

Geographically distributed work and new competency requirements

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I. Introduction

This paper focuses on new competency requirements arising from restructurings of work, in this case specifically research and development work in project based organizations.

Theoretically, it would be possible to deal with this issue completely divorced from the role of ICT and perhaps even completely separated from the issue of globalization, since projects can also be found as internal company forms of organization within national boundaries and it can be argued that projects have existed before increasing developments in globalization.

Nonetheless, there are in fact several links between the project organization described here and the use of ICTs. The competency requirements dealt with here arise from distributed work processes that go beyond company and national boundaries. This form of distributed project work is inextricably linked to ICT both as a means of information exchange and as a means of control. Many of the competency demands and the challenges faced by workers in the project environments examined here, derive from the spatially (and globally) dispersed character of the research and development being practiced.

II. The relationship between technology and geographically distributed work

(1) Technological development is seen as a central factor in the spread of distributed work. Purely technological perspectives see the rise in distributed work as being the outcome of the technological potentials that have made de-localized work possible. Here the emphasis is on the use of computer supported collaborative work forms through the perfection of virtual or other IT technologies that facilitate work across space. Many discussions on the relationship between ICT and new spatially dispersed work practices, such as distributed engineering, go further by stressing the driving force of ICT. Remarks from company interviews are, for example, „ without new information and digital technologies this type of work would be unthinkable – sending the documentation back and forth by post – the time delays... (would be impossible).“ In such positions, the use of ICT is an organizational and informational tool which bridges distances that otherwise would prove insurmountable for interactive, cooperative distributed engineering processes.

It is not surprising that in technical fields the orientation is toward the improvement and potential of the technology itself. What is perhaps more surprising is the determining role that sociological and organizational perspectives attribute to changes in technology which argue that the increases in speed and volume of information flow are what lead to the spread of distributed work forms. One trend in this direction offers a highly central role to ICT in determining new forms of work organization, by arguing that new information technologies make collaborative work more productive than hierarchically organized processes. (Powell 2001; Zuboff 1995) The general idea behind positions such as these is that information technologies enable cooperation in the relational openness of a network, thereby also making the use or mobilization of all competencies across a process chain possible. In traditional, more rigid forms of organizational hierarchies, this more open form of interaction and more diverse range of competencies and use of dispersed expertise, would not be available. (Gerybadze 2004).

In a somewhat less deterministic version, distributed work is often understood as an issue dealing with how people communicate and cooperate across space (Hinds and Kiesler 2001). Thus, technically mediated work types, especially the technology and its interfaces, become the center of attention. Social issues then tend to deal with the problems of peripatetic work, such as “digital nomads” (Makimoto 1997), who have only weak ties to companies and colleagues. This, in turn, exacerbates structures which are regulated through traditional employment relationships, including institutionalized forms of representation (Harrison 1994). It is sometimes argued that the evolution and spread of IT applications, geared toward the enhancement of collaborative work, hold the possibility of remaking work practices in radical ways. In one interesting twist, Bélanger and Collins (1998) see employees demands for distributed work arrangements to meet their needs for flexibility as the main driver in the rise of new technologies, leading to new types of working arrangements (such as remote work centers, telecommuting, or tele-work).

ICTs are often credited with, if not drivers, than at least facilitators of distributed work. Given the trend toward flexible forms of production, teamwork and decentralized organizational structures, ICTs are seen to contribute to the smooth functioning of such arrangements and to making information more accessible. Certainly, ICTs make collaboration between people across traditional boundaries of time and space easier. However, whether they define the work process or simply manage information, and what their relationship to particular forms of globalization is, still leaves room for debate.

(2) Distributed work is often associated with processes of disintegration. Given the problems of dispersion, technical tools are thus seen to have a central role as a means of facilitating information exchange and information flows. This focus tends to distract from the other main role of ICT in distributed work processes, namely how to reintegrate these dispersed processes, and of course, how to control them. As Flecker (2004, p.21) points out, management information systems such as enterprise resource planning systems (ERPs) make it possible to record and make transparent the performance figures and economic results of all the companies' units. Without this process of centralization, it is questionable how willing companies would be to allow the high levels of autonomy and responsibility that characterize distributed project teams. Companies take on a risk when they relinquish their typical means of control, both within and outside of their organizations (as with supplier relations). Centralized data systems allow them to distribute risk and decentralize financial pressure along the process chain, and at the same time maintain a high level of control. In light of the means of control through centralized planning and evaluation systems, project based organization is attractive because it potentially reduces costs by eliminating management functions, and then transferring responsibility to project leaders, often without compensating them. (Meil 2004) The emphasis on results and the increased levels of autonomy make project leaders their own performance optimizers and cost cutters. This type of organizational structure has a significant effect on the competency requirements and work demands of project team members and leaders.

III. Cases

This paper looks at the issue of competency requirements in distributed project work through the experience of three companies which carry out their product development in a project-based organization and are involved in a complex network of international collaboration to design, develop, and produce complex industrial products. The data derives from intensive interviews and workplace observation undertaken in 3 German manufacturing firms over a 2 year period (2001-2003). Intensive interviews were conducted with 40 project leaders and project engineers as well as human resource representatives and department heads of the product development areas in the German, Brazilian, US, and French sites of the companies. Two of the cases are medium-sized system suppliers who have undergone a difficult adjustment process, restructuring their development processes to meet the demands of their customers. The change has led to a shift in their role away from nationally based component

suppliers to system integrators in a global process chain. This shift has also had consequences for the organization of work and the role of workers in their companies.

Company A is a supplier to the aerospace industry which designs, engineers and manufactures landing gear, actuation systems, and air circulation systems for aircraft manufacturers. At its German site there are approximately 1600 employees; at its French site there are about 800 employees; and at the Brazilian site in which Company A has a 50% share, about 400 are employed. Company B is a supplier to the automobile industry and designs, engineers and produces exhaust systems and catalytic converters for most of the German, US, French and Italian automotive industry. At the German site there are approximately 2000 employees; at the U.S. sites there are about 125 divided over two different locations. Both companies have expressed seeing a large change in the demands placed on them by their customers over the last decade. The change mainly involves the requirement to take on the role of system integrator, meaning they are responsible for delivering an entire system to their customers. In pre-production this entails a much larger effort in the planning and design process, and generally a much larger responsibility for integrating the components and services in their respective system, including overseeing the sub suppliers and potentially the other partners that are part of the system. Their new responsibilities involve taking over a part of the integration process for the customer, by delivering a finished, fully integratable piece of the product. These requirements bring with them a much more complex development process, and a much bigger piece of the risks and costs involved in the development and pre-production process.

Company C is a high-end automobile manufacturer, employing 362,000 worldwide and about 100,000 in Germany, thus complementing the picture from the other side of the outsourcing and integration processes. Each automobile project involves the management of a large number of suppliers and distributed work arrangements with their international subsidiaries (often production facilities). The area of the company participating in the study was an information technology service department which employs 90 engineers and scientists, responsible for developing and adapting software applications for other company departments and partners.

A change in organizational structure that all three of the companies described here have undertaken can be summarized by the term – geographically distributed work. The term denotes the organization and implementation of work across different tasks, process chains, or production/service networks. The shift in production model and organizational structure associ-

ated with distributed work contrasts with former fordistic-tayloristic strategies, whose central goal was cost reduction and control through specialization and division of labor. In distributed work processes, the previous concept of “company” as an integrated unit in which all of the necessary structures to organize the work process – economic, technical, and social, were confined in a system with clear boundaries to the environment outside of it – is undergoing a fundamental change.

This paper focuses on one specific worker group in the distributed work environments that were investigated: highly skilled technical employees involved in product and series development in industry. Most of the employees are engineers, but other occupational groups, such as purchasers, controllers, and technicians are also involved in the product groups characterizing these work processes. All of the employees interviewed were involved in distributed work in which their jobs are organized into projects with a defined time frame. The projects not only span the entire company organization, but also a variety of suppliers, in a number of different countries.

IV. Shifts in competency demands

(1) Increases

A first analysis of the interview material revealed a shift, usually involving an increase, in the competency demands for project participants, especially project leaders. The findings are summarized in the following table which is divided into five different categorial dimensions. The left hand column gives examples of the expectations that the engineers felt were characteristic of the organizational structures for product development prevalent before the introduction of geographically distributed work. The right hand column shows the shifts in requirements that have taken place as a result of distributed work organized in international projects.

Table 1

Traditional	New
Technical Dimension	
Coordination and execution of inner company processes	Inter-company system integration; monitoring partner contributions
Communication Dimension	
Formal Documentation; Consultation inside company	Prioritizing material for overview; Consultation between companies
Customer presentations	Media competence
	Conflictual negotiations
Organization Dimension	
Design and formulation of work packages	Design and formulation of complex work packages
Team construction	Team construction under tight personnel availability
	Inter-departmental coordination of teams
Management Dimension	
Meet schedules	Heightened time and cost pressures
Monitor work content; Competence to evaluate work as basis for decision-making	Monitor work content and costs
	Ability to assert oneself in conflict situations; Conflict resolution; Risk taking
	Leadership without hierarchy
Intercultural Dimension	
Technically oriented international exchange	Intensive exchange beyond the technical dimension
Limited number of actors	Diverse actors
	Long and more frequent foreign assignments

In the *technical dimension*, there continues to be a demand for high levels of technical expertise. However, what is changing is the additional requirement for system integration and monitoring the contributions from partners. This means that there is a need for a much broader range of technical know-how outside of individual specialties, or even company boundaries. In the area of *communication*, the shift involves the ability to prioritize and filter large amounts of information. Also required is a more far-reaching coordination and understanding across fields, as well as the ability to negotiate, sometimes in conflictual situations. In the era of distributed work, in the *organizational* dimension, a growing complexity for work plans and work packages as well as increased difficulty in putting teams together to carry out the work plans is revealed. Interview partners referred to the process of acquiring a team to organize the work as „horse trading.“ This term describes the informality as well as the difficulty involved in getting the capacity necessary to fulfill work plans. This type of team formation presents a real challenge for the everyday work of project leaders in distributed work. Particularly in the area of *management*, the project participants, and especially the project leaders, have experienced a large shift and intensification of their working profile. Generally speaking, distributed work makes it necessary for project leaders to make decisions, take responsibility for fulfilling goals, and for disciplining project members (generally to

meet schedules) much more autonomously than before. Formalized or ritualized procedures are thus increasingly replaced by informal interactions. Finally, a shift and increase in the *intercultural* dimension means having an openness and flexibility in interactions taking place at the level of the work process and dealing with the varying bodies of knowledge and experiential backgrounds as well as the occupational and cultural differences that make up the cooperative base of international distributed work. What emerges is an understanding that finding solutions to problems is not only an objective process, but also a negotiated one. In effect, the intensification of international cooperative work leads to an interaction of different company and occupational structures which creates the need for the development of new working and social identities, at least in the context and duration of the work project.

(2) Professional identities

In the change to project organization, the basis for professional identity shifts dramatically. The once technical expert and specialist in a selected field becomes manager, negotiator, problem-solver, coordinator - all skills in which the technical expert has little or no background and in which he or she received little or no training. The project member spends most of his/her time in the project context, very often with new project leaders, new colleagues, new external partners, a new task (although certainly one highly related to the previous one). For the individual, this means constant shifts in orientation, defining the position in the team, forming alliances, setting the rules for interaction, etc. Thus, workers have to constantly renegotiate their position vis à vis other workers as well as in the organizational hierarchy.

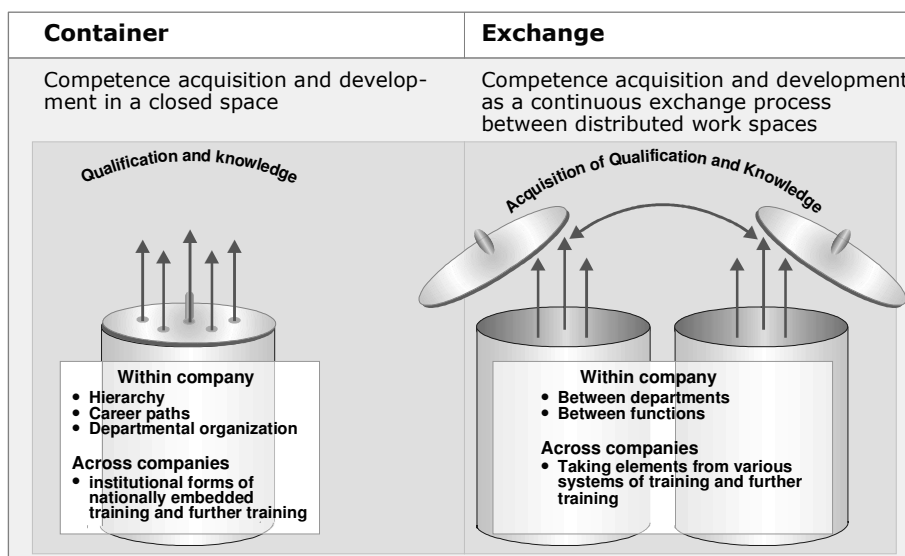
However, beyond the purely subjective or psychological level, there are also clear contradictions for workplace identity at the structural level. For instance, although the project member is carrying out work in the project context, he/she still belongs to a line organization unit. Most often it is this department head, and not the project leader, who is responsible for evaluation that determines pay increases, career development, recommendation for training measures, etc. Project leaders are expected to be both experts and managers, but it is unclear where the emphasis is and what the basis for evaluation is. One description of project organization likened the experience of the project participant as “playing a game of musical chairs” – an aberrant alternative to a steady life-long job with clear career prospects. There are also consequences for professional identity when technical expertise is the pre-condition for hiring, but is suddenly not the central qualification or is branded with a low value in practice.

(3) Knowledge generation in closed vs. open spaces

One of the difficulties for competency development in processes of distributed work is that the traditional way in which skills are acquired and experience is developed occurs in a “closed” space (Meil 2000). Highly skilled employees are products of nationally-based institutions of training and further training where they acquire their formal skills and specific areas of expertise. Then, the continued development of knowledge takes place within the company, usually within hierarchically organized functional departments. We call this form of competency development the “container model” (see figure 1).

The way knowledge is generated in this closed system can be counterproductive for the requirements that face skilled workers and engineers in processes of distributed work. In distributed work processes, competence acquisition and development is a continuous process of exchange between departments and functional areas within companies.

Across companies, it entails the exchange between different training traditions, cultural backgrounds and working habits. Therefore, the type of expertise and experience acquired in container type organizational structures affect the opportunities for the creation, acquisition and development of knowledge necessary for the dynamic, conflict-laden, broad-based knowledge and experience found in distributed work contexts. The point is that the way workers are taught and the way experience is accumulated both before entering the company and afterward, hinders the *acquisition* of knowledge and competencies that are demanded. Knowledge is created in concrete, spatially bounded learning contexts and work processes.



The *implementation* of knowledge, however, takes place in different spaces, both within and across company contexts. This leads to a complex interaction between knowledge production tied to a particular place and the exchange of results which takes place across large distances. Out of this situation, a fundamental tension arises in which competencies are generated over a long period in territorially and socially embedded systems, but are used and exchanged in temporally limited and spatially disparate dimensions that go way beyond company boundaries. Projects have a key role in this exchange process, because they represent the links between the inside and outside. Thus, projects become the pool where newly reintegrated, quasi-connected pieces of knowledge come together. In this way, project participants take on an important linking function in regulating knowledge and information flows between the different company sites. (Meil et al. 2004)

One consequence of the container model of acquiring knowledge for project work is that it creates obstacles for obtaining one of the central requirements for distributed work: process competence. Project members have to attain an extremely good and broad understanding of the entire range of processes in the development of their product and its delivery. Traditional divisions of labor do not promote obtaining an overview of the pieces and their links to one another.

(4) Different types of knowledge

Besides the creation of knowledge, another crucial issue for competency development in project-based work is the utilization and mobilization of knowledge, especially the changing importance between different types of knowledge.

Table 2

Formal Knowledge Processes	Informal Competency Processes
Standardization	Flexibility
Codification	Problem-solving
Technical-scientific expertise	Tacit knowledge, experiential learning
Specialization	Conflict resolution
	Negotiation
Occupational identity (work centered)	Use of the „entire“ person

This table summarizes the different knowledge types that are associated with technical work in product development. The left hand side lists the so-called objective, informational types of

knowledge that are linked to competency profiles of technical employees, and in work with ICT mediated processes. The right side lists the behaviorally anchored, subjective elements associated with working in new distributed work environments.

Moving toward the „objective“ types of knowledge is often the unspoken goal of companies: blocks of knowledge that can be measured, managed, and formalized. The problem is that they are often in direct contradiction with the subjective demands which are continually increasing as work becomes more complex, dispersed and interactive. (Böhle, Meil 2003).

Given the large number of uncontrollable processes and critical situations that are part of the distributed work organization, companies try to introduce planning procedures and tools to reduce the breadth of discretion available to project members. The goal is to make knowledge use as standardized and codified as possible. Not surprisingly, these attempts are only marginally successful. Despite efforts at formalization, within project groups, especially the project leaders find their competence profile shifting from an expert-based one toward a socially interactive one, with dimensions such as conflict resolution, negotiation, representing and pushing through company interests, pacifying customers, etc. taking on importance. Competency requirements are simultaneously technified and obfuscated: there are plans and tools and procedures and standardization, and at the same time there are vague requirements for social competencies. Here again the existence of conflict, whether of interest or organizational structure, is obscured. Not officially recognized, trained or compensated, these competency demands get individualized, that is passed on as an inexplicit expectation for the individual project member or leader.

The combination of the traditional way that learning and training continues to be practiced with the orientation to standardize, formalize, and plan makes the utilization and mobilization of the knowledge actually needed for distributed work difficult. It should also be added that the orientation of the actors in projects adds to the difficulty. Generally technically trained, project members in product development tend to see attempts at codification, formalization and standardization as the correct means of action. Thus they themselves underplay the significance of the social dimension of competency and tacit knowledge that is making up a larger and more important part of their working profile. Both the institutionalized and subjectified obstacles to preparing project members for their work is another element that adds to the extreme stress and pressure experienced in their jobs. The project leader, in particular, takes

on a key position, in which the use of tacit knowledge for selecting, combining and applying the wide range of information that is available becomes critical.

For the companies, which do not recognize the mismatch in the training and organization that is provided, the competency requirements often get reduced to personality trait issues. When asked what the criteria are in the search for appropriate candidates for project leaders, managers often reply that it is a “matter of character type.” The opinion is that certain types of people naturally have the ability to deal with conflicts, or deal with ambivalent situations, etc. This view not only closes off a path of development for a number of potential candidates who do not appear at first sight to possess the “right” personalities, it also makes organizational and training measures to support project work irrelevant. Thus, in the shared responsibility between company and individual for knowledge acquisition, the position that the necessary skills are a matter of “personality” leaves the onus of either acquiring the social skills for project work or bringing them to the workplace up to the individual. The entire issue of how to promote the acquisition of tacit knowledge, not to mention the problem of how to create the learning conditions for the transfer of knowledge and experience, is a major one. If the emphasis remains on technical solutions and otherwise presumes the existence of appropriate personality types, the problematic of determining the reliability of tacit knowledge or the conditions necessary for its promotion and transfer do not get addressed.

Finally, the social dimension of the competency requirement further underscores the company’s use of the “whole” person in the work process. Along with the elimination of time boundaries – project work can rarely be confined to a normal bounded working day; along with the elimination of space boundaries – distributed work takes place across distance and requires mobility away from home and family, comes the additional elimination of the division between the working person and the private person. (Boltanski and Chiapello 1999) The company benefits from the use of the whole person, but as with so many aspects of project organization, there is no attempt to compensate the project members for the additional competency which they are bringing into the work process.

V. Concluding remarks

The issues of competency or knowledge often get discussed de-coupled from the organizational context in which they are embedded and in which they arise, get accumulated, hindered, or developed. Those focussing on competency needs don’t have generally have a

great deal of interaction with the level of the work process. Therefore they don't see issues of conflict, power, and political considerations that impact on training and skilling practices. A vague remedy of "training is needed" ends up as a catch-all phrase to cure individual and organizational difficulties.

At the level of the organization, there is not much understanding for the creation of knowledge out of information or that processes of transfer involve both elements of content, but also elements of promoting interests. Just as with generic remedies for training, for project management one hears that "better instruments for managing information and data exchange are needed." This paper argues that competency demands that are difficult to formalize are increasing greatly for workers involved in project-based distributed work. Although this is recognized in some ways, a common approach is to search for a means of standardization so that data management systems can overtake a greater role and supposedly decrease risk.

In fact a further, if indirect, byproduct of the use of ICT on knowledge development is the overall trend toward an increasing depersonalization of human resources through the offshoring of human resource activities (for example the growing appearance of Electronic Human Resource (EHR) systems in large companies). The rise of such measures doesn't leave much hope for finding new ways to integrate new requirements of competency development with organizational change.

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