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Supporting organizational agility in a software company through boundary spanning and knowledge brokering

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Keywords
spanning, knowledge, brokering, agility, organizational, software, supporting, company, boundary

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Supporting Organizational Agility in a Software Company through Boundary Spanning and Knowledge Brokering

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Abstract

We demonstrate how boundary spanning and knowledge brokering as a dual approach support the organizational agility of a software development company. We present the case of an organizational unit whose members engage in both activities within as well as between the company and its environment. We analyze the team’s and its members’ approach and identify well functioning practices as well as challenges and problems and contribute to an improved understanding of an intertwined strategy of boundary spanning and knowledge brokering to provide a balancing mechanism between flexibility and stability, which characterize organizational agility to effectively respond to changes in the environment while simultaneously being efficient and productive.

Keywords: Organizational Agility in ISD, Boundary Spanning, Knowledge Brokering.

1. Introduction

Increasingly, information systems (IS) development and software development take place in dynamic and constantly changing situations as well as environments with rising complexity [27]. This underscores the need of IS development and software development companies to become more agile [12,21]. Organizational agility, also called enterprise or business agility, is the ability to be flexible enough to speedily respond to customer requests, market dynamics, emerging technology options, and to adapt to a turbulent environment [19,26]. It also means to be stable enough to show patterns and to have efficient processes, and sufficient frameworks and structure to avoid disorderly disintegration and to be productive [19].

Organizational research on environmental turbulence has suggested that one important mechanism to cope with increasing complexity is boundary spanning [1,2] to manage interfaces at the organizational boundaries between the organization and its environment [28,29] as well as between organizational units [2,16,17]. Beyond boundary spanning at organizational unit boundaries, knowledge brokering is important for facilitating knowledge sharing [5,22,23]. It takes place at knowledge boundaries between diverse occupational groups or different communities of practice. These groups of people are bound together by a collective understanding of what their community is about, as well as a shared repertoire of resources [31]. Although the concepts of boundary spanning and knowledge brokering are similar, the concepts remain theoretically distinct and describe different types of interaction [9]. They have not been investigated together in much detail, except for open innovation communities [9]. The current role and interplay of both for ensuring organizational agility in the software industry by balancing flexibility and stability is unclear. Therefore, we address the following research question: “How and why do boundary spanning and knowledge brokering enable organizational agility in the software industry?”

In this paper, we report from the results of an extensive field study. We explore the role of boundary spanning and knowledge brokering for balancing between stability and flexibility
within a medium-sized software development company. We present the example of an organizational unit whose members engage in both knowledge brokering and boundary spanning between the company and its environment as well as within the company, and we analyze the team’s and its members’ approach. We identify well functioning activities and practices as well as challenges and problems. As such we contribute to an improved understanding of an intertwined strategy of boundary spanning and knowledge brokering to provide a balancing mechanism between flexibility and stability. The remainder of the paper is structured as follows. The next section discusses the related work and theoretical background of our study, introducing the concepts of boundary spanning and knowledge brokering in more depth. We then present results from the exploratory study of a specialized unit within a software development company and develop an explanation of how this unit engages into boundary spanning and knowledge brokering, balancing flexibility and stability. We summarize and discuss our findings, and conclude with an indication of limitations and an outlook on further research.

2. Related Work and Theoretical Background

2.1. Boundary Spanning and Boundary Spanners

One critical implication of today's business context and the changing emphasis on organizational agility is the importance of teamwork and cross-boundary collaborations, not simply inside a firm but importantly across organizational boundaries [24]. If increased collaboration between organizational units and between firms is a primary route to organizational agility, boundary spanning becomes of growing interest. Research indicates that boundary spanning may help to manage the trade-off between flexibility and stability [13].

Research on boundary spanning has a rich conceptual and empirical history within the organizational learning and social psychology domain [2,3,4,28]. Seminal studies in organization theory on research and development projects [28,29] found that communication with the external environment under turbulent environmental conditions is not distributed evenly in teams but takes place through a limited set of individuals. These boundary spanning individuals link their subunits to external areas and serve to buffer their more locally oriented colleagues from environmental turbulence. These studies also show that high performing teams facing changing environments had significantly more boundary spanning individuals than did high performing teams facing stable environments. Accordingly, boundary spanners are individuals who are part of one organizational entity and who engage in boundary spanning activities towards other organizational entities than their own [2]. Boundary spanning takes place at organizational boundaries and comprises external boundary spanning between a firm or organization and its environment as well as internal boundary spanning between different organizational units within the same firm or organization [2,16,17]. Ancona and Caldwell [2,3] identified and summarized specific boundary spanning activities such as ambassadoring, coordinating tasks, scouting, and guarding, which they discovered in their studies of new product development teams:

- **Ambassadoring** covers buffering activities (e.g., absorbing pressures and protecting the team) and representational activities (e.g., persuading others to support the team or keeping higher levels informed of team activities). These activities contain both protective and persuasive goals such as obtaining the personnel, funding, equipment, and legitimacy from management. **Task coordination** consists of interactions aimed at coordinating technical or design issues (e.g., discussing design problems with others, obtaining feedback on the product design, coordinating and negotiating with outsiders). **Scouting** involves general scanning for ideas and information about the competition, the market, or the technology (e.g., more general scanning than task coordination). Both task coordination and scouting manage the dependence on other functions or groups that have critical information, expertise, and creative ideas. Finally, **guarding** comprises controlling the team’s release of information (e.g., activities
aimed at keeping information within the team’s boundaries in order to protect the team or present a specific image of the team to outsiders).

Boundary spanning thus includes political manoeuvring, management, and coordination as well as knowledge sharing activities [3], which goes beyond Fleming and Waguespack’s [9] view, who see boundary spanning as primarily bridging technological boundaries. Studies on boundary spanning in IS development projects [10,11,21] confirm these results.

2.2. **Knowledge Brokering and Knowledge Brokers**

The knowledge that is required for the design of software and IS resides with different stakeholders [8], thus knowledge sharing, the process through which knowledge is exchanged among stakeholders [5,6], is an integral part of software and IS development. Research and theories of situated learning in communities of practice [7,30] have coined the concept of knowledge brokering to explain and focus on knowledge sharing within organizations.

Knowledge brokering refers to activities of individuals who participate in multiple communities and facilitate the transfer of knowledge across the communities’ knowledge boundaries [9,22,23]. Knowledge brokers may be weakly linked to several communities at once, but not be a full member of any [19,22]. Pawlowski and Robey [22] and Pawlowski et al. [23] identified and summarized specific knowledge brokering activities, which they discovered in their studies of IT professionals. These are crossing boundaries, surfacing and challenging assumptions, translating and interpreting information, as well as relinquishing ownership and maintaining a facade of objectivity.

**Crossing boundaries** involves not just crossing knowledge boundaries or social boundaries, which Fleming und Waguespack [9] see as the primary boundaries that brokers are crossing, but also crossing organizational boundaries between units to share information, and to leverage resources. It also includes the effort of gaining permission from business units to cross organizational boundaries that are closed to others. **Surfacing and challenging assumptions** comprises stimulating reflection and change. **Translating and interpreting information** involves the framing of elements of the world-view of one group in terms of the perspective of another. **Relinquishing ownership and maintaining a facade of objectivity** includes the creation of the illusion that one is impartial and prepared to support any solution, even though a particular one is favored. Primarily, however, knowledge brokering focuses on knowledge sharing and processes of translation, coordination, and alignment between perspectives [30].

We have identified differences between knowledge brokering and boundary spanning. But the concepts are related at least with regard to knowledge sharing across boundaries. Fleming and Waguespack [9] argue that knowledge brokers can span boundaries, but not all boundary spanners are knowledge brokers. Some authors, however, provide conceptually rather unclear definitions and distinctions. Wenger [31], for example, states that knowledge brokering can take many forms, including what he calls roaming as “going from place to place, creating connections, moving knowledge”, and more explicitly boundary spanning as “taking care of one specific boundary over time”. Pawlowski and Robey [22] put forward that “it is likely that brokers perform an amalgam of roles, including those of scout and ambassador”, which are usually attributed to boundary spanners. Fleming and Waguespack [9] also propose that knowledge brokering and boundary spanning may correlate strongly in commercial companies because firm boundaries are more formal, longer lived, and may support the transformation and hardening of technological, unit boundaries into social, knowledge boundaries. However, in line with Fleming and Waguespack [9], who likewise highlight that both concepts are theoretically distinct, we treat them as distinct for analytical purposes.

Based on Ancona and Caldwell’s [2,3] categorization of boundary spanning activities and Pawlowski and Robey’s [22] classification of knowledge brokering activities, in the following we study knowledge brokering and boundary spanning together, but analyze them separately as they occur simultaneously in a specific organizational unit as a dual strategy to support the organizational agility of the software development company under investigation.
3. Research Design and Method

We conducted an single in-depth case study [32] to develop an understanding and theoretical explanation of how boundary spanning and knowledge brokering together enable organizational agility in the software industry. The case organization is a medium-sized German software solutions provider called SoftCorp (anonymized) that has recently undergone a transformation towards a more agile and flexible organization. The company is doing well in its dynamic environment. Over the last three years, the number of sold licenses has increased by 80%, and the numbers of acquired major customers as well as customer satisfaction have steadily risen; the fiscal year 2012 was the most profitable one in the company history according to the annual report, despite a time of prolonged economic downturn in Europe and the Euro zone. The selected case organization represents the main unit of analysis, but the individual departments, groups, and employees each represent analytical subunits, which allows for a multi-level analysis as called for by Marrone et al. [18] and is in line with multi-perspective innovation studies (cf. [14] for a detailed argument).

The two main methods for data collection were interviews and observation. During a period of 9 months (Oct. 2011 until Jun. 2012), we visited the company three times for one to three days at each visit. We conducted 9 open interviews with selected key informants (4 leaders Product Management Team, 1 developer Product Management Team, 1 manager Product Management Team, 1 Professional Services consultant, 1 manager Professional Services, 1 CEO, 1 manager Marketing), 8 group interviews (3x Product Management Team, 1x apprentices Product Management Team, 1x manager and leader Product Management Team, 1x lead developer and manager Core Development, 1x manager Product Management & Professional Services consultant), and observations of activities (1 Retrospective, 1 Review Meeting, Daily Stand-up Meetings on 3 days). We also reviewed various product and internal company documents. All interviews, which lasted from 30 to 120 minutes, and meetings were audio-recorded as well as transcribed. We followed a two-stage process of inductive and deductive coding of data [20]. First, both authors scrutinized and coded the data independently of each other. Based on previous work on boundary spanning [2,3] and on knowledge brokering [22,23] we started with initial seed codes for the identified activities and searched for evidence of knowledge brokering and boundary spanning in relation to organizational agility. Subsequently, both authors discussed their interpretations in person or using e-mail and teleconferencing. This resulted in the following analysis.

4. Case Report and Analysis

4.1. Software Development at SoftCorp

SoftCorp is a German software development company, founded in 1999 and now a subsidiary company of an exchange-traded IT service provider. SoftCorp employs around 70 staff at its headquarters, with about 90 employees in total and sales offices across Europe and the US. The core software product of SoftCorp is a content management system (CMS). Numerous companies from many industries worldwide use the CMS for managing their Internet presences as well as their intranet portals. Professionals from SoftCorp or selected partner companies provide consultancy and project services such as implementation, tailoring, or configuration of the CMS to end customers. SoftCorp’s strategy as regards the CMS is product-driven following an own product vision. It is not customer-driven following customer requests or market trends. As a result, SoftCorp focuses on the development of a stable software core that is compatible between release versions. End customers have to run their own development projects, possibly supported by professionals from SoftCorp or partner companies, for customer-specific extensions of the CMS’ core features. Such projects can range from simple extensions, so-called “modules”, to complex web application projects. For

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1 See next section for the company’s organizational structure
example, modules allow the application of e-mail marketing, the display of content on mobile devices, or the integration with enterprise application servers. Most of the time, these extensions are later not integrated into the core features of the CMS.

In SoftCorp’s organizational structure consulting services and support for Internet and intranet projects of end customers are provided by consultants and project managers from the “Professional Services” unit (31 employees). The unit “Research & Development” (21 employees) is responsible for developing and maintaining the CMS as the core product. This is done exclusively by the so-called “core development team” at SoftCorp’s headquarter (eight developers plus one manager). The core development team continuously develops and advances the CMS. In general, a release cycle takes several months, resulting in a gap between major releases of several years (e.g., version 4 in 2007 and version 5 in 2012). The development process follows a mixture of practices from traditional software engineering (e.g., variants of stage-gate models) and modern approaches (e.g., time boxing). The strategy to shield the core development team from outside pressure, developing the core product in a sustainable and stable way, thus results in a kind of “wall” to the environment and to other departments. Since spring 2011, the “Product Management” sub-unit (the PM team) of the Professional Services unit provides a second development team (six full-time employees and four apprentices). The PM team is responsible for developing modules for the CMS that address specific non-core features (e.g., video management). The PM team as a second development unit was created because of a felt need to be able to accelerate the development of modules in order to be able to react more quickly and faster to end customers’ and partners’ requests as well as to internal feature requests.

Thus, a specialization exists as regards software development. While the core development team develops the CMS as a stable core product in a steady way, with a pace and time horizon of years between releases, the PM team develops modules much faster, with a time horizon of months. This specialization using two distinct development teams allows SoftCorp to react more quickly to customer demands, without having to jeopardize the stability of its core asset. The PM team employs a different approach to software development than the core development team, using a variation of lean software development [25].

4.2. The PM Team: The “Jack of All Trades”

However, the PM team is not only responsible for software development in the form of new or customer-specific software modules for the CMS. In parallel, a variety of other tasks are situated with the team and it sometimes acts as an internal ‘fire-fighter’, or indeed a ‘jack of all trades’. As such, the team is addressed by colleagues from Marketing, Sales, and other units and by external partners with regard to a variety of topics related to the CMS and it acts as “internal help desk” and internal product support. But it also develops ‘show cases’ which comprises the design and implementation of concepts and presentations for new CMS features and modules to support Marketing and Sales at end customer demonstrations or fairs. In addition, the team provides intranet care, and maintains and supports SoftCorp’s intranet, both content-wise and infrastructure-wise. Furthermore, it supports the ‘CMS community’, where end customers and partner companies have the possibility to exchange ideas, knowledge, and experiences with each other and with employees from SoftCorp using an Internet-based bulletin board. The PM team answers questions regarding the CMS and provides content for the community members respectively. Finally, three team members serve as stand-by men and are infrequently used as consultants for internal product within end-customer projects.

4.3. Knowledge Brokering in the PM Team

Knowledge brokering within the PM team includes ‘crossing boundaries’ as well as ‘translating and interpreting’. During the tasks concerning internal product support and the development of ‘show cases’ – due to the PM team members’ extensive technical knowledge of the CMS – the team brokers knowledge between the core development team and other departments. The PM team routinely crosses internal boundaries between other departments.
and units within SoftCorp, which would otherwise not talk to each other by holding open review meetings. The PM team members also have direct access to members of the core development team, which members from other departments do not have. The PM team frequently translates and interprets elements of the technical views of the core development team regarding the core product CMS in terms of the perspective of other units and departments such as Sales, Professional Services, or Marketing. They are the internal contact for all departments that have questions regarding the product.

Specifically during the development of modules for the CMS, the PM team engages into ‘surfacing and challenging assumptions’ activities. This includes both product-level (technical and business perspectives) as well as organizational-level topics. As regards the former, the PM team continuously questions the way things are done in the CMS during the development of modules, and tries to find new architectural solutions, e.g., challenging the ‘pre-generation of content’ paradigm of the CMS in certain areas. The PM team also regularly challenges the existing practices and ways of doing things at SoftCorp, for example, by actively choosing to manage projects differently than the core development team, using lean software development, and by being much more communicative than the core development team.

4.4. **Boundary Spanning in the PM Team**

We found that especially the community work of the PM team presents a very interesting case of boundary spanning. It includes ‘ambassadoring’, ‘coordinating’, ‘scouting’, and ‘guarding’ activities on behalf of SoftCorp with regard to ‘outsiders’ such as external partners and end customers as well as to ‘insiders’: staff from Marketing, Sales, and other employees from Professional Services. The answering of questions that arise out of the community, including solutions to problems, in turn prompt activities such as scouting and feedback to new knowledge for the members of the PM team, e.g., existing issues with the CMS or new ideas for novel functionalities. Moreover, the PM team engages into ‘ambassadoring’ activities during their tasks as stand-by men when they visit partners and discuss the product and explore improvement possibilities. The PM team’s task of developing new modules for the CMS also involves frequent instances of ‘coordinating’ and ‘scouting’ activities, both coordinating technical or design issues by e.g. conducting workshops. In addition, they jointly with sales, presales, and professional services staff define module requirements.

Similarly, other tasks such as consulting support as stand-by men involves ‘scouting’ activities of the external environment in form of the competition, the market in general, or innovative technologies. As regards ‘guarding’, the PM team responds, quickly, to staff, and especially to customer and market demands, and thus shields the core development team from external and internal contacts so that the latter can concentrate on developing the CMS.

4.5. **Balancing Flexibility & Stability**

SoftCorp has to balance flexibility and stability based on market demands: the market expects for the core product at least a 3 years development roadmap, while for the modules there is a maximum of 12 months. The company has decided to do this by having two separate units, one that can react more quickly and nimbly to market, staff, and customer requests and one, the original development unit, that provides stability by allowing the core development team to design the CMS with a long-term vision.

The individual members of the PM team who are organized in this unit have business as well as detailed technical knowledge of the core product CMS, its software code, and the CMS implementation projects because of their diverse tasks. Gathering these skill sets in one dedicated organizational unit created a broad knowledge base which is considered beneficial for the organization. Against this background the PM team is central for both knowledge brokering of diverse kinds and boundary spanning between SoftCorp’s different units and towards SoftCorp’s environment as the interface between all departments. This provides the core development team with a solidity that has another positive effect: customers report less problems and their satisfaction has increased massively.
Boundary spanning and knowledge brokering as performed by committed individuals who are organized in one dedicated organizational unit in SoftCorp then contributes to increased flexibility and stability and balances flexibility and stability by simultaneously supporting (1) reacting faster to customer requests and influences from the market and the external environment, (2) spotting opportunities faster, and (3) augmenting speed-to-market while taking pressure from and shielding the core development team to pursue a sustainable long-term vision and allow for a steady development pace and to develop a stable product core. In terms of ambassadoring, this is achieved through the PM team’s engagement in a range of activities for SoftCorp, especially with the internal and external community tasks, their own development tasks, and as stand-by men in customer projects. With respect to coordinating tasks, this is reached when the PM team takes on various activities related to managing design and/or technical issues again through their performance of development tasks, their community tasks, and their role as stand-by men. In the identified scouting activities the PM team explores the external environment, the market in general, their competitors as well as novel and innovative technologies on behalf of SoftCorp during their work tasks. Finally, when guarding SoftCorp, especially the core development team, from outside and inside influences so that the core development team can concentrate on developing the core of the CMS, the PM team through their development work, performance of community tasks, but also as stand-by men plays a significant role in balancing stability and flexibility. In terms of crossing boundaries, the PM team contributes to both stability and flexibility by routinely crossing internal boundaries between other departments and units within SoftCorp, which would otherwise not talk to each other. With regard to surfacing and challenging assumptions, the PM team regularly challenges the existing product design decisions as well as organizational practices and ways of doing things at SoftCorp. Lastly, when engaging in translation and interpretation the PM team frequently outlines elements of the technical views of the core development team regarding the core product CMS in terms of the perspective of other units and departments such as Sales, Professional Services, or Marketing and it also translates market, customer and staff requirements to technical concepts which they either themselves develop into modules or pass on to the core team.

The role of the PM team as specialized unit that engages into both, knowledge brokering and boundary spanning between other departments, partners, end customers, and the market, thus contributes to SoftCorp’s organizational agility. The PM team provides flexibility as it reacts to changes much more flexible and interactive, both with the outside environment and with other units. It neither only conducts knowledge brokering nor boundary spanning; it does both in an intertwined way as part of a dual strategy. The core development team is intentionally shielded from outside and inside influences, and only has minimal contact to the environment and to other units. This increases SoftCorp’s stability as it allows for a sustainable development of the core product with a long-term vision.

5. Discussion and Conclusion

We performed a study that investigated boundary spanning and knowledge brokering, and demonstrated how they go together and are interwoven as a dual strategy organized in one organizational unit. In such a setting they supplement each other and balance flexibility and stability. As such they enable and support organizational agility. The results suggest the PM team serves an important function for SoftCorp. It offers a structure to balance the demand for more flexibility in a dynamic and increasingly complex environment and the demand for stability that is needed for the efficient development of the core product. The PM team provides a mechanism through which SoftCorp can act more quickly and make sense of changes in its environment, at the same time shielding the core development team from these influences. Importantly, the PM team’s dual roles of boundary spanning and knowledge brokering are both necessary for maintaining SoftCorp’s viability. This helps with keeping the core development team isolated in order to develop the CMS in a stable, slow-paced manner and allows SoftCorp to react quickly to changes in its environment. This dual strategy of “stable core product” vs. “fast modules” enables SoftCorp to implement organizational agility.
as a basis for their success. As a contribution to practice, our findings may help other companies to decide whether having an institutionalized “knowledge brokering & boundary spanning” unit is worthwhile in their situation or not in order to create organizational agility.

Previous literature points to the importance of such specialized units for balancing flexibility and stability (e.g., [13,15]). The data reported here support these arguments. In contrast to Harter and Krone [13], who revealed the role of a cooperative support organization acting as a boundary spanner and thereby helping the cooperative’s member organizations to balance change and stability, we found that SoftCorp has a dedicated team inside its own organization that contributes to balancing flexibility and stability, and not only by boundary spanning but also by knowledge brokering. Our work supplements the work of Kotter [15], who advocates to extend traditional organizational units with a second ‘operating system’ that uses an agile, network-like structure and different processes to assess the business, the industry, and the organization, and that reacts with greater nimbleness, speed, and creativity than the existing units. Kotter [15], however, does not consider how knowledge in such structures is shared with the organization. Moreover, while the literature provides evidence for boundary spanning and brokering as two separate sets of activities (e.g. [16,19,22]), we extend, based on our case, the common body of knowledge and establish that a unit that intertwines these activities can be useful to contribute to organizational agility, effectively balancing stability and flexibility. Having a dedicated unit, with members with complimentary skill sets and knowledge sets in order to be able to both span boundaries or to broker knowledge between others, is a promising strategy for other companies which also want to achieve organizational agility. In previous work, Fleming and Waguespack [9] have studied brokering and spanning together, however in open innovation communities, which are different from individual commercial companies. We provide an empirical confirmation for their proposition that boundary spanning and knowledge brokering are closely related in such a setting. They also put forward that brokers can perform spanning activities and spanners can perform brokering activities, but found that performing these activities simultaneously can have negative consequences with regard to the individuals’ roles in these communities. This might be related to the environment in which they performed their study and their focus on individuals. We do not find these negative effects; on the contrary, both sets of activities in our setting contribute to organizational agility without jeopardizing the individuals involved. Taking a starting point in individuals acting as knowledge brokers, others have also struggled with the conceptual distinction of knowledge brokering and boundary spanning [22,31]. As we focus on an organizational unit as a whole, this difficulty, as important as the distinction is for our analysis, jeopardizes the results of our study. We actually provide some new insights about the distinctive and the shared features of knowledge brokers and boundary spanners, but our results also indicate that more work has to be done to understand the idiosyncratic and the common characteristics of the involved sets of activities.

Finally, as a word of caution, we investigated one single case in depth and it may not be prudent to generalize beyond this individual case setting. Another limitation of our study is that we focused on boundary spanning and knowledge brokering from the outset and did not employ other lenses for scrutinizing our data, e.g., the role of “boundary objects” or the role of different “technology frames” surrounding the various units, which may play a role in this setting as well. These are subject to future research.

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