New Knowledge in Global Innovation Teams

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ABSTRACT: In multinational enterprises (MNEs), global innovation teams are used increasingly to pool knowledge from different international subsidiaries. While it is fairly well described how subsidiaries fulfill product and know-how mandates, how parents and subsidiaries may/should interact and why team diversity is desirable from the corporate standpoint (i.e. to strengthen corporate culture), little is known about the possible innovation and technology knowledge-related benefits global innovation teams offer. In this paper, it is proposed that resources, customer knowledge, knowledge diffusion, and knowledge protection play a crucial role in a MNEs decision to deploy a global innovation team. Results from four case studies and two expert interviews show that there are indeed significant reasons for a global team deployment within innovation projects.

KEYWORDS: Global Teams, Innovation, Knowledge Creation

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1 Introduction

The use of distributed participants in product development team organization is becoming more and more prevalent (McDonough et al. 2001). The success of this form of innovation team organization has been studied extensively. These studies focused mostly on the effect of team characteristics, such as cultural or professional diversity, or on team performance. The aim of this paper is to study the motivation for and the impact from the deployment of global innovation teams. This picks up a research thread from Gerybadze (2004) on the Management of global teams with consideration to both 'hard' and 'soft' issues.

In our research, we want to explore why the organizational mechanism of a global instead of a local team[2] is chosen for some innovation projects. We adopt a bottom-up approach by analyzing global innovation teams in order to identify factors that have lead to the deployment of the global team, and to understand what contribution to the innovation process a global team offers that could not be supplied by a local team. We expect that the main driving force behind the deployment of global teams will turn out to be knowledge and various aspects of knowledge creation. We are concerned here with the second of three innovation processes described by Pavitt (2005), that is, the translation of knowledge into working artifacts. Specifically, we address the process of innovation on the level of organizational mechanisms, i.e. a project team.

The common perspective on knowledge development and sharing is that of an initiative or mandate for innovation. Here, larger structures within an MNE are studied in a top-down-approach. We will describe these as the classic example of global R&D. Then we will go on to outline what is emerging as a new form of innovation organization, the global innovation team. To approach the subject of why MNEs decide to use global innovation teams, we conducted an explorative field study and present four cases to describe the reasons for global innovation team deployment. In this paper we first describe the role of the classic innovation structure within MNEs, the R&D mandate. Then, we review the concept of a global innovation team and discuss results from previous studies on team structure. We conclude our literature overview with a set of propositions about the knowledge-related contributions a global team could offer for an innovation process within an MNE, and describe some of the paradoxes that derive from these propositions. A detailed presentation and analysis of the four case studies follows. The paper closes with comments and

[2] We define global and local teams as follows: A global team is comprised of members from at least two different countries who stay in their respective countries while working for the team. A local team's members are located at the same subsidiary within a country. This definition follows the definition by McDonough et al. (2001, p. 111), which is briefly presented in section 3.

suggestions for future research.

2 Initiatives and mandates for innovation in MNEs

If dealing with technology and knowledge sharing as well as its transfer across the MNE network, International Business Research has in particular argued for different subsidiary mandates and initiatives. Approaches usually describe power and competence distribution between a subsidiary and the headquarter.[3] Past research has distinguished subsidiary roles in the MNE network by the gravitation center of core research and development (i.e. strong home-base, centers of excellence, embedded ness of MNEs in sticky clusters/industrial districts) or by patterns of interaction and responsibilities (in particular HQ-subsidiary relationship characteristics).

Sölvell/Zander (1995), based on previous International Business Research of several other authors in Strategy and Organization, categorize MNEs into home-based versus multi-home-based versus heterarchical MNEs. The home-based MNE keeps decision-making, R&D and engineering at the home-base resp. home country/region, whereas subsidiaries are there to exploit foreign markets by the home-based competitive advantage. The multi-home-based MNE is characterized by acquisitions and alliances; subsidiaries may thus carry out core MNE functions or serve as centers of excellence in particular business fields. Sölvell/Zander argue, specialized subsidiaries access „diamonds“ outside the home country, i.e. access to specialized labor pools or advanced customers. Opposite to the home-based MNE, in the heterarchical model core functions are geographically dispersed and responsibilities are changing over time. Considering the new flexibility of MNE mandates, Cantwell/Mudambi (2005) summarize the role of subsidiaries by distinguishing between “competence-creating” and “competence-exploiting” mandates (see Table 1).

Competence-creating mandates	**Competence-exploiting mandates**
- Internationally integrated MNE innovation network - Home-base augmenting investment (Kuemmerle 1997) - Centers of excellence	- Market serving subsidiaries without R&D competence - Home-base exploiting investment (Kuemmerle 1997) - No centers of excellence

Table 1: Characteristics of competence-creating and competence-exploiting mandates (Source: Cantwell/Mudambi 2005, Table 1, p. 1110, modified)

Above research streams have asked for how to distinguish the contributions of different subsidiaries

[3] For a comprehensive literature review on MNE subsidiary initiatives see Borghoff (2004).

from the headquarter and from each other, but they have not addressed collective action from non-collocated units as a mode of recombining given diversified knowledge stocks. In particular global teams have been neglected by international management research, although topics like initiative taking and mandates within the MNE have been addressed for years. Global innovation teams' generic competence is still quite unclear. To recombine given diversified knowledge stocks, however, could by nature be the mandate of a global team as it is located at several subsidiaries at the same time (globally dispersed team members).

3 Global Teams

Various terms have been used to describe teams with members in different locations and teams with members in the same location, such as distal and proximal or virtual and proximal (Workmann, 2007), dispersed and collocated (Polzer et al. 2003, Polzer et al. 2006), or transnational (Adenfelt/Lagerström 2006)[4]. An interesting definition was presented by McDonough et al. (2001, p. 111). They distinguished three forms of team organization: collocated, virtual, and global. The two variables or dimensions on which these forms vary are location of the team members, and culture. If the team members are located in the same place and share the same culture, they form a collocated team. When they are dispersed over several locations, but culturally similar (most likely when the team is dispersed within a single country), they form a virtual team. Only when the team members work and live in different countries and are culturally dissimilar do they form a global team. Our use of the term global team, as given above, follows this definition.

In section 3 we compare advantages and disadvantages of global teams from the MNE perspective. Furthermore, we show that there is a research gap as to why global teams are deployed. Rather, past research has focused on how to deal with challenges posed by global teams (in particular virtual team/business informatics research: virtual communication; or management research: conflicts through dislocated members), but also it has stressed particular expected soft benefits like profiting from a variety of inputs (in particular management research: diversity). In this paper we instead balance challenges of global teams with their contribution to innovation to deliver criteria for business to choose between the deployment of global or local teams. We find that global rather than local teams can be virtual, perform low with regard to project costs and time-to-market and that they may contribute different to knowledge sharing and knowledge creation within the MNE network. These aspects are addressed by the following subchapters.

[4] In this study, no local team structures were discussed.

3.1 Team Virtuality

All these descriptions focus on the spatial configuration, and sometimes the cultural diversity (or non-diversity) of a team. However, only the spatial dimension of team structure is of interest in this paper. We feel it is necessary to separate some terms from our usage of the label "global innovation team", and specifically to show the distinction between the more spatially oriented dispersion, and the more technology-oriented virtuality of a team. We posit that the virtuality of a team is a dimension separate from the two already described above. It follows, then, that a team can be both local and virtual, or both global and not virtual (although that might rarely be the case).

Global teams, whether virtual or not, are said to benefit from cultural diversity (Dubé/Paré 2001). Hence, they provide better and versatile ideas. Global teams are defined by a geographical dispersion of their team members, whereas virtual teams are characterized as such which are primarily coordinated and linked by IT-technologies (Dubé/Paré 2001, Malhotra et al. 2001). Malhotra et al. (2001, p. 229f) illuminate virtual teams as follows: "Suppose there is a ship canving a team given the task of creating a radical innovation … [which] will come from bringing people together from different companies, disciplines, products, markets, processes, and industries … We want the best and the brightest that the company has to offer; the person who deeply understands the company's core competency, not just uses it; the 'best able.' However, because these people are the best, they are already involved in many internal company projects. How do we get them on our ship? We don't. We dismantle our ship, send everyone home, and create a virtual ship where everyone works on the creative project from his or her desktop, so that team members can remain available to both their parent organization and the creative team." Global dispersion and virtuality as team characteristics are summarized in Table 2.

Global (versus local)	- Dispersed members, but regular or kick-off face-to-face meetings - Assigned membership - Agreed work shares per site
Virtual (versus real)	- Dispersed members, no or no regular face-to-face meetings - Electronically-mediated communication - Community-like self-subscription (i.e. open source projects) or Assigned membership - Unpredictable contributions per site

Table 2: Defining "Global Teams" and "Virtual Teams" (Source: Malhotra et al. 2001, own illustration from text)

Virtual teams (but also global ones) in contrast to local teams, however, need to build a shared understanding among their members about the problem to be solved, to set up rules (knowledge capture, sharing & use, work shares, and responsibilities), and to establish a common context for interpreting the created or absorbed knowledge (Malhotra et al. 2001, Gerybadze 2004).

Given all these obstacles to effective teamwork, we thus ask why MNEs employ global teams. Diversity could also be reached by impatriates/expatriates programs, creativity can also be increased by creativity labs, job rotation etc. We suggest, that global teams contribute to innovation processes and knowledge transfer in a unique and significant way, so that coordination costs and obstacles (see Table 3) pay off.

Management factor	**Issue**
Team objectives	- Emergent, changing
Development of a shared understanding	- Must be created since there may be no common allegiances
Frequent opportunity for interaction with team members	- Collocation infeasible as members having primarily obligation to their own company [global teams: regularly collocation, but at long intervals]
Role definition	- Must be flexible to respond to emerging tasks, problem, and solution
Coordination norms	- Difficult to define upfront

Table 3: Challenges to virtual teams (Malhotra et al. 2001, Table 1, p. 233, modified)

Technology is generally seen as project enabler in virtual teams (Malhotra et al. 2001) or, one variable describing the degree of virtuality (Chudoba et al. 2005). However, taken from in-depth interviews we can separate software in two streams: first, virtual teams at best need face-to-face simulating communication tools like video conference rooms, second, collaboration tools like issue management systems are needed to document recent problems and solutions as well as to signalize the status of the team project. Altogether, the term virtual team connotes a heavy use of information and communication technology within a dispersed group of people, with a research focus on the design and implementation of tools and applications in this field. Since we want to focus our research on the management of knowledge rather than the processing of knowledge, we decided to use the more management-oriented term of global to express and describe a team that is both spatially dispersed and culturally dissimilar.

3.2 Performance of Global Teams

Team performance is studied with respect to a wide range of variables that could influence performance. We have selected three studies to demonstrate that performance of global teams is prone to be lower than in local teams[5]. However, the evidence is not unanimous. McDonough et al. (2001) investigated the use of various forms of teams in multinational enterprises, and the differences between those teams. What they found was that global teams face greater behavioral challenges and are associated with lower performance than either collocated or virtual teams. While McDonough et al. present and research management issues concerning global teams and the use of this form of team (with a US bias, since their sample consists entirely of US companies), they only briefly comment on the decision local vs. global (see section 3.4) and do not discuss the matter of knowledge as a factor in team management. Workman (2007) studied schedule deviation and budget deviation on projects as performance indicators. He found that performance in teams decreased if they were either fully collocated or fully distributed. This is explained by the increasing negative effects of group cohesion. Very strong group cohesion leads to an isolation of the group from outside influences and damages the interactions of groups with their environment. Very low cohesion, on the other hand, limits the commitment of group members to the group task. Another result of his study was that conflict increased when the team was either fully collocated or fully dislocated, leading to decreased performance. Unsurprisingly, Workman argues for a hybrid team form to avoid the damaging effects of either full collocation or dislocation. Reasons for the use of virtual teams were not examined in this study. Kankanhalli et al. (2007), based on three in depth case studies, formulated a model of the relation between several relevant factors of global virtual teams (diversity, communication means) and task and relationship conflicts. These task and relationship conflicts in turn influence the performance of the virtual team. Since virtual teams are more likely to experience conflict, because they show more characteristics that can cause conflict, it can be assumed that a virtual team will suffer from conflict-related performance decrease.

The studies of McDonough et al. (2001) and Kankanhalli et al. (2007) suggest that local teams will perform better than global teams. Workman, on the other hand, paints a more complex picture, arguing for a mixture of global and local team structures to achieve best performance. These studies do not take into account the nature of the task a team is working on. Nevertheless, the fact that a global team faces more complex issues in its organization and management than a local team makes

[5] Berg (2006) also discusses the performance of global teams, but she defines a global team as a team consisting of members from different cultures working together, but not necessarily in different locations. Although she mentions team virtuality, the relevant characteristic for her paper is culture, not distance.

us assume that there is ample reason to state that a global team will have more difficulties to perform well than a local team. Other complications are presented in the next section.

3.3 Benefits and challenges of diverse teams

Further benefits and challenges for global teams can be derived from the study of team diversity. Diverse teams are also sometimes called global teams (Berg 2006), because team members come from diverse national and/or cultural backgrounds. It is safe to assume that a team that is of international composition, such as the global teams we are interested in, will also be diverse as to its cultural background. Most of the studies find that diverse teams offer an advantage in regard to creativity. A higher level of creativity is expected from culturally diverse teams, although it takes careful management (Gassmann 2001). According to an experimental study by Watson et al. (1993), over longer observation periods, multicultural groups achieved the same level of problem solving performance as did non-diverse groups[6]. The challenges to a global team have been studied in the context of group cohesion and communication. It was found that the dispersion of a group of people is detrimental to communication within that group (Allen 1977). Dispersion also leads to difficulties with cooperation (Boutellier et al. 1998). A multicultural team has trouble resolving conflicts (Kirchmeyer/Cohen 1992), creating cohesion (Watson et al., 1993), or building trust (Boutellier et al. 1998, Bradach/Eccles 1989, Jarvenpaa et al. 1998, Mayer et al. 1995). Also, multicultural groups often fail to realize their potential in making complex decisions (Adler 1997). Together, these factors are probably responsible for a reduced performance of global teams.

With all these hindrances to dispersed teamwork, it is not clear why MNEs would deploy global teams when they have the alternative of using a local team. We are aware, however, that the team form is not necessarily a free choice. We are particularly interested in situations where MNEs choose global teams to accomplish innovation objectives.

3.4 Global teams' contribution to innovation

According to Maznevski et al. (2000), global teams are temporary intra-organizational networks, which create social capital for the MNE network. Making or implementing decisions for the MNE, they embed knowledge (intellectual capital) in social structure. They do so through accessing and recombining knowledge, skills and capabilities. Maznevski et al. argue that there are "intangible

[6] For an extensive review of recent literature on intercultural teams see Berg (2006).

resources lying in relationships among people [resp. team members] (p. 8)." Issues are trust, network configuration, and transfer of tacit knowledge (p. 17f). If understood as relational resource, a global team's knowledge resp. social capital cannot be owned or appropriated by a particular party. By referring to Nahapiet/Ghoshal (1998) and Lin (1999), Maznevski et al. (2000) argue that global teams contribute to social capital from a structural perspective: Global teams' outcomes are better information flows and better knowledge sharing mechanisms as well as increased influence in the MNE network through social ties, recognition and credentials. Global teams also create shared representations, interpretations, and systems of meaning among team members (cognitive dimension of social capital, Nahapiet/Ghoshal 1998 in Maznevski et al. 2000, p. 12f).

Anand et al. (2003) describe global teams by both knowledge-processing activities ("knowledge acquisition, knowledge integration, and knowledge creation," p. 16) and knowledge structures ("knowledge differentiation," and "knowledge externalization," p. 17). Global teams may here be understood as boundary spanners between MNE units or between MNEs and their knowledge environments. The authors point out that the team possesses different types of knowledge (coming from diverse functional backgrounds resp. business areas) and a team member's absorptive capacity defined as to Cohen/Levinthal (1990) may differ between the different backgrounds. Differentiation and knowledge integration affect each other, when different knowledge stocks of the different team members must be combined to a set of knowledge, i.e. to create knowledge for complex tasks. Concerning R&D, Anand et al. (2003) argue with regard to Ashby (1968), global teams may create novel product solutions, inspired by the variety of the team's knowledge. The externalization of knowledge structures analyses, how knowledge from non-members can be used (acquired or integrated) by the team. Concerning knowledge acquisition, teams should be aware of external experts and should not outsource tacit knowledge creation, as it is harder to transfer than explicitly documented knowledge. Externals may also challenge accepted knowledge interpretations of the team and thus bring new knowledge or, be valuable to validate the team's knowledge.

Global innovation teams could also serve as coordination mechanism for technologies and knowledge (Gerybadze 2004, esp. Figure 3, p. 110). As global teams are possibly cross-functional and members may have experience from earlier projects, they could also function as knowledge integration mechanisms (KIM) to improve product innovation performance within the MNE network: De Luca/Atuahene-Gima (2007, p. 97), define KIM as "structures and processes, such as the use of documentation, information-sharing meetings, analysis of successful and failed projects, project reviews, and briefings by external experts and consultants, that ensure the capture, analysis, interpretation, and combination of knowledge within the firm." Global teams as KIMs could

facilitate cross-functional collaboration and mediate market knowledge to the benefit of the MNE network. Adenfelt/Lagerström (2006) took a similar perspective on transnational teams and Centers of Excellence as knowledge development and sharing mechanisms. Using a case study design, they compared a Center of Excellence and a transnational team in regard to knowledge development and knowledge sharing. The Center of Excellence had difficulties in combining these two areas, and focused more on knowledge sharing and less on knowledge development. It relied on past relationships with receiving subsidiaries for successful knowledge sharing. The transnational team experienced several problems in the beginning. There existed neither interpersonal relationships, nor shared structures or practices in the team. Also, the knowledge was asymmetrically distributed within the team. But in the course of the project, the team members brought together their individual knowledge and learned new ways of knowledge development. The knowledge sharing was facilitated by the fact that the team members came from different subsidiaries, the "not invented here" syndrome was prevented. The authors suggest that an informed decision for one or the other organizational mechanism requires that the management considers the aim and context of a given knowledge development or knowledge sharing project.

To conclude, global innovation teams could perform better than local teams in accessing different approaches how to solve product development problems, dispersing market knowledge and knowledge about costumers into the MNE network; recombining different knowledge stocks, represented through different cultural experience and market background of its team members; and taking innovation risks as responsibility blurs between the participating company units.

Thus, we expect to find the following reasons for the deployment of global teams in MNEs. McDonough et al. (2001) briefly discuss why the use of global teams is becoming more frequent. In conversations following their initial interviews they learned that the worldwide dispersion of company resources makes it more practical and cost-efficient to form global teams rather than bring these resources together in one location (McDounough et al. 2001, p. 117). Another important aspect is the emergence of centers of excellence within MNEs, as briefly reviewed by Adenfelt/Lagerström (2006) in their research on knowledge sharing within MNEs, and described by Frost et al. (2002) and Holm/Pedersen (2000). It is desirable for an MNE to include experts from these centers into innovation processes to leverage the available knowledge within the organization. This brings us to our first proposition for the contribution of global teams to innovation:

1. *Global teams may embed new local experts and other innovation resources, in particular special technologies, into the global MNE network.*

The use of local knowledge about customers to develop products for global markets is briefly mentioned in McDounough et al. (2001, p. 117) as a reason for the deployment of global teams, but is not further explored there. Gerybadze (2003, 2004) describes a change in innovation mode from research and manufacturing & logistics driven to lead market & demand driven (esp. Gerybadze 2004, p. 106), which will lead to more integration of local employees from the lead market into the innovation process for this market. Thus, the second area of contribution for the use of global innovation teams is as follows:

2. *A global team possesses knowledge about customers in various markets, and works on innovation with regard to the customer perspective.*

The dual role of the members of a global team allows them to acquire knowledge within that team, and at the same time make use of that knowledge in the local setting to which they originally belong. A transfer of the knowledge created within the global team into the local organization should happen via the local team members, and thus faster than knowledge brought into the local organization through external means or through single subsidiary initiatives. Therefore, we expect the following contribution by a global team:

3. *Global teams facilitate a synchronous diffusion of the created knowledge into the MNE subsidiaries.*

Cannice et al. (2004) study the use of technology protection means beyond ownership structures and describe the use of dependent technology to discourage misappropriation. One way of achieving dependence is to distribute functions between employees of different subsidiaries (Cannice et al. 2004, p. 142). Nieto/Pérez-Cano (2004) discuss the dependency of knowledge as a characteristic of technological knowledge. A higher dependency will result in better protection against misappropriation of this knowledge. We conclude that a competitor would have to hire all members of a global team to fully use / copy the technology developed by this team. This is an interesting aspect for the use of global teams, where the distribution of functions and work packages can lead to such a compartmentalization. This leads us to regard global teams as a knowledge appropriation mechanism[7]:

[7] For appropriation mechanisms, "APMs," see Winter (1987). The dispersion of knowledge through non-colocated, globally dispersed team members could serve as an informal APM.

4. *Global innovation teams allow the firm a better appropriation and protection of the created knowledge, since it is more difficult and costly for competitors to hire away all the team members simultaneously. Thus, the knowledge stock as a whole cannot be copied fast or at reasonable costs.*

Above four propositions and previous research are contradicting in some aspects and lead us to posing a set of paradoxes, which will be further explored in the following case evidence. First, team research shows that local teams perform superior in regard to knowledge creation, while global teams are hampered by difficulties in the creation process. Global teams, on the other hand, are very useful for the diffusion of knowledge within a multinational company, whereas local teams do not, per se, improve knowledge diffusion. How then do companies who use global teams balance these two performance issues? Second, global teams allow for better international knowledge diffusion within the company and provide better appropriation of knowledge by raising the difficulty of hiring that knowledge away from the company. How can a global team promote intra-organizational knowledge diffusion and inhibit inter-organizational knowledge diffusion at the same time? Are companies able to leverage both advantages?

Additionally, we assume that knowledge can not only stick to geographically bound structures (i.e. leading R&D centers or clusters and industrial districts) or local teams resp., but also to ties between dispersed team members. These ties connect deeply specialized knowledge to facilitate innovation variety and technological progress.

4 Case findings

4.1 Method

Possible motivations for the deployment of global innovation teams are only partially evident from past research and literature. This requires explorative research to study the stated contributions and to identify further contributions, since we are asking why or in which situations global teams are preferred (Yin 1995, p. 9). Case studies were conducted to distill relevant aspects of global teamwork, which would lead a company to prefer a global to a local team solution.

Our aim was to study teams with a global configuration (team members in two or more countries) in multinational corporations. 13 representatives from such organizations were contacted and asked to participate in our research. Nine had to decline because of time constraints on their part or because

their team experience did not involve global teamwork. We interviewed one representative each from four project teams in three large multinational corporations (Company A, B, and C, see Table 4), using a semi-standardized questionnaire (see Appendix B). Each interview lasted approximately one and a half hours and was conducted in German. For Case 1, we were able to use material previously collected for another case study (Gresse 2007). In addition, we spoke to two experts from two other MNEs (Company C and D), who had worked in global innovation teams or had other experience with such teams, for instance as consultants to global teams.

4.2 Cases and Expert Interviews

The cases described here are not representative. They serve to illustrate the field of study, and to draw conclusions on relevant aspects of global teamwork. We observed similarities which might have occurred due to the fact that all projects serve internal customers or due to the fact that all projects are software related in their content. The following Table 4 provides an overview of the cases.

	Project lead	Type of innovation	Schedule	High workload [a)]	Country: # of Project Members
Case 1 **Company A**	Strategic: Home country, USA Management: Foreign country, Germany	Product: Adaptation of a new leasing contract management software	2006 - 2008	Given Requirements: USA New Project Requirements: Germany Doing: India	Team sites: USA:4-6 Germany: 15 Doing sites: India: approx. 40 Hungary: 2-3
Case 2 **Company A**	Strategic: Foreign Country, Germany Management: Germany	Product: Development of a web front end for credit check solution	2000 - 2001	New Project Requirements: Germany and France Doing: Belarus	Team sites: Germany: 4 (1 customer included) France: 4 (customers) Belarus: 5
Case 3 **Companies B and C** **(legally interdependent)**	Strategic and Management: Both home countries, USA (Company B) and Germany (Company C)	Process: Improvement of a hardware-software interface for software download	2002 – 2003 (but several follow up projects in the different product lines)	New Project Requirements and Doing: Germany and USA	Team sites: USA: 5 Germany: 4
Case 4 **Company C**	Strategic and Management : Home country, Germany	Process: New software to control flows of requirement and technical data	2005 - 2008 (possibly until 2010)	New Project Requirements: Germany Doing: India and Bulgaria	Team sites: Germany: approx. 200 Doing sites: India: approx. 30 (specialized know-how) Bulgaria: approx. 20 (standard programming)

a) Given Requirements: Rules, process descriptions and targets specified before project start.
New Project Requirements: Rules, process descriptions and targets developed by the project team.
Doing: Activities to fulfill the project requirements.

All projects serve only internal, but not external customers.

Table 4: Case studies overview

4.2.1 Company A, Case 1: Adaptation of a new leasing contract management software

The goal of this project is to adapt and implement a bundle of software applications which support the management and administration of leasing contracts for the products of Company A. These products range from less expensive machines bought in large quantities to very expensive hardware that is usually sold as single units. The administration encompasses all stages of the leasing process, from the negotiation of a contract to its formulation, the regular invoicing, and the termination of the contract. The project is innovative for the German subsidiary, as it will change the way leasing contracts are handled. The project is still running, it was started in late 2006 and should be completed by early 2008. Whether this project was ever considered as a local project cannot be answered with the available data. But since the core know-how of global process and software bundle lay in the USA, it is difficult to imagine how this could have been implemented with just a local team.

The leasing business for Germany is handled by a local business unit of the German subsidiary of US-based Company A. The core of the project team tasked with the adaptation is drawn mainly from the IT unit of the German subsidiary. In order to successfully complete this project, a wide range of expertise is necessary. The main areas of expertise are the global leasing process, the functioning of the software bundle, the leasing process in Germany, and the actual programming to adapt the software. The implementation of the software bundle will allow Company A to unify its globally dispersed leasing business, to offer global leasing solutions to multinational customers, and to outsource routine work to low-cost countries. This will be a major innovation to the leasing business of Company A, influencing the worldwide management of leasing contracts, if it can manage to integrate enough national business units into this process. A global process of leasing contract management has been developed to achieve this, and the German subsidiary is expected to comply as much to the global process as German laws and regulations permit.

In this project, three main parties are involved: the global team, the internal customer, and a programming team in India. First, the global team consists of employees from the USA and Germany. The US-team members have knowledge about the global process, the software bundle, and have experience with implementation projects of this software in other subsidiaries. The German team members possess knowledge about the local German IT infrastructure and about the general leasing process in Germany. The task of this global team is to define requirements, solve issues, promote the new software bundle and accompanying process changes, and handle change

management on site. Second, the internal customer is the business unit for leasing contracts. Employees from the customer side of this project can be requested to give advice for specific problems regarding the adaptation to the German leasing situation, but are not part of the global team. They contribute knowledge about laws, regulations, tax and accounting issues as well as general process knowledge. Knowledge from the internal customer is crucial in this project, as the software has to be implemented into the core process of the customer unit within Company A. Third, all changes and adaptations of the software that are necessary for an implementation in Germany will be implemented by a programming team in India. They are part of the Indian subsidiary of Company A.

The global nature of the project team offers several advantages to the organization. The team members from the US have previously been involved in other localization projects for the same software, and thus have experience both with adapting the software to new organizations, as well as a good understanding of cultural differences. The experts on site provide the necessary process knowledge needed to adapt the new software. Additionally, the programming team in India allows a cost-efficient realization of any necessary changes. However, some disadvantages became evident during the project. US-team members are not working full time on the project, and their time budget is restricted, which means that they are sometimes not available to give assistance as the project requires. Communication is conducted mainly via Emails, Chat, a team room, and telephone conferences, with sporadic face-to-face meetings. It turned out that these communication methods are sometimes cumbersome. Furthermore, there is conflict potential in that Headquarters would like to see as much of the global process implemented as possible, while the German customer unit would like to keep as much of its current process as possible.

The time-to-market, or implementation time of this project, is only partly influenced by the fact that the team is globally organized. An advantage for this is that software can be tested on German servers while nobody is working in Germany, but any problems that remain after the test will only be discovered the next day during regular working hours, and can only be dealt with the next night.

4.2.2 Company A, Case 2: Development of a web front end for credit check solution

Company A is in the process of unifying its global business, and is trying to achieve this on all process levels. One of the levels considered for unification is the credit check process. This credit check verifies the credit rating of a customer of Company A, taking into account information from rating services, other existing contracts with this customer, and the nature of the proposed business.

To allow for faster credit checking processes, it was planned to automate this process as much as possible. Until a new, worldwide solution could be developed, some European countries were advised to adopt the German solution, which was flexible enough to be adapted to other countries' legal and other additional requirements. But the user interface for this software was still on a basic application level, which forced the employees to enter information manually that could be made available automatically. Therefore, it was decided to design and implement a web front-end for this credit check. This will allow partial automation of the credit check process and lead to optimized performance of the process, thus saving time and costs for Company A and its customers. Also, this will make credit checks in regard to contracts more comfortable and easier for the employees. The software was to be implemented in Austria, France, and Germany. This project was started in 2000 and completed in 2001. This project could have been completed locally, but it was decided to form a global project team for several reasons. The integration of representatives from the customer side allowed for better requirements definition for the software, while the low-cost advantage of the Belarus location helped with project budgeting. From the start, it was planned to implement the software sequentially in the local units.

The global team consists of people at three international locations with specific functions: a development and project management group in Germany, customer representatives in France, and programmers in Belarus. First, a development group was set up in Germany to design and implement the software. This group handled project management as well as the building of the architecture for the software. They had knowledge about software architecture, programming, and project management. Second, a member of the German development group was also functioning as the liaison for Austria in order to incorporate Austrian requirements into the development process. Employees from the business unit in France were assisting in the project to provide knowledge about French requirements. This project was set up to change a specific process part of the customer units' business. Therefore, knowledge about this process was essential to complete the project. Third, the actual programming was handled by the group in Belarus, which received their instructions from Germany and worked on modules of the software, which they then compiled and tested. To be able to do that, the German team members had to explain the credit check process to their Belarusian colleagues.

An important advantage of this project group configuration was that employees with experience of the local processes were tasked with designing the new software. The programming in Belarus allowed for inexpensive realization of the design. The integration of country representatives made

the implementation of country specific changes possible and was an advantage to the local acceptance of the new software.
No real disadvantages were experienced in this project. However, the Belarusian programmers first had to be briefed on the processes and functions of the credit check in order to be able to work on the software. This negated some of the advantages of having a programming team in a low-cost-country. On the other hand, it would still have been more expensive to hire Western European programmers.

4.2.3 Companies B and C, Case 3: Improvement of a hardware-software interface for software download

Company B and C, legally interdependent, are both doing the same product business. They are using electronic control units (ECU) in their products, which have to be equipped with software during their installment into the final product. This process, but also the sourcing of related components were issues in the case described here. In particular, both companies decided to develop one standardized, shared procedure to equip hardware (ECU) with embedded software. The global team especially focused on describing the software download procedure by one bundle of specification documents. These specifications were to be applied to the product lines of both companies. Furthermore, companies B and C could profit from sourcing ECUs more consequently together in future. Thus the project is intended to generate synergies and economies of scale from dispersed work between USA and Germany.

One subgroup of the project team was stationed in Germany, another in the USA. It was clear prior to the start of the project that the two organizations were dissimilar in regard to project management as well as technological approaches. Through initial workshops, trust and a common understanding of the project were developed. After that, the groups worked on their tasks separately, with regular coordination sessions, mostly via telephone conferencing, but sometimes with face-to-face meetings, where work tasks were distributed. At the end of the project, a common standardization document was produced and the standard was introduced in the country units.

The global team's know-how is mainly about how to create and how to implement effective process specifications. Its members are employees from R&D or R&D-near company units. As all members spend most of their working time in the primary line organization,[8] other R&D-near employees can contact the global team via informal ties. Furthermore, through their line function the global team

[8] The project bundles different company units rather than selecting single employees to form a global project.

members are familiar with the needs of the team's customers (these are R&D, product development, and testing). Additionally company C communicates very brief competence profiles from the different units on a regular basis throughout the MNE (via intranet). Such profiles may also list current global projects.

The two companies benefit greatly from the joint standard development, because requirements of both country units could be integrated during development. The integration of team members from the countries furthermore may avoid a not-invented-here syndrome at company B: Although industry experts agree that the technology base of company C is more advanced than the one of company B, company B tends to refuse innovations brought by company C only. Besides, both companies get to know each other's approaches concerning the description of problems, the design of a solution process and the creation of final documents (in particular specifications), so that global teams induce organizational learning here. On the other hand, the speed with which the solution was produced suffered from the fact that two different sets of requirements and two different worlds (processes, technology assets, cultures) had to be integrated. Thus negotiations about how to deal with and how to choose one solution out of different alternatives is quite a complex issue. As the interview made clear, conflicts in choosing between appropriate, but technically contradicting ways to solve the requirements given have to be decided by higher hierarchy levels. Thus the global team may significantly prolong the time-to-market. On the other hand, the increased acceptance of team result (through integrating both company B and company C units in the global team), may push diffusion of the specifications created and thus shorten the time-to-(in-house)-standard. However, the higher personnel fluctuation in company B challenges the effectiveness of the team structure as all American team members must be replaceable when they leave company B and hence the global team.

4.2.4 Company C, Case 4: New software to control flows of requirement and technical data

Case 4 is about the engineering of a new software suite to handle highly specific technical know-how along the internal product development process chain. Considering that the company software currently in use (a standardized, proprietary solution) is not sophisticated enough or lacks tailored functionalities resp., company C has decided to develop a software solution in co-operation with its internal stakeholders. Information logistics are needed to deal with the high amount of technical data, which particular units may send or receive. Hence, the issue is about how to integrate various

inputs from R&D facilities, product developers, production experts, but also sales and after sales people into one integrated and consistent information flow. Information furthermore undergoes a long process chain from product requirement engineering, over the selection of general technical approach, technical specification, documentation, prototyping, internal testing and product re-modification, to tests with the companies' lead-users. The local team and global project's customers are in particular those units transferring or receiving high amounts of technical data.

Although the project lead (strategic) is situated at and around the headquarter, the project work is done on different continents. Furthermore, internal IT-units interact with external IT-services, as most programming of the new software is off shored and outsourced to two low-cost countries. These two facilities are subcontractors of a big IT-provider from C's home country. Company C, however, has no contract with the programming firms, but with the IT-provider who subcontracts both low cost facilities. Company C only directly exchanges its software requirements with the IT-provider, not with the two offshore facilities, but receives the software code directly from the low-cost programmers. In each of the three participating countries in the project one national leader coordinates a sub-team. However, management, process know-how and engineering are done in Germany only, so that one can speak of a local (German) team which outsources the "doing" part of the project.

While the home-based units situated near the headquarter office understand, plan and economically improve the product development process, foreign sites write the software code and design software appearance. Thus they fulfill specifications delivered by the strategic project lead although they are not aware of the specifications' wider context and its economic means resp. R&D-related home-country sites of the company, however, in general can participate in requirements engineering. The contracted IT-provider instead bears responsibility for keeping programming time schedules and programming cost targets. Thus, the automotive company seeks process expertise from the home-base and specialized (compared to the home country lower priced) IT-know-how from Asia and Eastern Europe. Company C's purpose however, was to save labor costs through off shoring of all programming activities to IT mega-cities in Asia. However, as the engineering and process know-how is located at and around the headquarter, the company decided to set up a global project, but to coordinate it by a local team (project lead/strategic and IT-provider in Germany).

It was said in the interview that global teams only pay off, first, if work shares are clearly divided between the sites, second, if one finds a shared understanding of the project mission, third, if there

is common understanding of end customer expectations about the product/service, and fourth, if requirements are clearly defined so that misunderstandings and conflicts are avoided through professional team members' communication. Thus the company prefers global teams if projects need creativity, local teams rather if the additional costs of employing global teams are not compensated by gained technological advantage, as well as benefiting from diversity and creativity. Innovations brought to the MNE by global teams should thus in general be more radical than those by local teams. Through subcontracting the company keeps all core competencies in Germany, but seeks specialized IT-know-how at a low price. The interview partner furthermore stated that two sources of knowledge are of particular importance if the project shall succeed in scope, costs and time, namely knowledge about the value added by each process step in the internal product development process chain and knowledge about the companies' own IT-infrastructure. The knowledge is highly implicit (namely process experience) and thus can be reused in future projects.

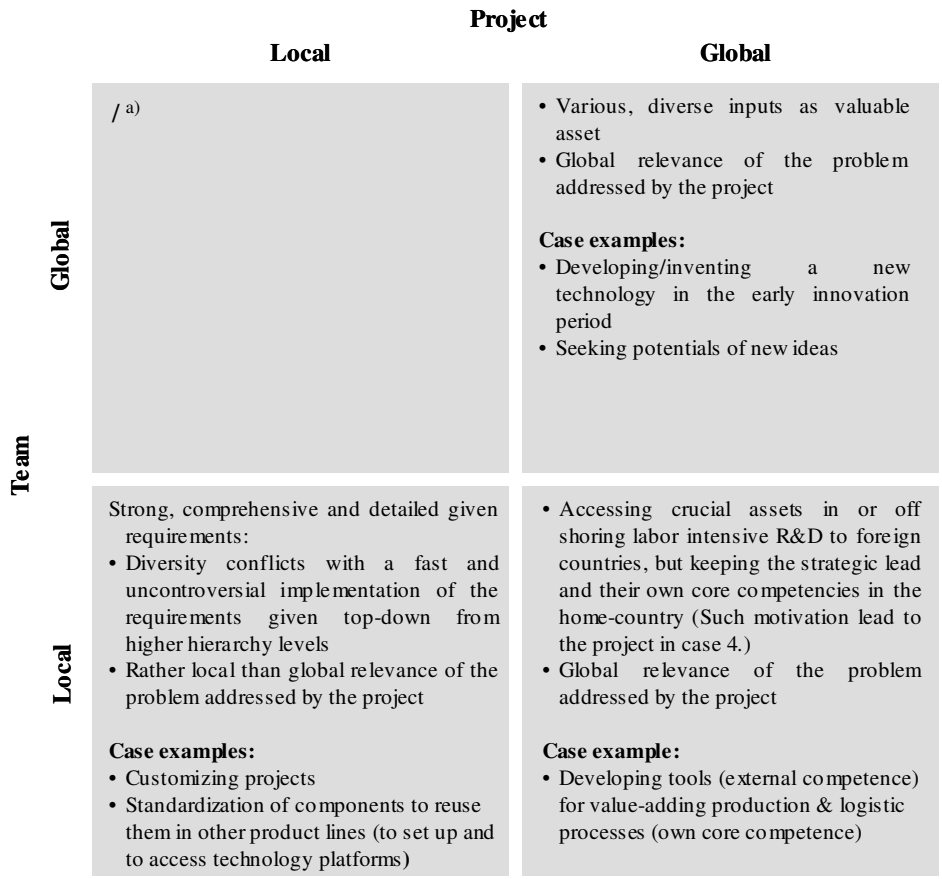
4.2.5 Expert Interviews

To broaden our perspective on the subject of global innovation team deployment, we interviewed two experts on international innovation and teamwork. Expert E1 is working for a big diversified German multi-business technology firm, expert E2 is employed at a large German machine manufacturer. Additionally, we draw upon broad project expertise from the interview partner for case study 4.

With expert E1, we discussed mostly knowledge protection in Asia, because he has some experience with the Chinese market. For him, a global team is always about merging market and technology knowledge. While the technological knowledge is kept safe at corporate headquarters, it is also important to produce innovations in the foreign subsidiaries for their specific market needs. This requires headquarters to closely guard, which knowledge is diffused within the corporation, and which is kept secret. Most of the time, this will result in some employees having one part of the required knowledge, and others having complementary parts. This illustrates high dependency of knowledge, a very effective informal way of protecting products and innovations against misappropriation. Global innovation teams are thus tasked with the development of a final product, but very rarely with the development of a general technology. If a certain technology is needed in a foreign subsidiary, expert E1 described that an expatriate with this specific knowledge is deployed to the foreign subsidiaries team, implements his knowledge or the technology, but does not share his know-how with locals. This can be aptly described as a 'black box expatriate'.

The second expert, E2, has worked extensively with global teams as a coach and consultant. His observation was that global teams definitely have to face greater challenges than local teams. They need additional resources (capital as well as manpower), have to cope with complex communication issues, and face higher costs than local teams. During global cooperation, team members are more hesitant to share information, frequently resulting in slower information exchange. But sometimes the corporation has no choice but to deploy a global team, especially when the customer demands it. What both experts commented on was the growing need of emerging markets for medium tech components. The high-end technologies used in most industrial countries' products were too expensive or 'over-engineered' for the use in foreign subsidiaries. A transfer of knowledge which is already 'old' as to our standards might become more important in the near future, which could produce new revenue streams from technologies judged to be obsolete. This will require more intensive and well-structured international cooperation, some of which will probably take the form of global innovation teams.

With regard to the difficulties and costs global teams imply, our interview partner from case study 4 summarized that global teams should be used where the access to both home-based technologies and foreign lead or growth markets are crucial for a successful global product. Diversity thus does not only imply creativity, rather it stands for the access to diverse inputs as valuable assets within the innovation process. Local teams should be employed if the solution of an industry problem/an innovation project has rather local customers than global ones and if requirements are clearly defined top-down. Diversity would then just slow down and blur a proper implementation of the already specified project objectives. Another case for the employment of local teams is a situation where crucial assets shall not be diffused globally to other subsidiaries. This is typically the case if firms fear plagiarism in the foreign country. Such cases are sometimes addressed by the concept we labeled "black box expatriates." Furthermore, our interview partner from case 4 argued that local teams can concentrate better on the project as they are a) identical with the corresponding line organization unit or b) released from their line function for the time of the project. For a comprehensive illustration see Fig. 1.



a) Due to our definition of global teams, by terminology global teams cannot work on local projects. Global teams are considered to consist of globally dispersed and non-temporary members. If a project is local, but team members originally come from different sites, we would rather speak of a delegated team where employees from dispersed units are delegated to one location until the project is put through.

Figure 1: Interaction of team form and project characteristics, drawn from Interview Case 4. Cells contain factors which are beneficial to the specific combination of team form and project characteristic.

4.2.6 Evaluation of the Cases

In case 1, the deployment of a global team delivers important knowledge resources. US team members contribute knowledge about the global process and insights into the functionalities of the software bundle. Since the internal customer for this project is located at the same site as the German team members, this is not a reason for the global nature of the project. A synchronous diffusion of the adapted software in other countries than Germany is not intended. However, the experience gained from this project will probably be a benefit to the US team members, and thus some diffusion of knowledge into later company projects will happen, albeit not explicitly expressed by management as a project goal. As the created software is highly specific to the needs of company A, competitors could only use it with major changes. It was, however, not intended by

company A to protect the results of the project through a global team organization. The global implementation of headquarter defined processes via an integrated software solution shall help to improve the German subsidiary's business performance through more functionalities and the option to use globally developed features. Low-cost considerations are also important to the project, as software programming is off shored to India.[9]

Case 2 is about how to harmonize the company's credit check solutions in Europe to prepare the ground for later global innovation. Rather than in case 1, the global team in case 2 does not source new resources[10] from different sites. Again, low-cost considerations lead to off shoring software programming to a low-cost country, namely Belarus. The customer side in this project was integrated in the form of representatives from the French business unit. A synchronous diffusion of knowledge was not intended by the organization: Rather the software shall be released sequentially to the business units in Austria, Germany and France, for the reason to avoid redundant error debugging or uncoordinated software modifications. The global team structure offered no informal protection for the created knowledge, because all processes had to be made explicitly available to all participants in order to allow for an effective work on the project. The knowledge was instead partly protected by confidentiality agreements signed by the programmers. Although Belarus was only included to optimize cost structures, the company met one extraordinary innovative programmer in the Belarus team site (1 out of 5 team members). This is just one of several unexpected benefits which can hardly be anticipated when balancing project costs and benefits.

As two hierarchically identical and functionally similar units of company B and C form the global team in case 3, resources are rather redundant than new. Company B, however, profits from more advanced technology assets of Company C. Company C learns about (methodically and culturally) new ways to create specification documents. Customers, in particular product developers, may be integrated through the dual position of the global team members (team membership and R&D-related line function). However, customer integration is not an argument for a global team in this case, because a local team would have integrated such customers as well. Other employees can furthermore use informal ties via the line organization to contact the global team. The synchronous diffusion of the created knowledge (i.e. the specifications for a standardized software download procedure) into both companies' R&D and product development units is one of the main purposes of this project. The created knowledge is public throughout the affected units, but crucial basic

[9] For a comprehensive case overview about the global teams' contribution to innovation processes see Appendix A.

[10] Meant are those resources like know-how or assets which are new to the gravitation center of the project and thus cannot be delivered at the project-management-located site.

concepts are only accessible to very few employees of company C. Thus in case 3, appropriability is not an argument for neither a local nor a global team.

Case 4 can be considered a dummy case for our three other cases. Opposite to all other cases, management and strategic lead are organized as a local, not a global team. Requirement engineering and programming of the software are organizationally separated from each other. Employees from both project sites (the local team of company C, versus off shored and subcontracted programming units of C's IT partner) only interact via company C's IT partner for this particular project. Thus we do not observe any new resources which are explored through the local team. Instead the projects main purpose for going global about the "doing" part and programming resp. simply is to cut costs by low-cost structures.

The team embeds several functions as single local team members come from various units of company C, such include in particular the area of product engineering, process experts and experts for the different components of the company's core products. A diffusion of knowledge about engineering and production processes (however synchronous or sequential) is not desired, because such know-how is crucial for understanding the company's production system. The software rather takes from this knowledge to make such processes work better. Hence, the project is supposed to support technical information flows of processes and procedures highly relevant for production, but not to share the process know-how behind the software concept. Core competencies are rather strictly kept at home. The protection of company C's process know-how against the low-cost sites is realized in that the local team communicates only milestones and detailed software code requirements to Bulgaria and India. Both programming sites are not briefed about the project context and gain very few insights into company C's internal structures, so that both sites cannot be considered to be part of the (thus local) team.

Considering that the software connects various information needed at a particular point of a process, we conclude that the project is about improving information logistics and to make process and technical know-how work hand in hand without necessary context knowledge at the accessing site, the employees. Hence, product knowledge is not created here, and process knowledge is rather employed than created. If projects are about the own product of company C (not about software and engineering tools), C, but also its industry in general employs global teams to develop standardized product & technology platforms, so that the company can realize economies of scale. Typically the industry modularizes their products, so that components/modules can be implemented or recombined in various product lines and brands.

We found that in each case only one of our four propositions was central to the deployment of the global team. In cases 2 and 3 we found that one other proposition seemed to play a minor role in the deployment of the global team (see Table 5).

	1. Resources	2. Customer	3. Diffusion	4. Protection
Case 1	**			
Case 2		**	*	
Case 3	*		**	

Table 5: Relevance of the four propositions for the four case studies. (** indicates high relevance, * indicates little relevance, and an empty cell indicates no relevance)

4.3 Discussion

In our case studies we found some evidence for our first three propositions. It seems that the inclusion of new resources or experts, the integration of customers or knowledge about customers, and the diffusion of knowledge all play a role in the decision to deploy a global innovation team. What was surprising is that these reasons do not appear together in one project. Table 6 gives a comprehensive overview about what the observed global teams focused on.

Case 1	**Focus**: New Resources, Experts	- Knowledge about global process - Insights into functionalities of leasing software bundle
Case 2	**Focus**: Knowledge about customers; customer integration	- Team included representatives from French customer
Case 3	**Focus**: Synchronous Diffusion	- Diffusing one standard procedure for download in both companies

Table 6: Main focus of described global teams' projects.

In regard to our propositions it seems that the appropriation or protection of knowledge might not be a strong contribution of global teams. We argued that the distribution of the team members would split up the project knowledge and thereby protect it against misappropriation. But as especially case 2 showed, in order to work in a global team, all team members need to know to a certain extent about the project. In case 4 it became evident that the company chose a local team especially for the reason of knowledge protection. In one of the expert interviews, a similar statement was made. Here, international project cooperation sometimes requires the use of expatriates who travel to a foreign location and apply their knowledge and skills without transferring any of this knowledge to the local operations in order to protect it from

misappropriation. This strategy of using 'black box expatriates' seems interesting for further research.

In addition to our propositions, which were all based on the premise that knowledge creation issues are of major importance in the deployment of a global innovation team, we found that other considerations had an equally strong influence on the choice of team form. Not surprisingly, if the customer unit is situated in another country than the core knowledge, a global innovation team will be formed to transfer existing MNE knowledge about the product and knowledge about requirements back and forth. Low-cost seeking has been an argument in all observed project (as well in the three observed global team projects as well as in the local team project/case 4).

The results from the case studies give some insight into the previously discussed apparent paradoxes following from our propositions. As for paradox 1, the global teams we described neither showed great difficulties in knowledge creation, nor were there large problems in regard to knowledge diffusion. If anything, knowledge creation and the transfer of knowledge during the project work were hindered by the use of communication media instead of face-to-face meetings. But to finally resolve this paradox, a larger study would have to be conducted with quantitative measures for both knowledge creation and diffusion performance in local versus global innovation teams. Paradox 2 appears to be nonexistent. It seems that knowledge diffusion after the project has ended is indeed better with global teams, but they do not, as far as we can tell, provide any advantage for the protection of knowledge. On the contrary, it appears that companies have to take extra measures with global teams to protect their knowledge. We conclude that the geographical dispersion of project members (and thus global teams) challenge the appropriation of accessed knowledge if knowledge flows must be explicit for project success and cannot be covered through tacit transfers.

Our final expectation was that knowledge could also stick to a loosely coupled structure such as a global innovation team. Here, our results are inconclusive, that is, we did not observe any instance in which the global team became a repository for knowledge in the same way an organizational unit would. Rather, parts of the teams would later use knowledge they had acquired in the global project. This was observed in case 2, where acquired skills with Java programming were brought into new projects by the German part of the team, or in case 3, where knowledge about requirements engineering was transferred from the sub-team in Company B to the sub-team in Company C. However, it seems that our case selection is not qualified to clarify the issue of sticky knowledge:

Only in one case, case 2, the strategic lead is situated outside the home country (Germany), but Germany is not a lead market for the company's industry. Furthermore, we did not measure the team performance in a comparable/quantitative way. Therefore we find no data basis in our case studies to compare high-tech clusters with high performing global teams.

5 Conclusions, limitations and further research

The aim of this study was to shed some light on the influence knowledge-related issues have on the deployment of global teams. There are some limitations to this study. Our case material cannot serve as reference to characterize the quality and kind of a global team's knowledge stocks in contrast to local team's ones. Furthermore, we did not provide a representative sample of companies which would deploy global innovation teams. Some of the observations could be explained with the fact that all four described projects had company-internal customers, and were IT-related. The specific relations between global innovation teams and knowledge factors could be studied in more detail on larger and more representative samples. This paper attempted to provide a basis for this research. In future research on this topic, team task factors and structural variables such as size of the team, and specific communication structures should be considered.

We had originally planned to immediately follow our case studies with a quantitative analysis of the importance of the identified knowledge issues, but the results from the case studies made it obvious that more theoretical work is necessary to structure such a research attempt. Conceptual studies are missing about how frequent and why European companies deploy global innovation teams. Our only lead in this is the study by McDonough et al. (2001), which is only studying US companies. Several details of our paper (knowledge transfer and knowledge sharing process characteristics, stickiness and structures of knowledge, global teams as knowledge coordinating mechanisms, the economic effect of global teams on the MNE knowledge stocks/the value of their contribution to innovation and product development etc.) are in need for a more detailed, in depth research. This is probably because our perspective on global teams is different from the IT-related focus on communication tools (virtuality) and the international management's perspective on global teams as more creative and time-zone-spanning teams (diversity, 24-7 work) compared to local projects, so that research streams lack a strong "global *innovation* team" perspective. However, our discussion showed that recent research about global teams has neglected the cost argument and overemphasized benefits of cultural diversity.[11] Global teams contribute to innovation differently

[11] We are not saying that culture does not matter to management practice or innovation performance, rather that there

than local teams do: They may bring new resources to the different sites, improve customer integration (if technologies/solutions are from another country than the customer is situated in), and support knowledge diffusion (a not invented here syndrome could challenge how one subsidiary accepts the other subsidiary's project outcomes).

Additionally, we observed mainly four issues for further research: First, given quite specialized research streams from different scientific domains, quantitative surveys should be done to prove case study findings. Global teams could serve as mechanism to strengthen corporate culture and to benefit from diversity (building intercultural competence and understanding), to increase creativity by the variety of inputs to innovation, to improve the efficiency and frequency of knowledge and technology transfer, but also to be themselves the locus and driving force of innovation. Second, the contribution of global teams to product, process, and technology development lacks case study research for a better understanding of the global team's mandate within the MNE being a worldwide innovation, and thus knowledge, network. Third, it should be analyzed how information, dynamic capabilities and knowledge contribute to configure know-how for solving business problems by innovation. It may be thus fruitful to consider innovation as a process of embedding know-how into new products, services, and process technologies as well as organizational processes and structures. Fourth, knowledge is complex as it might refer to cultural context and/or personal experience. Thus, it needs to be specified, how companies can effectively transfer different kinds of knowledge. Since many studies only take into account the classic duality of explicit and tacit knowledge, it would be interesting to expand this concept with a knowledge quality described by Gerybadze (2004, pp. 111-115), the interpretive coherence of knowledge. This dimension probably is even more relevant to diverse teams than to culturally similar ones. Again, it should be promising to study latter concept with the use of quantitative data.

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are also other mechanisms than global teams like expatriates/impatriates to increase cultural awareness and diversity in MNEs. Our main point is that only global teams form a second, informal network within an MNE which a local team cannot offer (except selected ties embedded through recent expatriates/impatriates).

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Appendix A, Global teams contribution to innovation processes. Case overview

Case Contribution	Case 1, Adaptation of a new leasing contract management software	Case 2, Development of a web front end for credit check solution	Case 3, Improvement of a hardware-software interface for software download	Case 4, New software to control flows of requirement and technical data
New resources, foreign sites experts	- Knowledge about the global process - Insights into functionalities of leasing software bundle	-	- But: Company B can profit from more advanced technology assets of Company C	-
Knowledge about customers and customer integration	- Customers available in Germany, integrated as experts - Global team members "have worked with" customers before	Team included representatives from French customer	Customers use informal ties via the line organization to contact the global team	Product engineers in Germany are integrated in defining requirements
Synchronous diffusion of created knowledge	Not intended by project scope (Germany)	Sequential diffusion intended to reduce redundant fixing of software errors (debugging) and dysfunctionalities	Diffusing one standard procedure for download in both companies	-
Appropriation of created and used MNE knowledge	Knowledge is highly Company A-specific, other business could use this only with major changes to the software	Protected by confidentiality agreement with programmers (Process must be made explicit for all team members to allow effective work)	Team form has no impact: crucial concepts are only accessible to very few employees of Company C	-
Further (also, but not necessarily unexpected) benefits	The US-team may improve its best practice as it gains additional implementation experience	Innovativeness of one excellent programmer from Belarus	Learning from each others different approaches of specifications to standardize and to specify processes	Rather, this industry employs global teams to develop standardized plattforms for Economies of Scale
Low-cost issues	India	Belarus	-	EEU / India

Appendix B: Questions and Topics discussed in the Case study interviews and Expert interviews

0. Personal background of the interviewees; experiences made in their teams; and project characteristics

1. Assignment of global innovation teams
   - Which advantages and disadvantages do global innovation teams show in comparison to local innovation teams?
   - Which characteristics, competencies and skills should members of a global innovation team provide?

2. Resources
   - How are work packages and tasks distributed within the team?
   - Which special resources does the global innovation team provide rather than a local team could?
   - How are factors like customer perspective, market knowledge and user know-how represented in the global team?

3. Contribution to innovation
   - To which extend does your global innovation team create solutions for problems, to which extend basic knowledge?
   - How do global teams contribute to knowledge sharing and technology transfer within the MNE network?
   - Which factors determine the economic value of created knowledge?
   - Which advantages and disadvantages does a global innovation team offer regarding "time-to-market" and "time-to-standard"?
   - How does the team contribute to the application of the generated knowledge a) intra-corporate, and b) externally?

4. Diffusion and protection of the generated knowledge
   - How do you judge the performance of your team concerning a) knowledge creation, and b) knowledge diffusion?
   - How (simultaneous or sequential at the different subsidiaries, by whom) and at which point of time is the generated team knowledge transferred into the line organisation?
   - How are knowledge diffusion, knowledge creation and knowledge protection related to each other (timing, context)?
   - How does the global distribution of the team knowledge and also of the team members contribute to the protection of generated knowledge?

5. Location of the knowledge (where is the knowledge stored? Where does it come from?)
   - Where is the created knowledge stored and managed after conclusion of the project?
   - How do factors such as personal relationships, geographic clusters and project management contribute to the correct interpretation of knowledge. How do ensure that the knowledge generated is well-documented and not forgotten?