted from prior research (see Table 2). These questionnaires were administrated in a face-to-face manner

Data analysis

Our analysis focused on getting insights on dyads of actors. We study the industrial designer in relation to the project manager and other relevant NPD managers he or she collaborates with. We wanted to gain insight in how individuals' ambidextrous orientation, experience and gaps and the collaboration between them relate to project outcomes. Mean scores on the different scales can be found in the Tables 3 to 6. To calculate the actors' ambidextrous orientation we combined the scales for explorative and exploitative orientation. We follow De Visser et al. (2011) and we subtract the mean exploitation items from the mean score of the exploitation items. In this way, an individual that has a preference for exploration will have a positive score (max: 6) and an individual who engages in exploitation will have a negative score (max: -6). A respondent with an ambidextrous orientation has a neutral score (0). Consequently, the ambidextrous orientation gaps have a maximum value of 12 and a minimum value of 0. Appendix 1 presents additional information about the respondents' (actual and perceived) explorative and exploitative orientation. The scores for ambidextrous experience were constructed by looking at two most recent projects the respondents completed (we added an overview with additional information about both projects in Appendix 1). Only two projects were studied because InfoConnect's project last two to three years in general: we decided that studying older projects would result in biased answers. A score of 7 on ambidextrous experience indicates that the two project the respondent participated in were both explorative, while a 1 indicated that they were both exploitative. A score of 4 indicated that a respondent has experience in both explorative and exploitative projects, or that the projects he or she participated in were neither very explorative, nor exploitative.

Case	Degree of project exploration / exploitation	Project provided competitive advantage	Project launched on time	Project launched within budget
GreenChoice	3.71	5.78	1.00	1.33
EffectivMerge	2.43	5.33	4.00	4.00
NextGen	3.29	3.56	3.33	5.00
DocuShare	5.43	5.80*	6.33	5.00

Table 3. Project outcomes

* Several answers missing

Case	Actor	Quality interface
GreenChoice	Industrial Designer	6.15
	Project Manager	6.77
EffectivMerge	Industrial Designer	6.08
	Function Manager	6.38
NextGen	Industrial Designer	5.69
	Function Manager	5.92
DocuShare	Industrial Designer	5.62
	Project Manager	6.92

Table 4. Quality of the interface

Case	Actor	Actual ambidextrous orientation	Perceived ambidextrous orientation	Ambidextrous experience
GreenChoice	Industrial Designer	0.67	0.67	3.29
	Project Manager	-0.78	-0.78	0.00
EffectivMerge	Industrial Designer	0.78	0.39	3.50
	Function Manager	-0.61	-1.11	1.00
NextGen	Industrial Designer	0.11	-0.28	4.00
	Function Manager	-0.39	-1.56	4.07
DocuShare	Industrial Designer	0.78	0.72	1.79
	Project Manager	-1.44	-1.17	0.00

Table 5. Ambidextrous orientation and experience

Case	Actor	Actual – perceived orientation gap	Actual orientation gap	Perceived orientation gap	Experience gap
GreenChoice	Industrial Designer	0.00	1.45	1.45	3.29
	Project Manager	0.00			
EffectivMerge	Industrial Designer	0.39	1.39	1.50	2.50
	Function Manager	0.50			
NextGen	Industrial Designer	0.39	0.50	1.28	0.07
	Function Manager	1.17			
DocuShare	Industrial Designer	0.06	2.22	1.89	1.79
	Project Manager	0.27			

Table 6. Ambidexterity gaps in the interface

RESULTS

The results are summarized in Tables 3 to 6. These tables are used for the analysis of the individual cases which is presented next.

GreenChoice

In GreenChoice an eco-friendly hard- and software solution to manage and share information was developed. This solution was somewhat exploitative (a score of 3.71 on a scale from 1 to 7). InfoConnect gained competitive advantage by developing GreenChoice (a score of 5.78 on a scale from 1 to 7). However, the project was not developed on time and within budget (a score of 1.00 and 1.33 on a scale from 1 to 7), but this was due to influences external to the NPD team.

The industrial design and project manager working in this NPD team have similar scores with regards to their ambidextrous orientation. The industrial designer had an ambidextrous orientation that was slightly explorative (0.67 on a scale from -6 to 6). The project manager that worked on this innovation had an ambidextrous orientation of -0.78 (on a scale from -6 to 6). Thus, this actor is somewhat oriented towards exploitation. There were no substantial gaps between the orientation of these actors. Thus, the actors did not differ very much in terms of their ambidextrous orientation.

Looking at the ambidextrous experience of the actors, we see that the scores of the project manager are missing because he did not, for the past 6 years manage an NPD project but instead, was involved in general managerial roles. The industrial designer completed one exploitative project, while the other was neither very explorative, nor exploitative to InfoConnect. In terms of experience, the industrial designer has a score of 3.29 on a scale from 1 to 7.

The collaboration between the industrial designer and manager went well: the collaboration in GreenChoice was scored with a 6.15 (designer) and 6.77 (manager) on a scale from 1 to 7.

EffectivMerge

In EffectivMerge, the focus was on the integration of a highly effective hardware solution to share information and a user-friendly software solution to manage it into one product. The outcome of this project was exploitative to InfoConnect (a score of 2.43 on a scale from 1 to 7). Additionally, EffectivMerge provided competitive advantage to the firm (a score of 5.33 on a scale from 1 to 7). The project performed sufficiently on the on time and on budget measures (scores of 4.00 on both items).

The industrial designer and function manager working in this NPD team were pleased with the working relationship in EffectivMerge (scores of 6.08 and 6.38 on a scale from 1 to 7). These actors have similar (actual and perceived) ambidextrous orientations, even though both have slight preferences to either exploration or exploitation. The industrial designer that worked on EffectivMerge has an actual ambidextrous orientation which is slightly explorative, and he is perceived as such as well by the manager (a score of 0.78 and 0.39 respectively, on a scale from -6 to 6). The function manager is exploitative, and the designer also considers him as such (-0.61 to -1.11 on a scale from -6 to 6). The gaps between these individuals' actual and perceived orientations are not larger than 0.50. Thus, the actors are perceived as explorative/exploitative as they are in on the basis of their own responses. Moreover, the gap between the actual ambidextrous orientations of the actors, and their perceived ambidextrous orientation are not larger than 1.50 (on a scale from 0 to 12). Thus, there are no very large differences between the orientations of the industrial designer and function manager.

The industrial designer completed one exploitative project and one which was neither very explorative nor exploitative to InfoConnect, while the function manager completed two exploitative projects. In terms of ambidextrous experience, the industrial designer has a score of 3.50 (on a scale from 1 to 7) and the function manager has a score of 1.00. The gap between the experience of the actors is 2.50 (on a scale from 0 to 12).

NextGen

NextGen is a project in which a new version of a current product of InfoConnect was developed. NextGen provided users with a more effective way to share and manage information, and a feature to do this by means of a mobile platform. This outcome was exploitative to InfoConnect (score of 3.29 on a scale from 1 to 7). Moreover, InfoConnect gained some competitive by means of this project, but their advantage over competitors was not extensive (a score of 3.56 on a scale from 1 to 7). The project was slightly delayed (a score of 3.33 on a scale from 1 to 7), while the budget was adhered to (a score of 5.00 on a scale from 1 to 7).

The industrial designer and function manager were content with their working relationship in NextGen (scores of 5.69 and 5.92 on a scale from 1 to 7). The industrial designer that worked on NextGen has an actual orientation that is explorative, while she is perceived as somewhat exploitative by the function manager (scores of 0.11 and -0.28 on a scale from -6 to 6 respectively). The function manager was exploitative in reality and is also perceived as such (scores of -0.39 and -1.56 on a scale from -6 to 6). The gap between the actual and perceived ambidextrous orientation of the industrial designer was not large (0.39 on a scale from 0 to 12). The gap between the actual and perceived orientation gap of the function manager is 1.17 (on a scale from 0 to 12). This individual is perceived as slightly more exploitative than he is in reality. The gap between the actual ambidextrous orientations of the industrial designer and the function manager is 0.50 (on a scale from 0 to 12), while the gap between their perceived ambidextrous orientation is 1.28. Thus, these individuals have a similar actual ambidextrous orientation and the difference between their perceived ambidextrous orientation is also small.

The past projects the industrial designer and function manager completed were neither very explorative, nor exploitative to InfoConnect. Therefore, in terms of ambidextrous experience, the industrial designer has a score of 4.00 and the function manager has a score of 4.07 (on a scale from 1 to 7). The gap between the actors' ambidextrous experience is small (0.07 on a scale from 0 to 6).

DocuShare

In DocuShare a web-based service to share and manage information was developed. The end result was explorative to InfoConnect (a score of 5.43 on a scale from 1 to 7) and helped InfoConnect to gain competitive advantage (a score of 5.80 on a scale from 1 to 7). The project was completed within time and budget (scores of 6.33 and 5.00 respectively, on a scale from 1 to 7).

The industrial designer and project manager were content with their collaboration (scores of 5.62 and 6.92 respectively on a scale from 1 to 7). Both actors also have similar (actual and perceived) ambidextrous orientations: there are some differences but both can be called ambidextrous. The industrial designer who worked on GreenChoice had an actual and perceived ambidextrous orientation which was slightly explorative (0.78 and 0.72 respectively, on a scale from -6 to 6), while the project manager has an actual and perceived ambidextrous orientation which is exploitative (scores of -1.44 and -1.17 respectively, on a scale from -6 to 6). The gaps between the actors' actual and perceived ambidextrous orientation were small (0.06 and 0.27 respectively, on a scale from 0 to 12). Thus, the

industrial designer and project manager were perceived by their counterpart to be as explorative/exploitative as they are on the basis of their own responses. The gap between the actual ambidextrous orientations, and the perceived ambidextrous orientations of the actors were not very large either (2.22 and 1.89 respectively, on a scale from 0 to 12). Thus, the industrial designer and project manager have similar ambidextrous orientations, and they perceived each other as having the same interests as well.

The ambidextrous experience of the project manager is missing. This individual usually works as a marketing manager and he has no prior experience in managing NPD projects. Based on the two most recent projects the industrial designer completed, this individual is inclined to engage in projects which are mostly exploitative to InfoConnect (score of 1.79 on a scale from 1 to 7).

DISCUSSION

Our research aims to gain insights about individual ambidexterity and dyads of NPD team members. We wanted to know to what extent key NPD team members can be called ambidextrous, and how their ambidexterity characteristics (ambidextrous orientation, ambidextrous experience and the ambidextrous gaps) and their collaboration relate to innovation outcomes.

Our results suggest that the designers and managers of InfoConnect we interviewed seem to have a similar ambidextrous orientation, integrating both explorative and exploitative goals. However, designers tend to be slightly more exploration oriented and NPD managers slightly more exploitation oriented. This seems logical: designers' main tasks are to develop new ideas and concepts while the main tasks of project managers are to make sure a project is finished within time and budget. Nonetheless, the difference between these two actors is far less than expected. In addition, there were only small differences between the actors' actual and perceived ambidextrous orientation, meaning that the respondents were perceived as explorative/exploitative as they are according to themselves. This may be because the respondents were all employees from the same firm. Furthermore, some of the actors in the dyad already collaborated with each other in earlier projects. Thus, most probably, these individuals could easily estimate each other's ambidextrous orientation. Beckman (2006) states that team members who know each other and work at the same company have shared understandings. Our respondents indeed seem to understand each other's interests, but they also indicated that they often approach a problem in a different way than the managers (designers) they collaborate with.

Andriopoulos and Lewis (2009) argue that ambidexterity at the individual level should help firms to become ambidextrous at the project level as well. We see that our findings are in line with this assumption: our ambidextrous respondents delivered projects that can be described as ambidextrous too: the projects built on existing knowledge but also created new knowledge.

LIMITATIONS AND FUTURE RESEARCH

We studied only four NPD projects within one firm. This provided us some insight into the validity of our concepts, but to test our model a much larger number of NPD projects within different companies should be studied. Moreover, we focused on studying the relationship between in-house designers and in-house project managers. It would however be interesting to study inter-organizational dyads. Actors in inter-organizational dyads do not share the same organizational culture and most probably, they do not collaborate with each other on a regular basis. Product designers that work at design consultancies and are hired by external clients to participate in NPD projects are particularly interesting to study. To what extent can these external designers be called ambidextrous, and to what extent does their actual or perceived

ambidextrous orientation and experience differ from that of the project managers they collaborate with? Moreover, to what extent do the differences or similarities between these actors result in different kinds of NPD outcomes?

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REFERENCES

- Allinson, C.W., J. Hayes. 1996. The cognitive style index: a measure of intuition-analysis for organizational research. *Journal of Management Studies* **33**(1) 119-135.
- Andriopoulos, C., M.W. Lewis. 2009. Exploitation-Exploration Tensions and Organizational Ambidexterity: Managing Paradoxes of Innovation. *Organization Science* **20**(4) 696-717.
- Atuahene-Gima, K. 2005. Resolving the Capability - Rigidity Paradox in New Product Innovation. *The Journal of Marketing* **69**(4) 61-83.
- Beckman, C.M. 2006. The influence of founding team company affiliations on firm behavior. *Academy of Management Journal* **49**(4) 741-758.
- Beverland, M.B. 2005. Managing the Design Innovation-Brand Marketing Interface: Resolving the Tension between Artistic Creation and Commercial Imperatives*. *Journal of Product Innovation Management* **22**(2) 193-207.
- Bstieler, L. 2005. The moderating effect of environmental uncertainty on new product development and time efficiency *Journal of Product Innovation Management* **22**(3) 267-284.
- Candi, M., G. Gemser. 2010. An agenda for research on the relationships between industrial design and performance. *International journal of design* **4**(3) 67-77.
- Candi, M., G. Gemser, J. Van den Ende. 2010. Design effectiveness: industry report. Rotterdam School of Management, Rotterdam, The Netherlands.
- Danneels, E. 2002. The dynamics of product innovation and firm competences. *Strat. Mgmt. J.* **23**(12) 1095-1121.
- Danneels, E., E.J. Kleinschmidt. 2001. Product innovativeness from the firm's perspective: its dimensions and their relation with project selection and performance. *Journal of Product Innovation Management* **18**(6) 357-373.
- De Visser, M., D. Faems, P. Van den Top. 2011. Exploration and exploitation within SMES: connecting the CEO's cognitive style to product innovation performance *The 18th International Product Development Management Conference* European Institute for Advanced Studies in Management (EIASM), Delft, The Netherlands.
- Gemser, G., M. Candi, J. Van den Ende. 2011. Designer Involvement in the idea phase of NPD and innovativeness *The 18th international Development Management Conference*. European Institute for Advanced Studies in Management (EIASM), Delft, The Netherlands.
- Gibson, C., J. Birkinshaw. 2004. The Antecedents, Consequences, and Mediating Role of Organizational Ambidexterity. *The Academy of Management Journal* **47**(2) 209-226.
- Gotsi, M., C. Andriopoulos, M.W. Lewis, A. Ingram, E. 2010. Managing creatives: paradoxical approaches to identity regulation. *Human relations* **63**(6) 781 - 805.
- Groysberg, B., L.-E. Lee. 2009. Hiring Stars and Their Colleagues: Exploration and Exploitation in Professional Service Firms. *Organization science* **20**(4) 740-758.
- Gupta, A.K., K.G. Smith, C.E. Shalley. 2006. The interplay Between Exploration and Exploitation. *Academy of management journal* **49**(4) 693-706.
- He, Z.-L., P.-K. Wong. 2004. Exploration vs. Exploitation: An Empirical Test of the Ambidexterity Hypothesis. *Organization Science* **15**(4) 481-494.
- Jansen, J.J.P., F.A.J.V.D. Bosch, H.W. Volberda. 2006. Exploratory Innovation, Exploitative Innovation, and Performance: Effects of Organizational Antecedents and Environmental Moderators. *Management Science* **52**(11) 1661-1674.
- Jansen, J.J.P., G. George, F.A.J. Van den Bosch, H.W. Volberda. 2008. Senior Team Attributes and Organizational Ambidexterity: The Moderating Role of Transformational Leadership. *Journal of Management Studies* **45**(5) 982-1007.

- Jansen, J.J.P., M.P. Tempelaar, F.A.J.v.d. Bosch, H.W. Volberda. 2009. Structural Differentiation and Ambidexterity: The Mediating Role of Integration Mechanisms. *Organization Science* **20**(4) 797-811.
- Leenders, M.A.A.M., B. Wierenga. 2002. The effectiveness of different mechanisms for integrating marketing and R&D. *The Journal of Product Innovation Management* **19**(4) 305-317.
- Lewis, M.W., A.M. Welsh, G.E. Dehler, S.G. Green. 2002. Product development tensions: exploring contrasting styles of project management. *Academy of management journal* **45**(3) 546-564.
- Lin, H., E.F. McDonough III. 2011. Investigation the role of leadership and organizational culture in fostering innovation ambidexterity. *IEEE Transactions on Engineering Management* **58**(3) 497 - 509.
- Lubatkin, M.H., Simsek, Z., Ling, Y., Veiga, J. F. 2006. Ambidexterity and performance in small-to medium-sized firms: the pivotal role of top management team behavior integration. *Journal of Management* **32**(5) 646 - 672.
- March, J.G. 1991. Exploration and Exploitation in Organizational learning. *Organizational Science* **2**(1) 71-87.
- 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 Flows. *Journal of Management Studies* **44**(6) 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* **20**(4).
- Sheremata, W.A. 2000. Centrifugal and Centripetal Forces in Radical New Product Development under Time Pressure. *The Academy of Management Review* **25**(2) 389-408.
- Smith, W.K., M.L. Tushman. 2005. Managing Strategic Contradictions: A Top Management Model for Managing Innovation Streams. *Organization Science* **16**(5) 522 - 536.
- Tushman, M., C.A. O'Reilly III. 1996. Ambidextrous Organizations: Managing Evolutionary and evolutionary Change. *California Management Review* **38**(4) 8-30.
- Vidgen, R., P. Allen, P. Finnegan. 2011. Towards 'Open' IS Managers: An Exploration of Individual-Level Connectedness, Ambidexterity, and Performance *2011 44th Hawaii International Conference on System Sciences (HICSS)*, 1-10.

APPENDIX 1

Case	Actor	Actual exploitative orientation	Actual explorativ e orientatio n	Perceived exploitativ e orientation	Perceived explorative orientation
GreenChoice	Industrial Designer	5.00	5.67	5.00	5.67
	Project Manager	5.67	4.89	4.00	3.22
EffectivMerge	Industrial Designer	3.67	4.44	4.83	5.22
	Function Manager	4.83	4.22	4.00	2.89
NextGen	Industrial Designer	5.33	5.44	5.50	5.22
	Function Manager	5.50	5.11	4.33	2.78
DocuShare	Industrial Designer	4.33	5.11	4.17	4.89
	Project Manager	5.00	3.56	5.17	4.00

Table 7. Actual and perceived explorative/exploitative orientation

Case	Actor	Degree of project exploration/exploitation for project 1	Degree of project exploration/exploitation for project 2
GreenChoice	Industrial Designer	4.57	2.00
	Project Manager	0.00	0.00
EffectivMerge	Industrial Designer	2.86	4.14
	Function Manager	1.00	1.00
NextGen	Industrial Designer	3.43	4.57
	Function Manager	4.86	3.29
DocuShare	Industrial Designer	2.14	1.43
	Project Manager	0.00	0.00

Table 8. The respondents' two most recently completed projects