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ENTERPRISE SYSTEMS AS COORDINATING TOOL IN LARGE SCALE DISTRIBUTED DEVELOPMENT

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Abstract

In this paper, we explore the role of Enterprise systems in coordinating knowledge-intensive work. Drawing on an in-depth case study conducted in a global high-tech, knowledge-intensive project organization, this paper offers insights into different coordinative capabilities of enterprise systems and the relationship with the project context. By employing the concepts of boundary object and boundary spanning this paper suggests that the enterprise systems and related IT components can only partially support information sharing between organizational groups. The organizational actors in different roles drew on enterprise systems components and IT tools as boundary objects to a varying degree. These boundary objects were more significant to some actors than others. The paper argues that different kinds of boundary objects and communication were needed depending on the project context. The findings also suggest that staffing for high value strategic projects could be effectively handled through the informal organization whereas routine staffing could be handled with the help of the enterprise systems.

Keywords: Boundary Objects, Boundary Resources, Enterprise Systems, Expertise, Knowledge-intensive organization, Organizational change, Staffing.

1 Introduction

Many global knowledge-intensive organizations are restructuring through flattening their structure and distributing the work across the globe to become more customer oriented and to focus on relationships with their key customers. These flexible and informal organizational forms have strong employee involvement and they rely on self-organizing autonomous teams (Greenwood et al., 2009). Due to the informality they face challenges of coordination and effective resource utilization across diverse expert groups and spatial and temporal boundaries. Enterprise systems (ES) are often employed by global high-tech companies to deal with these challenges of work coordination and project resourcing. This may allow for flexible work organization, however may also alienate the workers and if executed poorly might hinder the crucial transfer of knowledge across work sites causing inefficiency and poor quality of work. Despite the widespread deployment and use of ES, we have only limited understanding of the effectiveness of ES as a coordination tool in knowledge-intensive, high-tech organizations with diverse expert groups. This study aims to address this knowledge gap.

Existing studies on coordination between diverse expert groups have emphasized the challenges of sharing knowledge and creating shared understandings around activities (Boland and Tenkasi, 1995). Coordination in these contexts, as a result, might be hinging less on structural arrangements and more dependent on knowledge integration (Argote, 1999; Faraj and Xiao, 2006). Many studies draw on the concept of “boundary object” to illustrate the role played by objects in establishing shared meanings and understandings across diverse expert groups in organizations (e.g. Carlile, 2002). The boundary-crossing capacities of objects are also significant for facilitating coordination across expert groups (Levina and Vaast, 2005).

To investigate the potential role of the ES in coordinating work in a globally distributed project setting we conducted an in-depth case study in a knowledge-intensive project organization that was undergoing a transformation from a hierarchical structure, with operations in a few countries, into a multinational matrix organization. The key research question the paper seeks to address is: *What is the role of ES in coordinating knowledge-intensive work?* Given this role, to what extent ES served as a boundary object? By focusing on the role of ES, we seek to gain insights into different coordinative capabilities of components of the ES.

Our findings suggest that the ES and related IT components could only partially support information sharing between organizational groups about project staffing. This means that staffing for high value strategic projects was handled through the informal networks within the organization whereas routine staffing was handled with the help of the ES. Furthermore, it was found that organizational actors in different roles drew on a collection of ES components and IT tools as boundary objects to a varying degree. These boundary objects were more significant for some actors than others. Finally, we found that different kind of boundary objects and communication was needed depending on the project context.

The remainder of this paper is structured as follows. Section 2 presents a review of the key concepts relating to the role of objects in coordination. Section 3 presents the research methodology and Section 4 the case description in. The analysis of the case is presented in Section 5, followed by our observations and findings in Section 6. Finally Section 7 outlines the implications of our findings for research and practice.

2 Theoretical background

Many companies seek to deal with the challenges of work coordination and project staffing by using Enterprise systems (ES) and their primary form Enterprise Resource Planning (ERP). They integrate and standardize the core business processes and information resources (Davenport, 1998) and are

claimed to create various kinds of benefits, such as lower costs, better customer service, improved resource management and performance control (Shang and Seddon, 2002). If the implementation of ES is successful it can lead to big efficiency gains, but the reported rates of failure are high (e.g. Griffith, Zammuto and Aiman-Smith, 1999). Originally ERP systems were developed with a focus on resource planning and accounting, but now they include also HR and project management functions.

Knowledge-intensive organization relies on intellectual capital and expertise (Starbuck 1992, Alvesson 1993) as well as horizontal collaboration between diverse groups. For coordinating work between employees across boundaries of communities, existing research suggests the use of boundary objects (Star and Griesemer, 1989) or other mechanisms facilitating interaction. Boundary objects are a range of artifacts that have interpretive flexibility and can enable coordination and knowledge sharing between diverse groups (Sapsed and Salter, 2004). Faraj and Sproull (2000) stress that coordination of diverse expertise is a more important predictor of project effectiveness than traditional factors such as administrative coordination, individual expertise, or development methodologies.

Coordinating work in laterally structured organizations requires communication within and between different communities of knowledge workers. Boland and Tenkasi (1995) argue that producing knowledge in this kind of organizations requires developing perspectives inside a community, perspective making, and taking the perspectives of others into account, perspective taking. Boundary objects facilitate the development of coherence across intersecting social worlds.

Engaging members of different communities to interact with each other is referred to as boundary spanning. Individuals who can link separated groups of employees and facilitate information sharing are called boundary spanners. IT artifacts may be assigned as boundary objects but they may not, however, become boundary objects-in-use. Similarly, nominated boundary spanners may not become boundary spanners-in-practice. (Levina and Vaast, 2005).

Following Jonsson et al. (2009) we see that ES may turn boundary-spanning into an IT-intense activity, as they produce and transform information about key activities of the company and there is no other means of acquiring or processing this information. In our case the change of the staffing process itself is altered.

Organizational members may engage in cross-boundary coordination in several ways. Coordination may be aided by the processes of transferring, translating and transforming (Carlile, 2002; Kellogg et al., 2006). However, Kellogg et al. (2006) found in a dynamic environment “*boundary objects.. may be less effective in nonhierarchical and shifting contexts*” (p. 24), instead coordination across the different groups involved the following practices: 1) making work visible (“*display*” practices) 2) making work legible to other groups (“*representation*”) and 3) assembling products, such as client presentations, from loosely linked items produced by different communities (“*assembly*” practice). Barrett and Oborn (2010) stress that boundary objects and their use have implications for knowledge sharing and power relations in distributed software development. These political dynamics are visible in our case. The relational aspects of boundary objects are for our case, as the project organization is maintained through the system.

3 Research approach

In this case study we adopted an interpretive case study approach. Walsham (1995, p.79) argues that generalization from interpretive research may take the form of development of concepts, theory, specific implications or rich insights. The rich insights we gained from our study may be useful for understanding related work in other organizational settings (Walsham, 1995). Our challenge was to identify deep structures, which were hidden below everyday work activities and which had an important influence on the use of formal and informal networks in the case company. We used theories and concepts regarding boundary spanning and identification in an exploratory fashion as sensitizing device, when relationships between different variables were not expressed (Miles and Hubermann, 1994, Myers, 2009). The research question of this case study emerged from the research

data as one interviewee formulated the need for transferring the customer team spirit into offshoring countries:

“We have to be happy to work for a certain customer in our offshoring countries too. That we all have the customer’s flag on the table and we keep saying to ourselves ‘yippee, the customer will be able to manufacture its products since we have finished our own work assignments’. We should be able to transfer our own pride and joy [from Nordic countries] to offshoring countries too.” Director (Role: Business Manager)

Based on such comments we started analyzing the ways in which the goals and values of the team are shared across the boundaries. This led us to look at the ways in which the system can act as a coordinating tool and what the key boundary objects and boundary spanners are and what they should transmit across.

3.1 Data collection

We conducted an in depth case study in a large European high tech company, here named Neon. Bearing in mind criteria for good qualitative data (e.g. Patton, 2002; Myers, 2009) the empirical material consisted of interview transcripts, field notes from observations, and excerpts from documents. The main emphasis was on the analysis of interview transcripts and notes whilst official documents complemented the data collection by offering further insights into phenomena under investigation. In order to get a bigger picture about the phenomena and updating existing data we used these materials during the whole research process.

The empirical data gathering took two and a half years from December 2008 to February 2011. We gathered interview data including 41 interviews in three phases. The lead author conducted most of the interviews, with all researchers participating in the data analysis. In order to make a better perspective of how the boundary spanning mechanisms and identification were structured we introduced interviewees’ “main roles” during the staffing process. These main work roles were: Sales Manager, Customer Manager, Business Manager, Project Manager, Staffing Manager, Line Manager, HR Manager, Project Member, Controller, and ES Developer. Face-to-face interviews lasted for 40-80 minutes, they were recorded and later transcribed for subsequent analysis.

3.2 Data analysis

In order to draw valid meaning and to realize when an interview should be conducted to fill in gaps we adopted a continuous data analyzing method (Miles and Huberman, 1994). All the transcriptions from previous phases were reread, coded and discussed thoroughly in the research group meetings. In these meetings we presented the emerging explanatory themes and patterns, and discussed these along with our main interpretations and explanations. The coding process involved categorization of empirical data based on the emerging constructs. During the initial coding phase specific codes emerged from the data. These codes were for example technology, work role, virtual team, collaboration activity, collaboration device, customer, or utilization. We continuously compared emerged codes with respective literature in order to find theories and models that could be used as a sensitizing device. We adopted three cross-boundary practices – display, representation, and assembly - (Kellogg et al., 2006) as our second order categories and combined emerged codes with them.

4 Case description

4.1 Company description

The case company Neon (a pseudonym) is a large European high-tech company operating in project business. With over 16.000 employees in close to 30 countries it delivers IT, R&D, and consulting services to several customer sectors either locally or globally.

At the beginning of 2009 Neon implemented a new three-dimensional matrix organization structure in order to transform into a more horizontally integrated company (*Figure 1*). The matrix model replaced former business area structure, in which there was very little interaction between business areas. As Neon's strategy was based on differentiation and specialization as well as high value added services, the company attempted to create competitive advantage by combining advanced technology with innovations and deep understanding of customer's businesses. In order to find growth opportunities and to respond to high price pressures the company developed the global project delivery model. In this model staffing organization replaced the team heads of small industry-specific or customer-specific teams in handling resource management.

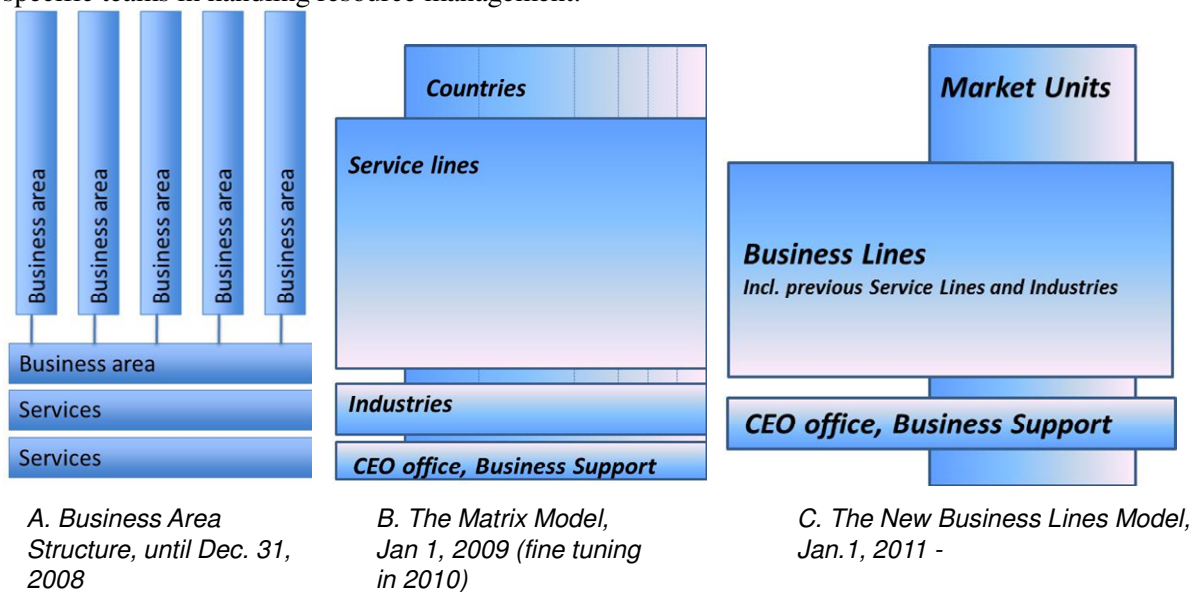


Figure 1. Organizational transformation process 2009-2011

Further, in January 2011 Neon announced the new two-dimensional Business Lines model, in which Service Lines and Industries were combined together into Business Lines and the country-dimension was replaced with market units to streamline decision-making.

4.2 Enterprise system and the formal staffing process

Neon's enterprise system was an important tool for organizational transformation. The ES was a US-based system with the basic operational functionalities for an expert organization, integrated with local systems. Figure 2 illustrates the timeline of organizational change and related ES and systems tools. Guided by Neon's new corporate strategy and global project delivery model the company established a new staffing process in February 2009. In this process the staffing network of 50 staffing managers replaced the local collaboration between small customer and industry specific teams. The new staffing network aimed to ensure that the external customer needs were combined with the internal employee competencies by allocating right person to the customer projects and services.

The global staffing process was supported by new ES functionalities such as competence catalogue (CC) and resource management (RM) module. The formal staffing process and system usage seemed to be created in order to find requested resources from large resource pools organized by competencies or technologies. It aimed to reduce idle time and to mobilize free resources more easily in order to achieve higher utilization and offshoring rates. In practice the use of formal staffing process and the ES varied greatly in the organization and informal staffing networks were commonly used.

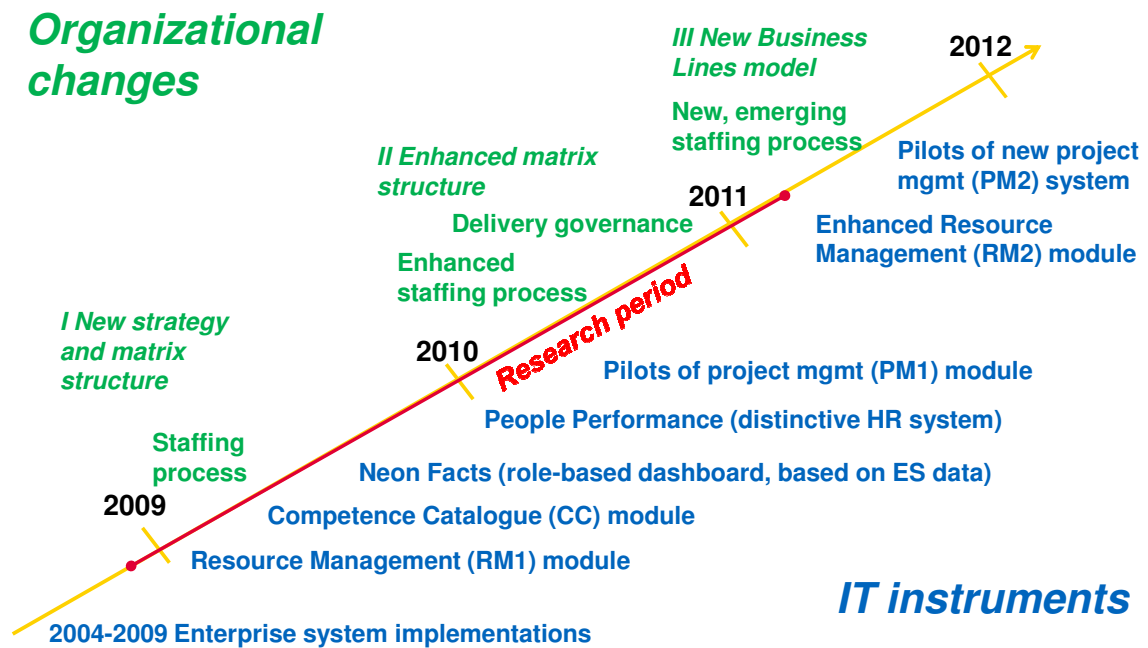


Figure 2. Organizational changes and IT instruments in Neon

4.3 Staffing process in practice

In basic staffing the prospective project management was located in the Nordic countries, while most of the project members were staffed from offshoring countries. Project members didn't know each other beforehand. In the sales phase an architect planned the first solution to the customer's problem. In this first project set-up selected technologies were mapped with requested competence profiles. Regardless of continuous transfers of employees back and forth in the organization, line managers were quite familiar with subordinates' competencies, previous project experiences or availabilities. According to this information, employees' CVs were updated with relevant competencies and project experience before sending them to the customer. Generally, a project manager and some key persons were provisionally allocated for the customer project in the ES during the sales phase. However, as the sales process was rather time consuming, the provisionally reserved persons were usually allocated for another project when the bid was converted into an agreement.

Staffing manager's role and position in the organization had been quite unclear during the organizational transformation. The business managers to whom they reported set their performance measures. In order to perform well staffing managers were expected to be familiar with the unit they worked for. Sometimes a former staffing manager transferred the knowledge about employees and competencies in the unit to his or her successor, but contacts with line managers were seen as essential:

"Usually this (mapping employees and competencies) takes place via e-mails, maybe sometimes by phone. But you know, the staffing manager needs to know the organization she or he is responsible for." Staffing Manager (Role: Staffing Manager)

Although the staffing manager was able to find the theoretically best match between requested competencies and individuals by using the ES, the staffing manager was not able to know all employees in the organization. In order find a suitable person for a certain work assignment line managers activated their own networks as one line manager described:

"First I will check my own resources (subordinates), if someone is actually free or if I am able to rotate someone, who matches better with the new work assignment. If I don't find anyone, I will ask line managers in my circle of acquaintances in JAVA practice. And if I don't get help from local line

managers in our own country, I will check HR department, if there are candidates in short term hiring process. If there is someone in the interview process, I will get the interview results, CV and so on. But if there is no candidate, I will ask staffing manager if there are available resources in other units or in other countries.” Unit Head (Role: Line Manager)

Project and customer managers relied heavily on their own networks. However, in the case of global staffing geographical distance made face-to-face interviews impossible, and the project and customer managers had to rely on a staffing manager in respective off shoring country. Sometimes the results were less than stellar.

It was found that poor staffing decisions had been expensive, caused delays and negative influences, particularly on persons who had eased out from the project. Some interviewees even suspected the sincerity of some staffing managers and accused them of offering candidates with outdated or minor competencies. Project team members were not usually involved in the staffing process. In some cases the project manager insisted on interviewing them, but usually line managers took charge of the negotiations. All employees were expected to update their competencies into the Competence Catalogue, but the discipline of filling and updating the CC was poor.

“I usually check from superior, because I cannot trust the RM completely. Sometimes a person is not assigned to the project in the RM and the RM offers a person. Then it shows us that yes, a brilliant case, now we will interview a person. But when we contact the superior, the person is not available.”

Manager (Role: Customer Manager)

At the time of this research the most important deficiency seemed to be that the competencies and different roles were not integrated with each other. The level of seniority was maintained at a general level, not at the competencies level. In summary, the formal staffing process required the use of the ES, but it was omitted for various reasons.

4.4 Managing the virtual team

Interviewees considered working in a virtual customer team as business as usual. The use of Neon’s common IT tools such as Live Meetings, Office Communicator or Neon Facts was seen as important in the transformation to a virtual organization and global staffing. Even if the customer had selected a global project delivery, they usually wanted to have local contact persons, who took care of all the communication during the project. Transferring project knowledge between local contact persons and employees in the offshoring countries was challenging:

“I would lie if I said that everything goes right. At least our area is quite difficult. I have a project, whose implementation started when defining was unfinished. So a part of the definitions were missing. And employees in our offshoring country are not able to look at one corner, but they should see the wholeness. So they need a lot of support from us and we haven’t understood how much support they need.” Manager (Role: Customer Manager)

Transferring customer and industry specific knowledge was another challenge:

“Off course we should agree the role the new person takes. Anyway, we have thought here,, that we are working for a certain customer. It feels that this customer connection is looser now. And if we are teaching one person for years (in off shoring country), he can easily leave the company. In my opinion the work assignments allocated into offshoring countries should be very clear. We have done these work assignments for 10 years and it is based to a great extent on tacit knowledge.” System Analyst (Role: Project Member)

In practice the customer and industry knowledge seemed to transfer during project work even if the previous workers were unwilling to transfer their knowledge. According to the interviews employees in offshoring countries had learned a lot by doing similar projects for different customers. Employees who had worked for a certain customer for a long time were often very committed to the target customer. Expert hoarding created challenges for both the staffing and managing the project. Despite

the fact that utilization rate was heavily emphasized certain key persons were kept reserved even if they didn't have work to do at the moment.

Thus Neon's new global project staffing process consisted of different cross-boundary practices. The new process required that these practices were performed using the tools within the ES. In practice however, these cross-boundary practices were more informal and based on personal relationships. As these cross-boundary practices were very significant in the global project staffing we analyzed them in detail in the empirical analysis phase.

5 Case analysis

In our analysis, several ES components and IT tools emerged as boundary objects in cross-boundary practices. We first present these objects and discuss their limitations as boundary objects. We then extended our analysis by combining two different project phases, staffing the team and managing the team. For this, we draw on Kellogg et al., (2006) work on cross-boundary practices (display, representation, and assembly) and the concept of boundary objects. Finally, we focus on the "main roles" of key staff served as boundary spanners by improving information processing among groups through better communication and uncertainty reduction.

5.1 Boundary objects in staffing

We found six important boundary objects: competence profile; CV; "informal profile"; "MySite identity"; project resource request and work load report, which were analyzed thoroughly during our research.

In practice employees were able to decide for themselves, for example, the levels of their competencies or their visibility in the system. By filling in and updating the competency catalogue within the competence profile, employees sought to integrate their competencies, experiences and roles into a coherent image of themselves. This self-created competency profile had some limitation as a boundary object, because of the reliability of the data. The performance feedback from project managers or other team members (which could have shaped the quality of the information) were not collected and stored into the ES in a structured form. The nature of competence data was very sensitive; hence there were some limitations in defining the access rights. Further, information on the seniority levels of the staff was also missing.

Naturally the customer project team split up as the project ended. As the customer was usually willing to get the project team with project members already familiar with the previous set-ups, the efficient recreation of the customer project team was tempting. Unfortunately, due to privacy regulations, customer project information was not made visible in the employees' competence profiles in the Competence Catalogue. Customer project information was stored in the ES and it was possible to transfer this information to employees' CVs. Since these CVs were used for both selling and staffing purposes with different emphasis, case-specific revisions were needed to make the CVs more effective as Boundary objects for coordination.

The interviewees in the case company revealed that there were different informal channels, which provided information about employees' competencies, experiences, motivation, cooperation skills etc. In our analysis we distinguished two different outputs, "Informal profile" and "MySite identity". Informal profile was based on internal discussions and evaluations between different parties like project managers and team members or it was based on e.g. customer evaluation. Due to the data sensitivity this information was not systematically stored in the ES and a resource requester should have known the right channel in order to get this data. This kind of informal employee project experience data from managers was largely used in the staffing process and it provided a quite realistic evaluation about an employee. MySite identity was based on employees' own, subjective view. For example by inputting certain kind of data into intranet employees aimed to strengthen certain image of

themselves. These could have been very useful in terms of richness of information they offered about the staff, but they were seldom used for staffing.

A resource request described what kinds of competencies were needed as well as when and where those competencies were needed. It had little information about the target customer, cooperation skills or motivation. A project resource request was also searching for an individual, not a project team. As project work is based on mutual trust, project managers were not necessarily willing to take whoever was available for a project without being familiar with individual's work experience. Obviously, a lot of informal networks and tacit knowledge outside the ES was required in project staffing. These practices required some important boundary spanners that could share information about for example resource requests, original customer agreements, persons, competencies, or technologies.

5.2 Cross-boundary practices in staffing

In this section we present our analysis on the nature, form and consequences of cross-boundary collaboration and coordination at Neon. As this organizational context was seen as a “dynamic environment” we adopted Kellogg et al.’s (2006) three cross-boundary practices as described above.

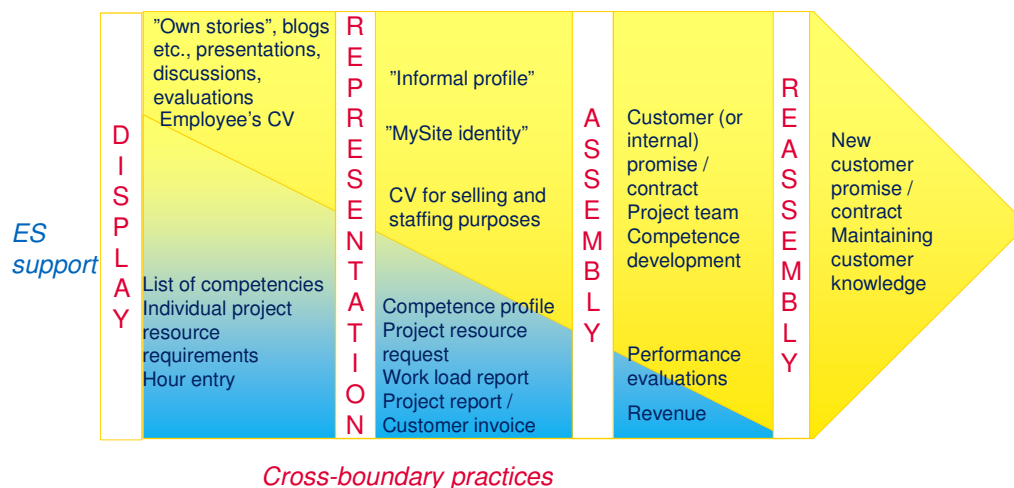


Figure 3. Boundary objects in cross-boundary practices and the ES use in Neon

As shown in the figure 3 the ES use (blue area) decreased fundamentally as staffing process continued and other ways in coordinating and collaborating (yellow area) became more important. Finally, the ES was only rarely used for assembly type of cross-boundary practices. In practice this meant that staffing an individual or a team was conducted by assembling loosely linked items produced by different communities. At the time of this study, the ES was not used at all for “reassembling” such as recreating global project teams. Thus the staffing process had to start over or use informal networks. Next, we analyzed boundary objects in detail in order to define how they worked in practice.

5.3 Boundary spanners

Boundary spanners and identification were analyzed by describing their main characteristics and boundary objects in use. The boundary spanners drew on key boundary objects very differently in different parts of the organization. For example sales managers rarely used the RM, while it was widely used by staffing managers. To further complicate the matters, the staffing process itself was staffed with employees who often were in low power status and it seemed that informal networks were used to bypass the official processes and this further eroded the use of the system provided boundary objects and processes. Our analysis showed that boundary spanners were identified within their immediate local working group, or organizational role group, instead of global project team.

6 Discussion

Our analysis illustrates some of the key boundary spanning mechanisms in the staffing and managing the project team. It has been shown, that key boundary objects give shape, form, and visibility to the global project staffing process. However, our case shows that it is challenging to replace local project staffing practices with global staffing process supported by advanced ES.

First, our findings indicate that in a knowledge-intensive organization, only certain parts of project staffing information can be codified and handled solely by the means of the system. Several important parts of the staffing process need informal contacts and boundary spanners to work. For example, as the knowledge about high-performers cannot be stored in the system it is challenging to recreate a new customer project team without using informal networks. Second, existing boundary spanning mechanisms are highly dependent on each other and all of the functionalities of the ES have to be in place from the start or otherwise difficult workarounds have to be found. Third, the boundary objects in the ES seem to emphasize employee's personal identity, not customer team identity. For example, the project resource request in the ES is searching for individuals, not a customer project team. Also measures in the ES often are at individual level, not at customer project team level. Finally, we argue that in this kind of large organization with flexible routines and diverse habits in different parts of organizational, there is a need for the simultaneous existence of formal boundary objects, trading zones and informal knowledge networks.

To develop this theoretical idea further we look at consulting resources needed and the ES support in four key project types at Neon: high value strategic key customer projects, ordinary renewal projects, standard system implementation projects, and maintenance projects (*Table 1*). High value strategic projects are usually tied closely to the key customer, who often asks for certain trusted workers. Staffing is handled via informal organization with direct contacts. Sales are guaranteed by known names and when projects are in trouble, certain employees are called to save the day. These projects are probably so important that they can keep their ways. The intimate relationship with customers and the reliance on key personnel gives them bargaining power against the forces of standardization within the organization. The use of key consultants requires slack, which is not supported by the staffing process and the measures used for performance measurement.

Project type/ work assignment	Resources required	Boundary problems/issues	ES support	Role of boundary spanners & informal networks
Strategic/ Key customer	“Top” competencies / High-performers	Tacit knowledge transfer Semantic	Weak	High
Renewal/ Enhancement	Customer-specific competencies	Customer references not easily available Semantic	Weak	High
Standard systems implementation	Certified, commensurable competencies (customer references)	Customer references not easily available Semantic Syntactic	Moderate	Moderate
Maintenance/ Continuous services	Technological, (commensurable) competencies	Syntactic	High	Weak

Table 1. Four project types and boundary spanning

Renewal projects usually are subject to customer-specific competencies. As customer references are not easily available in the ES, the role of boundary spanners and informal networks is emphasized. Standard system implementations request “standard” competencies. These competencies are commensurable and they can be codified quite easily into the system. Communities of knowing may

have different expressions for these competencies (syntactic issues). Further, if customer knowledge is needed, some semantic issues may also arise as different communities of knowing use different meanings, languages, have different cultures, egos, etc. In maintenance projects the key dimension is often the price of the deal. As knowledge of customer's previous set-ups is not necessary this leads into the use of e.g. technology consultants in low cost countries. Boundary objects are syntactic.

As illustrated above, staffing decision-making requires integration of knowledge from various sources. The knowledge creation within the community happens through communication. In order to present Neon's communication model we adopt two models of communication (Boland and Tenkasi, 1995) and bring them into this organizational context. Communication in a local group (community of knowing) is both a language game and a transmission of messages through a conduit (Boland and Tenkasi, 1995). Boundary objects (in the ES) are seen as conduits. The conduit model forms the core of Neon's communication model. As in this model communication is described as message sending and message receiving, it can be seen suitable for solving the routine staffing cases.

Language game model is utilized in solving more complex project staffing cases. For example staffing of strategic key customer project requires tacit knowledge transfer as persons involved refine their knowledge. Boundary problems in these cases are semantic. As these cases demand integration of knowledge from different parts of the organization the role of boundary spanners and informal networks is important. It is worth noting that the wrong model of communication inscribed into the ES may hinder perspective making and perspective taking between different communities of knowing (Boland and Tenkasi, 1995).

7 Conclusion and implications

This paper presented the findings based on an investigation of the role of ES in coordinating knowledge-intensive work. We demonstrated the key role of certain boundary objects that replaced coordination based on informal, human practices. At the same time we identified gaps, where boundary spanners and informal networks are still very much needed. Our key message and finding here is that in fast-moving, post bureaucratic organizational forms there is a need for simultaneous existence of highly codified and highly informal practices. Coordination of work in this kind of organization therefore centers on the development of "trading zones" as Kellogg et al. (2006) suggests but also centers on creation of "common knowledge" through boundary objects (Carlile, 2002). This means that boundary objects and less formal trading zones need to co-exist.

The practical problem identified by Neon was how to support the reassembly of a project team a distributed work arrangement, such as the staffing process here, through an ES. It seems that the goal of codifying all resource and competence information into the system is theoretically and practically impossible and some parts of the staffing process are based on personal networks that cannot be replaced by a system. In this case the current staffing process and its supporting tools served certain types of work assignments well, but more complex consulting assignments were poorly supported. Also the need for human boundary spanners remains. These findings call for less structured tools for informal and ad-hoc communication and support for local knowledge (e.g. mental maps of staffers).

The findings also demonstrated that the staffing process relied heavily on informal connections and knowledge sharing between communities of knowing. As for example confidentiality issues restricted the sharing of knowledge about competencies or performance via the ES. It was therefore essential to nurture the right kind of informal networks that produced good collaboration. It seems that communication of complex staffing knowledge within and between Neon's multiple communities of knowing required combination of line managers or project managers and a certain set of boundary objects to take care of the more informal knowledge sharing. We believe that this may be common in all knowledge intensive work and this could be investigated in other similar contexts in the future. Furthermore, the transfer of informal knowledge about competences could be experimented with quite easily with suitable ad-hoc communication and social media tools.

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