Stefanie Betz, Juho Mäkiö, Rolf Stephan (eds.)

Offshoring of Software Developement

Methods and Tools for Risk Management

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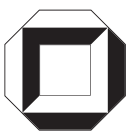

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Current State of IS Offshoring Research: A Descriptive Meta-Analysis

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Current State of IS Offshoring Research: A Descriptive Meta-Analysis

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Abstract. This paper summarizes the results of a descriptive meta-analysis on existing academic research in IS offshoring from 1996 to 2006. It identifies relevant research, categorizes it, and suggests future research directions. The results show that IS offshoring represents a new research area with most research being published during 2003 to 2006. Non-theory based, descriptive research designs dominate. Most studies focus on the questions of "why" to offshore, "how" to offshore, and the "outcome" of IS offshoring. Other aspects such as "what" services to offshore or "which" decision to make are under-researched. Future research could focus on these areas. Additionally, more empirical-confirmatory research might enrich the IS offshoring body of knowledge by providing findings that are based on more diversified patterns of research designs.

Keywords: Offshoring, nearshoring, information systems, information technology, meta-analysis, research approaches.

1 Introduction

Current international and Germany-focused research in IS offshoring lacks a consolidated view on existing research results [33, 52]. The study at hand addresses this research deficit. It conducts a descriptive meta-analysis on existing academic research in IS offshoring from 1996 to 2006. Its main objectives are to identify relevant research contributions regarding IS offshoring, categorize their theoretical foundations and research designs, and show implications for future research. The meta-analysis applies an IS managerial and business-oriented point of view and excludes technology-related aspects of offshoring. Furthermore, it partially follows the methodological approach employed by [15] in their extensive literature review for IS outsourcing. Thus, it ensures research continuity by building upon an existing approach and it enables comparability of research findings between the two studies.

The paper understands IS offshoring as the partial or total transfer of IS services provision (i.e. infrastructure, application development or other IS services) to a

service providing organization residing in a near or far away country different to that of the service receiving organization. The service providing organization can be an internal subsidiary, a partially-owned unit or an external service provider. Fig. 1 illustrates the dimensions of IS offshoring. [9, 10, 20, 23, 25, 36, 38, 40, 41, 52]

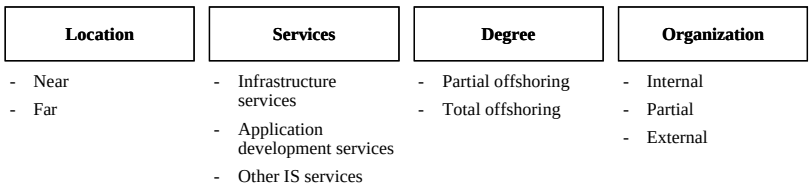

Fig. 1. Definitorial dimensions of IS offshoring.

Several studies perceive IS offshoring as a variation of international IS outsourcing and name it "IS offshore outsourcing". This perception does not contradict but rather fits to the previously defined dimensions in Fig. 1. However, outsourcing usually requires a contracting arrangement with an external party [15]. By defining IS offshoring as a variation of IS outsourcing, definitions would limit themselves to "external" arrangements in the dimension "organization".

In terms of this paper's IS offshoring definition, we recognize "IS offshore outsourcing" not as a variation of IS offshoring but as a combination of both IS offshoring and IS outsourcing [16].

2 Methodology

2.1 Analysis Approach Overview

The analysis approach consists of four steps. The *first step* retrieves literature from electronic databases, examines, and archives all literature items. The *second step* excludes "non-relevant" research from further analysis. This exclusion is necessary, since the database-driven search approach might return irrelevant results. Having identified relevant literature items, the *third step* classifies and tabulates them. The *fourth and last step* interprets and discusses the research items' findings.

2.2 Literature Retrieval

The meta-analysis focuses on journals and conferences to identify relevant knowledge in the field of IS offshoring.

We use electronic databases to find relevant journal articles. The employed database is ebsco's "Business Source Complete". It covers more than 1,200 scholarly business journals. Electronic database search comes with certain limitations, e.g.

regarding available journal issues in the database and record completeness. Nevertheless, we opt for a database-driven search because it allows a wide coverage of literature sources and assures repeatability of the search process by other researchers.

The paper focuses on four renowned IS conferences: Americas Conference on Information Systems (AMCIS), European Conference on Information Systems (ECIS), Hawaii Conference on System Sciences (HICSS), and International Conference on Information Systems (ICIS).

The last ten years from 1st January 1996 to 31st December 2006 serve as the relevant timeframe for searching literature items from journals and conferences.[1] Article titles, abstracts, subject terms, and assigned keywords represent the relevant search fields for journal articles. For conference papers, their paper titles are searched.

The corresponding query string is "offshor* OR off-shor* OR nearshor* OR near-shor* OR (global AND outsourc*) OR (international* AND outsourc*)". The wildcard symbol "*" reduces the terms to their principal forms (so-called "stemming", [19]). It ensures that the search also covers term variations such as "offshor*ing*", "offshore", and "offshor*ed*". The search term "global AND outsourc*" and "international* AND outsourc*" identifies literature items that address the aspect of offshore outsourcing but do not explicitly use the keyword "offshoring" (e.g. [1]).

The keywords above yield more than 900 search results with low relevancy, e.g. related to manufacturing offshoring or the oil drilling industry. Therefore, we use a database subject filter to focus on content-wise relevant research. The subject filter is "'Information Technology' OR 'Strategic Information System' OR 'Management Information Systems'" for journal articles. The search furthermore excludes journal articles with a length of less than five pages. Additionally, the database filter "Scholarly (peer-reviewed) journals" ensures a minimum quality in research results.

2.3 Literature Item Exclusion

We exclude non-relevant research to assure that the meta-analysis only contains content-wise relevant literature. Research is "non-relevant" when it has a non-IS context or does not have an IS managerial or business-oriented research focus such as studies on manufacturing offshoring or on IS education. Additionally, the analysis excludes conference papers that resulted in a journal article and conference papers with no original content such as announcements for discussion boards or research agendas/proposals.

2.4 Literature Categorization Framework

As Fig. 2 shows, relevant dimensions for categorizing the identified research items are the *reference theories* the items build upon, their *research approaches*, their *research types*, their employed *research methods* in terms of data gathering and data

[1] Except for ECIS where proceedings of the 2006 conference were not yet available.

analysis, the specific *IS offshoring stage(s)* they address, and the *IS services* they focus on. [7, 15, 49]

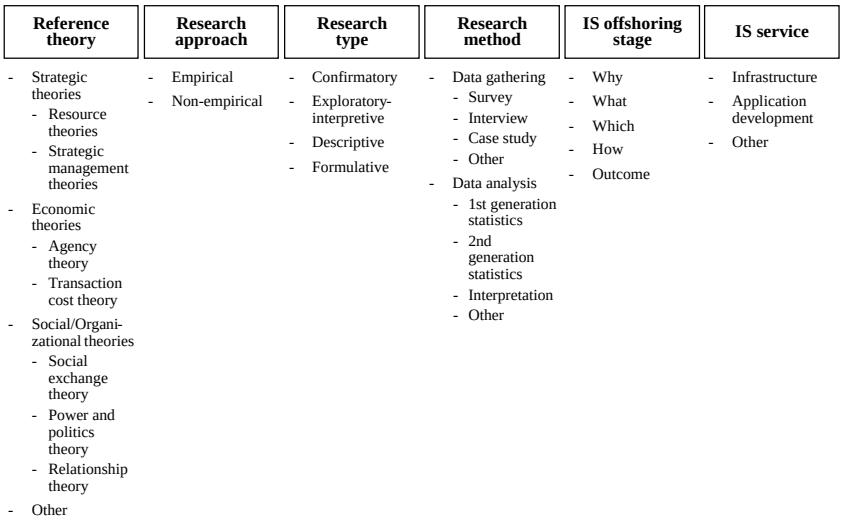

Fig. 2. Dimensions of literature categorization framework.

Content-wise, the five sub-stages of the dimension *IS offshoring stages* are derived from [15] using their adapted version of Simon's decision making model [46]. They are defined as follows:

"W*hy*" to consider offshoring examines the determinants that lead to the consideration of offshoring as a sourcing option. Research at this stage tries to understand potential advantages and disadvantage or risks and benefits associated with IS offshoring.

"*What*" to offshore looks at the aspects of the areas and functions, e.g. IS department activities or applications, that are offshoreable but also addresses the structure of the offshoring arrangement, e.g. regarding the degree of offshoring in terms of IS budget.

"*Which*" choice to make refers to the decision whether to offshore or not. It examines the procedures, guidelines and stakeholders involved to evaluate the available options and make the decision.

"*How*" to offshore looks at the implementation of the offshoring decision, e.g. on setting up an offshore unit or selecting an offshore service provider, structuring the arrangement and managing it. Research at this stage solely focuses on the structure or conceptualization of the implementation but *not* on the outcome or its quality.

"*Outcome*" of offshoring addresses the result of the implementation of offshoring relating to experiences such as best practices, types of success, and the various determinants for success of the offshoring decision.

2.5 Research Validity

We compared *database* search results of "Business Source Complete" to those of "Academic Search Premier", "Computer Source", and the "ProQuest" database. The results suggested that "Business Source Complete" does not ignore relevant articles. We compared the amount and content-wise relevancy of results when using different search fields. A search in titles, abstracts, keywords, and subject terms but not in the articles' full texts yielded the most useful results.

3 Descriptive Analysis

3.1 Selection of Relevant Literature

The databases were searched in March 2007. The search resulted in a total of 66 journal articles with more than four pages published between 1st January 1996 and 31st December 2006. Additionally, the search identified 38 conference contributions. This resulted in a total of 104 literature items in-scope for the literature review.

We examined these items, archived them, and analyzed their relevancy regarding IS offshoring research. 45 journal articles and 23 conference contributions are considered "non-relevant". As a result, 21 journal articles and 15 conference papers remain, thus totaling relevant 36 literature items. Fig. 3 illustrates the selection of relevant literature.

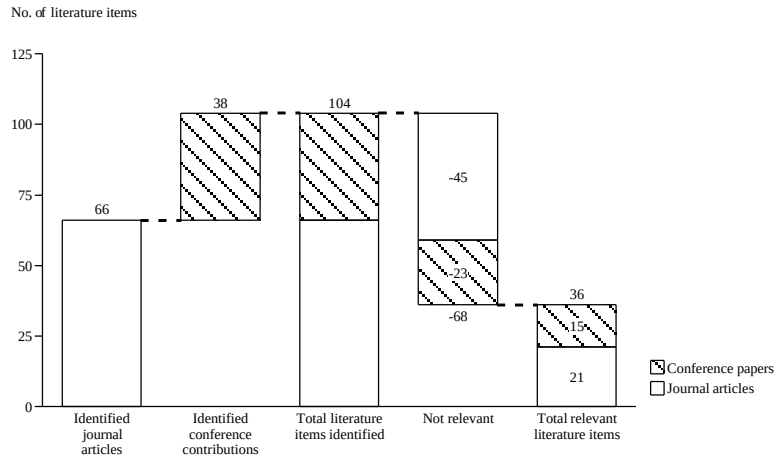

Fig. 3. Selection of relevant literature items.

3.2 Publication Period

Fig. 4 shows the publication years of the relevant literature items. Most research was published in the four years from 2003 to 2006 with the majority of 18 items in 2006. It seems that research in IS offshoring barely existed before 2003 and increased from that time on. This marks a difference to the research situation in IS outsourcing where a significant amount of publications exists starting from as early as 1992 [4, 15].

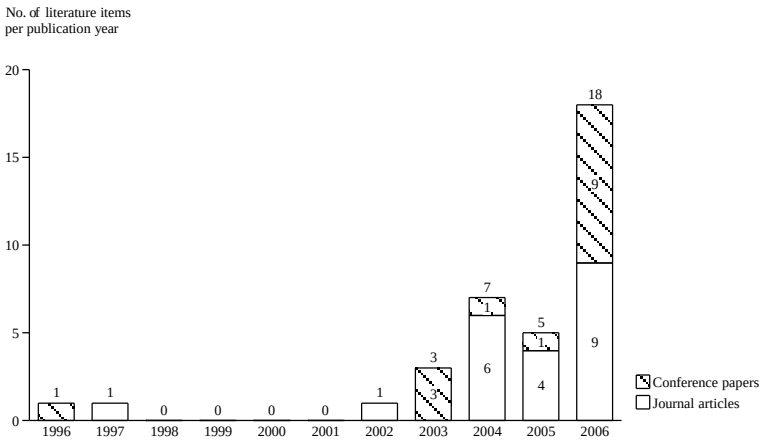

Fig. 4. Publication years of identified relevant literature items.

3.3 Research Design

Most of the literature items do not draw on theoretical foundations to conduct their research (23 items). If they apply a theoretical foundation, transaction cost economics dominates (5 items), followed by resource theories (2 items). More empirical (20 items) than non-empirical (16 items) research exists. Descriptive research dominates the literature (19 items), specifying either no data gathering methods at all (16 items) or applying case study approaches (11 items). Correspondingly, studies use either no data analysis methods (16 items) or apply interpretation (15 items). Fig. 5 shows the categorization of all literature items regarding research design.

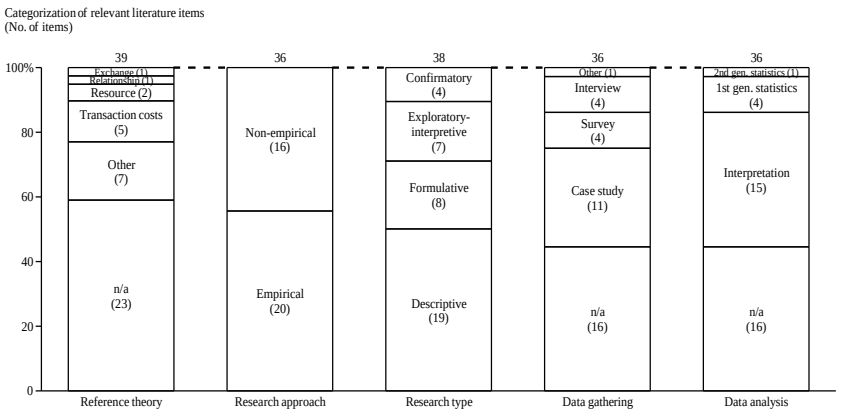

Fig. 5. Categorization of identified literature items regarding their research designs.

3.4 Research Objectives

As Fig. 6 shows, most literature items address the "why" (17 items), "outcome" (14 items), and "how" (12 items) stages of IS offshoring. The "what" stage is less frequently researched (7 items). No literature item examines the "which" stage, thus leaving this stage un-researched in terms of the literature review. Most items do not explicitly state which offshored IS services are in focus of their research (19 items). However, if they specify a specific service, application development dominates (17 items).

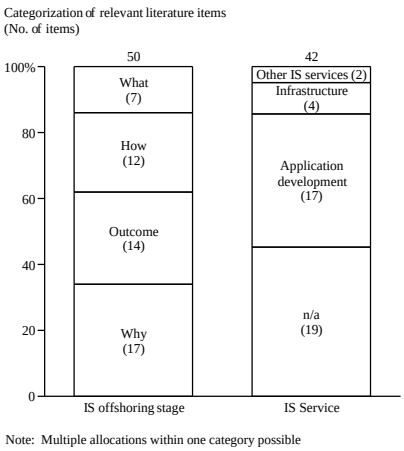

Fig. 6. Categorization of literature items regarding their research objectives.

4 Discussion

4.1 Research Patterns

Certain research design patterns dominate current IS offshoring research: most studies do not draw upon any reference theory and use a descriptive research type. They are purely conceptual or use case studies as data gathering approaches, and apply no data analysis methods or – if any – interpretation.

This situation exhibits some drawbacks. First of all, the domination of one research design pattern provides a one-sided research view on the IS offshoring phenomenon. Furthermore, if research is empirical, sample sizes are often low. If research is non-empirical, findings are often conceptual and not theory-backed. This undermines the generalizability of results and limits the comparability between different studies.

A potential explanation for this observation is that the IS offshoring phenomenon itself is a rather new area of knowledge and consequently less researched. The fact that most research was published between 2003 and 2006 supports this perception. Therefore, the research community might currently be at the stage of establishing an initial understanding of the phenomenon, its constituting variables, and underlying theories. Such a research situation would explain the dominance of non-theory guided, descriptive and conceptual [12]. Noticeably, this research situation marks a contrast to research in IS outsourcing where a significant body of knowledge already exists and research tends to be more theory-driven and confirmatory [4, 15].

4.2 Research Opportunities

A greater variety in research designs could enrich the body of knowledge in IS offshoring research. Especially, more confirmatory-empirical research using theory-derived hypotheses and research frameworks is missing. Such empirical research would add most value if it built upon greater sample sizes and used statistical methods beyond descriptive 1st generation statistics.

Regarding research objectives, more studies addressing the stages "what" and "which" would deepen the understanding for the IS offshoring phenomenon. Additionally, consideration of intercultural aspects and theories and their relevancy to IS offshoring could create further insights.

4.3 Limitations

Limitations of this study clearly come from its database-driven search approach. Despite thorough validity checks, it is possible that the search approach missed relevant research. Better results might arise from searching more databases and conferences. Therefore, repeating the literature review at a later date and comparing the results might provide additional insights.

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Appendix

Overview Categorized Literature

Study		Reference theory									Approach		Research type				Data gathering					Data analysis					Offshoring stage					Service covered			
		Strategic		Economic		Social/ Organizational			Oth.	n/a																									
Author	Year	Res. theories	Strategic mgmt.	Agency	Transaction cost	Exchange	Power-politic	Relationship	Other (Theory)	n/a (Theory)	Empirical	Non-empirical	Confirmatory	Exploratory-interpretive	Descriptive	Formulative	Survey	Interview	Case study	Other	n/a (Data gathering)	1st generation statistics (e.g. Regression)	2nd generation statistics (e.g. SEM)	Interpretation	Other	n/a (Data analysis)	Why	What	Which	How	Outcome	Infrastructure	Application development	Other IS services	n/a (Service)
Apte, U. M. et al.	1997									X	X				X		X					X					X	X				X	X	X	
Balaji, S. and C. Ranganathan	2006	X									X			X					X					X							X		X		
Balaji, S. et al.	2006								X		X			X					X					X						X			X		
Benamati, J. and T. Rajkumar	2002								X		X		X					X						X			X				X		X		
Bhat, J.M. et al.	2006									X	X				X				X					X							X		X		
Brooks, N.	2006									X		X				X					X					X	X								X
Chua, A.-L. and S. Pan	2006									X	X				X				X					X			X	X		X		X	X		
Delmonte, A.J. and R.V. McCarthy	2003									X		X			X						X					X	X				X		X		
Dhar, S. and B. Balakrishnan	2006				X						X		X						X					X			X				X				X
Erber, G. and A. Sayed-Ahmed	2005									X		X			X						X					X	X			X					X
Erickson, J.M. and C. Ranganathan	2006	X							X		X			X					X					X							X		X		
Feeny, D. et al.	2005									X	X				X				X					X						X					X
Fish, K.E. and J. Seydel	2006									X	X				X		X					X						X				X	X	X	
Ganesh, J. and D. Moitra	2004									X	X			X					X					X							X				X
Gonzalez, R. et al.	2006									X		X			X	X					X					X	X	X							X
Graf, M. and S.M. Mudambi	2005									X		X				X					X					X				X					X
Holmstroem, H. et al.	2006					X					X			X					X					X							X		X		
Kakumanu, P. and A. Portanova	2006									X		X			X						X					X	X						X		
Khan, N. et al.	2003									X	X				X				X					X			X								X
Kliem, R.	2004									X		X			X	X					X					X	X			X			X		
Krishna, S. et al.	2004									X		X			X						X					X					X		X		
Kumar, K. and L. Willcocks	1996				X			X	X		X			X					X					X							X		X		
Li, H. et al.	2006								X			X				X					X					X				X					X
Murray, M.J. and R.E. Crandall	2006									X		X			X						X					X				X			X		
Murthy, S.	2004									X		X			X						X					X		X				X	X		
Niederman, F. et al.	2006								X			X				X					X					X	X	X		X	X		X		
Pfannenstein, L.L. an R.J. Tsai	2004									X		X			X						X					X	X								X
Pu Li, J. and R. Kishore	2006				X							X				X					X					X				X					X
Rao, M.T.	2004									X		X			X						X					X					X				X
Rottman, J.W. and M.C. Lacity	2006									X	X				X			X						X							X				X
Sakaguchi, T. and V. Raghavan	2003									X	X					X	X						X							X					X
Sayeed, L.	2006				X						X			X				X						X			X	X		X					X
Smith, H.A. and J.D. McKeen	2004									X	X				X			X						X			X								X
Tafti, M.H.A.	2005									X		X			X						X					X	X								X
Whitaker, J.W. et al.	2006								X		X		X							X		X									X				X
Whitaker, J.W. et al.	2005				X						X		X				X					X					X								X
Total		**2**	**0**	**0**	**5**	**1**	**0**	**1**	**7**	**23**	**20**	**16**	**4**	**7**	**19**	**8**	**4**	**4**	**11**	**1**	**16**	**4**	**1**	**15**	**0**	**16**	**17**	**7**	**0**	**12**	**14**	**4**	**17**	**2**	**19**

A System Dynamics Perspective into Offshore Software Outsourcing – uncovering Correlations between Critical Success Factors

Juho Mäkiö, Stefanie Betz

A System Dynamics Perspective into Offshore Software Outsourcing – uncovering Correlations between Critical Success Factors

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Abstract. Software offshore outsourcing is stirred among others by efficiency, availability of manpower, quality and cost reduction. The results are often disappointing and problematic to the offshoring company especially when the costs outgrow the desired budget or when the delivered software indeed turns out to be faulty. The anticipated possible complications in an offshoring project need to be vigilantly weighed and roughly approximated using tools that can generally predict the results of an offshoring project. This article presents a system dynamic approach to unearth the inherent risk of offshore software development. It consequently defines eleven highly interconnected elements with high levels of abstraction that can be used to generally predict the results. It additionally shows that these elements are inadequate and goes ahead to introduce some sub elements. A further study based on the sub elements is recommended.

Keywords: Software offshoring, software outsourcing, system dynamics, critical success factors

1. Introduction

A business is using the so called offshore software outsourcing in developing its software when it wholly or partially contracts out some of the software development activities to another. We speak about offshore software outsourcing – or shortly offshoring, if the organisation is remotely located. The “global software development”, also “global software work” or “distributed software development”, implies that the development activities are located in various parts of the World. The reasonable and successful execution of such a project is uncertain because of the diverse distribution of its activities all over the world. This offshoring may economically be seen as a natural evolution steered by lack of resources, shortened

development cycles, tight budgets, higher flexibility and concentration in the core business, access to the qualified professionals and competition that create a need for cooperation with external partners. This offshoring phenomenon is a relatively new trend. It became a viable strategy in the 1990's owing to Internet that enabled cheap and efficient transport of digital information to qualified workers in low cost countries. In the meantime, offshore software outsourcing remains a controversial subject. Benefits such as reduction of development costs, access to highly specialized professionals, flexibility, and reduced development time are some positive aspects. Nonetheless, the software offshore outsourcing is coupled with a couple of setbacks that compromise the results.

Communication among offshore outsourcing software developers is reported to be much more complicated than projects that are executed traditionally. Cultural differences often result to miscommunication. Moreover both geographic and temporal distribution negatively impact on the interaction between onshore and offshore teams. Various studies suggest that approximately 40 percent of offshore projects fail to deliver the expected benefits. Obviously, such projects are challenging and risky. The huge gap between the expectations and actualisation is for example caused by deficiency in theoretical basics in software engineering and lack of options as well as ignorance of the risks that are part of such an outsourcing software development project.

However, the offshore software outsourcing is a phenomenon that has become a key software development method in multiple companies. Obviously, the alluring benefits overweigh the inherent risks when deciding if a software development project is executed offshore or not. In respect to these inherent risks, the software offshore outsourcing does not make an exception to traditional software development. According to Boehm [1], most failures in software development projects would have been avoided had there been explicit early concern in identifying and resolving their high-risk elements.

In the current literature, multiple success factors and risks are linked with the software offshore outsourcing. The identification and management of the inherent risk requires the understanding of its causes. However, it is hard to name any single risk element that solely leads to the failure of an offshore software development project because the simultaneous interrelation of multiple elements often seems to cause failure. These interrelations are difficult to understand and their effects are hard to gauge. We propose a system dynamical approach to uncover correlations between critical success factors of outsource software offshoring projects. This approach provides a foundation for a tool that will be used for computer based simulation of offshore software outsourcing projects.

2. Risk Analysis of Offshoring

The first systematic representation of the "risk" in the software area was published in the Boehm's spiral model in the 80's. This model is iterative and the risk analysis is done systematically. The word "risk" comes from the Italian word "risicare" that is

derived from the Latin word “risicu, riscu” which means “to dare” [3]. Consequently, the risk is something that needs to be managed.

The risk may broadly be looked at from two perspectives: the economic and the managerial [8]. The economic perspective portrays risk as the variance of the probability distribution of possible gains and losses associated with a particular alternative. The managerial perspective portrays the risk as a danger or hazard to the potential positive realisation of a project since risk is associated with its negative outcome.

In the last decade the software development has grown to be even more risky. Success and evasion or minimisation of the risk through suitable methods of risk management is crucial. Risk management in software engineering focuses on all processes in the software lifecycle. Risk management should not only point out simple details in the project, but also be the core of the business [2]. Risk management may also help immensely in actively in preventing these problems.

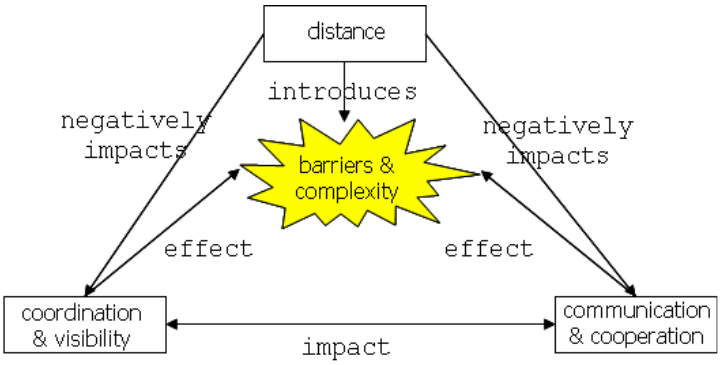

Figure 1: Impacts of the distance in a distributed environment (ref. [4])

The success of an offshore project can be gauged by three parameters based on the satisfaction of the client: quality, time, and costs. Quality is measured some what as the degree of the fulfilment of the requirements and as per the software design conformity. The time parameter simply refers to the deadlines. The third parameter, costs, refers to the fitting of the offshoring project into a desired budget. An offshore project that fulfils the expectations of the client is successful otherwise a failure. Approximately 40 % of offshore projects fail. One of the major reasons for the failures is distance.

The coordination and management of various tasks and decisions requires communication among the stakeholders Casey and Richardson state that distance introduces barriers and makes the management of these tasks even more complex. The key variables for success (effective coordination, visibility, communication and cooperation [6], [7]) are negatively impacted by distance. This is illustrated in Figure 1. Consequently, the major challenge in the coordination and management of offshoring projects is the minimization of these negative effects. Minimization however requires a more detailed insight into the causes and effects of the undesirable outcome, especially into the correlations between single success factors.

2.1 Undesirable Outcomes of Offshoring

Interviews were carried out so as to assist in the understanding of the components of risk and their correlations. Additionally, the results of the study were proven by means of a literature study. The possible high risk areas are illustrated in Figure 2. Technical aspects, IT-infrastructure or time zones have interestingly, not been found critical compared to soft factors like communication, the way of thinking, cultural differences, or project management. We are convinced that undesirable outcome mostly originates from by these four factors.

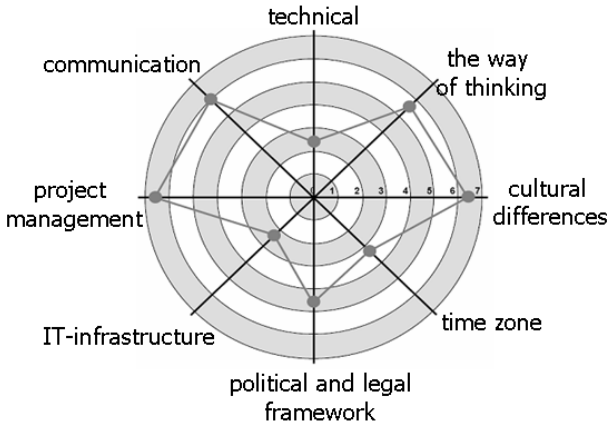

Figure 2: Problematic fields in offshoring (ref [22])

These factors are however structurally very abstract. The authors feel that they need to be split in sub elements so as to improve the critical fields. The sub elements and their impact need to be keenly analysed. Offshoring evaluation methods are handled in the following sections.

2.2 Evaluation of Software Offshore Development Projects

The success of an offshoring projects may be gauged against its major target i.e. cost reduction as to in-house development [10]. The expected cost reduction is heavily dependent on multiple co-relating factors. This makes it hard to unanimously predict their combined effect on the total cost. Multiple methods are indeed used to evaluate the economic benefits of an investment project. This section discusses the concepts of Return on Investment (ROI) and Balanced Scorecard (BSC) in respect to their capability to evaluate offshoring projects.

2.2.1 Return on Investment

ROI is a financial tool for gauging the economic return of a project or an investment. It is used to measure the effectiveness of the investment by calculating

the number of times the net benefits (benefits minus costs) are recovered from original investment. It may additionally be used as a decision support tool. ROI is one of the most popular metrics used to understand, evaluate, and compare the value of different investment options. The ROI in an offshoring project is calculated according to the following equation: $\sum S - C_s - C_t$, with variables [11]:

- S savings per individual production step;
- C_s set up costs of the offshoring;
- C_t transaction costs of the offshoring.

The calculation of the ROI for offshoring is similar to the regular ROI calculation, except that when used for the offshoring calculation, it considers the savings instead of profit going away from the regular ROI investment calculations.

The major weakness in the use of the ROI in offshoring calculations stems from the fact that the determination of the reference costs is inaccurate in complex software development projects due to a likely change of requirements.

2.2.2 Balanced Scorecard

The balanced scorecard (BSC) was developed by Kaplan und Norten [12] in order to provide managers with a concept to measure the activities of a company in terms of its vision and strategies by giving them a complete over-view of the business performance. The focus contains financial outcomes as well as the human issues that drive those outcomes enabling an insight into the business using four perspectives: customer, internal, innovation and learning.

As mentioned above, BSC assesses the activities of a company. These four perspectives (service provider, software development project, outsourcing company and financial) have to be set suitably so as to accurately estimate the activities in offshore software development projects and eventually enable the use of BSC in offshoring projects. However, the use of these methods to assess offshoring activities may be criticized mainly because they does not consider critical success factors [14] like political and juridical stability in the vendor country. Another weakness is pointed out by Gold quoting *"… although the balanced scorecard is a useful and mercifully brief (one- or two page) reporting mechanism, it may not be the most effective vendor perform tool within the context of a legal contract or even a specific application. This is because the overall performance "score" is balanced among the four quadrants."* [15, p. 176].

Further more, the BSC only provides an ex-post insight into offshoring without including interdependencies between critical success factors. BSC too doesn't provide forecasting or simulation of offshoring. It hence seems to be unsuited for use as a priori risk evaluation method in offshoring projects.

2.2.3 System Dynamics

The characteristics of a complex system are the occurrence of a large number of parts with multiple nonlinear interactions that typically exhibit hierarchical self-organization under selective pressures ([16, 18]). The complexity is not accidental [17], but an inherent property of large systems. Simon states that the behaviour of a

complex system may be studied by analyzing the behaviour of each component as well as their relationship with others. We feel that a software offshore outsourcing situation is built just like a complex system. System dynamics approaches complex systems behaviour from two perspectives: relationships between components and the behaviour of individual components. The verse understanding of the costs that arise from offshoring project and risk management is inevitable. Interestingly, according to [19] only 25 % of companies achieve a cost reduction larger than 10 % through offshoring, despite the wide labour cost gap. This is accounted to transaction costs. We therefore need to understand how the complex system is built up so as to manage the inherent risks of offshoring. The following Section introduces a system dynamics approach to the analysis of software offshoring projects.

3. System Dynamics approach to Offshoring

The system dynamics approach is used in order to formalize the basics for simulating offshoring projects. We recommend the use of eleven high-level elements (ref.

Figure **3**) so as to describe them. Each element contains a number of sub elements that further describe the high-level elements in detail.

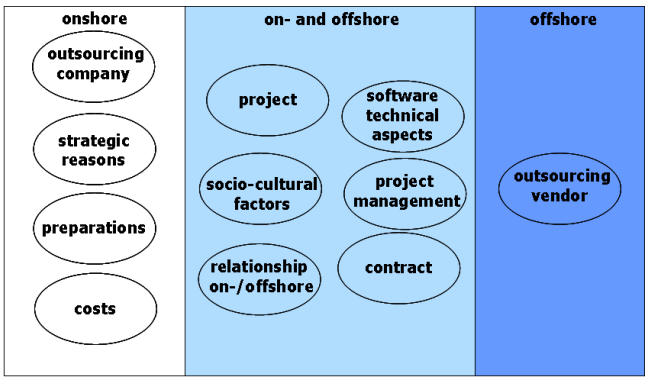

Figure 3: Components of offshoring

Figure 3 subdivides the elements into three groups: the onshore group, the on- and offshore group and the offshore group. The first group contains elements that the onshore side is responsible for. The second group, the responsibility of both sides and the third is that of the offshore side. Links between the single elements are not included for clarity reasons.

	preparations	strategic reasons	costs	contract	socio-cultural factors	software technical aspects	project management	project	onshore/offshore relationship
preparations		x	x	x	x	x	x	x	x
strategic reasons	x		x	x	x	x		x	x
costs	x	x		x	x	x	x	x	x
contract	x	x	x		x	x	x	x	x
socio-cultural factors	x	x	x	x			x		x
software technical aspects	x	x	x	x			x	x	x
project management	x		x	x	x	x		x	x
project	x	x	x	x		x	x		x
onshore/offshore relationship	x	x	x	x	x	x	x	x	

Figure 4: Interconnections between offshoring elements

The elements are strongly interconnected hence complicating the analysis (ref. Figure 4). Additionally, multiple sub elements may be part of each element. For example, the "cost" element entails the sub elements: "size" ([23]), "duration" ([24]), "complexity" ([24]), "interfaces" ([24]), "technology" ([23]), "specifity", "project specification" ([23, 14]), "test requirements" ([23]), and "onshore, offshore mix" ([23]). The sub elements in turn are connected with other elements. For example the element "test requirements" is connected with the "contract" element (ref [26]). The authors have defined seven aspects that need to be considered in [26] (test environment, test data, profiles for the performance tests, documents for users and for training, documentation of the architecture and design, test cases are based on real user cases and definition of procedures for difficult problems were not detected during the tests). These aspects are further connected with many other elements. Consequently, further research is required so as to make the system dynamics approach practical in the analysis of software offshoring.

4. Discussion / Summary

The study in this article is still work in progress. Interconnection between the components is broad (ref section 3). An offshore project is characterised by a complex technological system.[1] The complexity in the structure of the technological system is owed to interdependence between the elements that make up the system. The effects of these interdependencies between elements need to be taken into account because focusing on the element-specific properties may otherwise prove to be counter

[1] Hughes' ([20], p. 51) concept of technological system includes, apart from technical components, organizations, scientific texts, patents, and laws. Hughes ([20], p. 55) does acknowledge the usefulness of approaches that define systems solely in terms of the embodied technical components embodied.

productive due to negative effects of the combination. Thus the choice of elements cannot be independent of other elements in complex systems where elements function interdependently. The collective evaluation of these elements is crucial so as to effectively analyze the whole[2] system.

The deeper evaluation of the elements at the system level is complex. It has proven harder to find a system rather than to find a good element design, because the number of possible combinations between different variants of elements is exponential to the number of elements.

This is Simon's explanation "Suppose the task is to open a safe whose lock has 10 dials, each with 100 possible settings, numbered from 0 to 99. How long will it take to open the safe by a blind trial-and-error search for the correct setting? Since there are 10010 possible settings, we may expect to examine about half of these, on the average, before finding the correct one – that is, 50 billion settings." ([16], p. 194).

The evaluation of all possible combinations between elements follows the global trial-and-error strategy. Only global trial-and-error is effective in finding the optimal solution (cf. Alexander 1964 [1994]: 21) in complex systems. Using global trial-and-error in offshoring, ultimately amounts to trade off between a massive volume of settings. These settings can hardly be optimised in such a way that the end result really delivers practical results to the company that is using the software for offshoring.

Acknowledgments. The heading should be treated as a 3rd level heading and should not be assigned a number.

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[2] This does not imply that the whole system is superior to the sum of its parts. The whole system is different and not greater than the sum of its parts. ([21], p. 572).

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Amplification of the COCOMO II regarding Offshore Software Projects

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Amplification of the COCOMO II regarding Offshore Software Projects

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Abstract. Offshoring of software development projects comprises several critical success factors which endanger the success of collaborative development. Therefore we need methods to reduce the risk in offshore outsourcing software development projects. In this paper we introduce an attempt built on COCOMO II to estimate the effort of globally distributed projects. Thus we are able to give a more accurate estimation than the existing methods of traditional software development projects. This helps to predict the outcome of collaborative project whereby the overall risk can be reduced.

Keywords: COCOMO II, risk management, offshoring, cost estimation

1 Introduction

Offshoring has become a key software development technique. Its impact is continuously increasing as pointed out by statistics. This is motivated by the prospects of cost reduction, decreasing time-to-market and flexibility of resources. However, various studies suggest that approximately 40 percent of offshore projects fail to deliver the expected benefits. There is a huge gap between expectations and reality respecting the results. This is caused by the lack of theoretical basics and the ignorance of risks bounded to an outsourcing software development project. Thus, an offshore development project comprises prospects and problems which even experienced managers are often not aware of. Our goal is to give them a method to estimate the additional sources of costs and effort of offshore software development to provide a more realistic cost estimation which has come under scrutiny. In this paper we introduce an attempt built on COCOMO II to estimate the effort of globally distributed projects. Thus we are able to give a more accurate estimation than the

existing methods of traditional software development projects. This helps to predict the outcome of collaborative project whereby the overall risk can be reduced.

The paper is structured as follows. Section 2 gives an overview about the motivation, the state-of-the-art and integrates our approach. Section 3 introduces the existing COCOMO II. Section 4 presents the approach along with further particulars of the additional cost factors which occur during offshore outsourcing software development projects. The new approach examines the COCOMO II with regard to geographically distributed software development and amplifies it with specific functionalities for cost estimation. Section 5 discusses strengths and limitations of the approach and presents key questions for future research.

2 Motivation

An organization outsources the software development when it wholly or partially contracts out the software development activities into another organization. We talk about offshore outsourcing of software development project if one of the organisations is remotely located. The “global software development”, also “global software work” or “(geographically) distributed software development”, implies that the development activities are located in various parts of the World. The diverse distribution of the activities all over the world causes a number of questions to be answered about their reasonable and successful execution.

Since the dawn of the 21st century, more and more companies have started offshoring and will continue to do so in upcoming years. Project management plays a crucial role in IT-Offshoring, because it is the way a company develops and implements its global offshoring strategies in order to become more competitive in the global market. Also good project effort estimation is a decisive factor for the success of each individual IT-Offshoring project. Accurate effort estimation is a very big part of the challenge. Estimation of project costs and length has been a problem of software engineering that started with the rising of the business itself. IT project managers are afraid of giving estimations because they know that almost every project has hidden work that applies more to a global software development project. A global software development project hides an array of additional estimation sources, which should be taken into account during calculating the effort. There are additional risk factors in conjunction with the company’s capabilities. These should be taken into account to give a realistic approximation of the project effort. There is no deny that global software development brings more effort into the software development because communication and coordination effort is considerable larger in a distributed project [1], [2], [3].
The cost estimation in software development projects is always complex, because the effort of the task is very difficult to quantify and can hardly be estimated by an expert. There exist more than 500 software metrics to measure the quantitative aspect of a

software development project [4]. The two well known and used in practice are: the source lines of code (SLOC) [5] and the function points [6]. They are the cornerstone of the cost and effort estimation systems and are widely accepted. But the two metrics show to be insufficient to estimate the effort of software projects as coding is more complex than the number of lines of a program or number of functions of a program. Therefore cost estimation models are needed. Especially in the seventies and eighties a lot of these models have been developed and published, for example the System of Evaluation and Estimation of Resources - Software Estimating Model (SEER-SEM), a commercial system [7] and the Constructive Cost Model (COCOMO), an open cost model, by which all details have been published. COCOMO is used for estimating the number of person months used for developing a software product. Every detail inclusive the time and effort equation with every assumption and every definition has been made public.

Hence and because the COCOMO is "[…] the most established software cost estimation model […]" [8] we decided to use the COCOMO approach as our basis to generate an estimation model of global software development. We adopt the model regarding the *Effort Multipliers (EM)* to give more accurate effort estimation than the existing methods for traditional software development projects. This helps to predict the outcome of collaborative project and therefore reduces the overall risk.

3 COCOMO

The theoretical basics were designed in the seventies by Barry Boehm to establish better and more realistic estimations for software projects [8]. The first version (COCOMO 81) was introduced in 1981 also by Barry Boehm. The purpose of this model is "[…] to equip you to deal with software engineering problems from the perspective of human economics as well as from perspective of programming." [5]. - The Software engineering world has since changed a lot. These changes have exerted influence on the original COCOMO model and resulted in the COCOMO II [9], which has been published in 2000. As pointed out before, it is a widely accepted public cost model [10]. COCOMO II is based on more than 250 projects and is calibrated with 161 actual project data [8]. It can be calibrated from the organization's historical data, but if there is no data available for the parameter objective impact analysis the factors can be made by standard values.

In the following we will give a quick overview over the model[1]. The basic version of COCOMO estimates the effort of a software development project in person month (PM)[2]. The COCOMO II enables the use of source lines of code and function points as reference parameter for the calculation of the *Size (S)* of the project. To determine the actual size of the project algorithmic methods as well as historical data or expert opinions could be used. Depending on the project stage different COCOMO-Models exist and could be deployed:

[1] For further information please refer to [BABC00].
[2] One person month is standard calculated with 152 working hours.

- Early Prototyping Model
- Early Design Model
- Post-Architecture Model

We focus on the post-architecture model which is a detailed model widely used in practice. It provides a deep insight into the cost driver, but it depends on a clear definition of the life-cycle and software architecture. The effort equation of COCOMO II looks as follows:

$$PM = A * Size^{E} * \prod_{i=1}^{17} EM_{i} \quad \textbf{(1)}$$

PM: Person Month
A: Constant (2.94 for COCOMOII.2000)
Size: KSLOC[3] (SLOC, Function Points)
E: Scale Factors
EM: Effort Multipliers

The constant *A* is a calibration factor. It depicts the dimension of the productivity. The standard value for COCOMO II is 2.94. But it should be calibrated with the aid of historical project data of the company. The scale factors (*E*) depends on five factors: development flexibility, architecture/ risk resolution, team cohesion, process maturity, Precedentedness. Scale factors have an exponential influence on the effort of a software development project. These factors are cost drivers as well as the effort multipliers (*EM*). Cost drivers are characteristics for the software development which have impact on the effort of the software development project. Effort Multipliers are classified in the categories from very low to extra high[4]. Numerical values have been assigned to these categories. Thus, they are quantified with a numerical value from the COCOMO-tabulations [9]. The nominal value of a cost driver is 1.0. If the value is higher than this nominal value, the estimated effort of a software development project increases. If the value is below 1.0, the estimated effort of a software development project decreases. 17 *EM* exist within the post architecture model (cp. table 1) [9].

[3]Kilo Source Lines of Code; Kilo = 1.000

[4]The *EM* do not have to be part of all categories.

4 Amplification

The amplification of COCOMO II has been carried out in three steps as depicted in Figure 1:

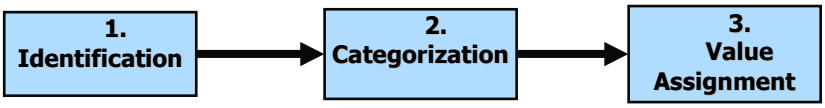


Figure 1. The amplification of the COCOMO II

In the first step Identification we identified the additional cost drivers for distributed development projects. In the current literature multiple success factors and risks are linked with the software offshore outsourcing [3], [11], [12], [13]. Additionally we did a qualitative survey based on semi-structured interviews with 22 interview partners from respectable German software producers. This research was an explorative research to gain knowledge about the cost drivers of offshore outsourcing projects. We applied the grounded theory, which was invented by [14] to identify the major threats. These threats are the cost drivers of offshore outsourcing software development projects. Then we analyzed the existing cost drivers of the COCOMO II to check their relevance for the global software development. We found several factors which are affected by offshore outsourcing software development as depicted in Table 1:

Effort Multipliers	**Scale Factors**
Product attributes: DOCU	PREC, TEAM, PMAT
Personal attributes: ACAP, PCAP, PCON, APEX, PLEX,	
Project attributes: SITE	

Table 1. COCOMO II cost drivers affected by global software engineering

From the **Scale Factors** Precedentedness (PREC), Team Cohesion (TEAM) and Process Maturity (PMAT) are affected. Precedentedness shows the experience of a software developer with the present project context. This factor can considerable vary between the offshore provider and the onshore buyer. The same is true for the factors Team Cohesion and Process Maturity. The first one indicates the ability of the team to work as a team. This factor is naturally affected by offshore outsourcing development. The Process Maturity quantifies the process maturity of the company. And this maturity can differentiate.

The linear **Effort Multipliers** of the existing COCOMO II are also affected by offshore outsourcing software development. From the group of the product attributes only Documentation Match to Life-Cycle (DOCU) is affected. This is because according to [15] two different developer teams have different effort on documenting even if the document follows the same standard. Thus the effort changes if the development teams are distributed. The platform attributes aren't affected at all, because they are determined by the specific product requirements. Whereas of the group of the personal attributes all cost drivers are affected by the offshore outsourcing software development project. Analyst Capability (ACAP) and Programmer Capability (PCAP) quantify the capability of the analysts, e.g., the software engineers. Of course the capability of the employees varies since they have different experience, education and settings. The Personnel Continuity (PCON) evaluates the staff continuity, and since fluctuation is known as a critical factor of offshore outsourcing software development projects, this factor changes too. The last factors of this group Application, Platform, Language and Tool Experience (APEX, PLEX, LTEX) could also differ depending on the experiences of the buyers. Of the group of the project attributes only the special factor Multi-Site Development (SITE) is affected. It is the only factor of the COCOMO II which concerns itself with geographical distributed software development. The effort sources of this cost driver are the geographical distance between the development teams and the complexity of the communication channels. Consequently the cost driver SITE is a step in the right direction. But there are more effort sources than the two behind SITE [3], [11], [12], [13], [16].

The direct use of the COCOMO II in the offshore outsourcing software development would not be sufficient, because it does not cover the complexity of the topic. Thus, we decided to amplify the model. We used the modular composition of the COCOMO II to integrate the additional cost drivers in the model. Cost drivers suggested in [BABC00] can be kept or excluded by the user. Thus, we identified new cost drivers concerning offshore outsourcing software development and added them to the model.

We used Effort Multipliers to build up the new costs drivers, because there haven't been any observations made that new scale factors arising through global software development[5] [17]. The current research tempts to reduce the risks and the development effort of offshore outsourcing software development. Hence, if the additional effort doesn't become too high, cost savings can be achieved.

The new effort equation looks as follows:

$$PM = A * Size^{E} * \prod_{i=1}^{17} EM_{i} * \prod_{j=1}^{11} EMO \qquad (2)$$

We added 11 new Effort Multipliers to the equitation and named them Effort Multipliers Outsourcing (*EMO*). These factors are grouped into 4 groups: Outsourcing Factors, Buyers Outsourcing Maturity, Providers Outsourcing Maturity and Coordination Factors (cp. table 2).

[5] But it could be a possibility to build up the follow-the-sun approach with such a factor.

Outsourcing Factors	Buyers Outsourcing Maturity	Providers Outsourcing Maturity	Coordination Factors
CULT	BOXP	OOXP	OFIT
BALA	BUPM	OUPM	PMGM
TMZN	CODS	-	TESP

Table 2. Effort Multipliers Outsourcing factors for offshore outsourcing software development

- The **Outsourcing Factors** define three basic and static cost drivers which could be possible if collaborating with an international partner. The cost drivers are: Cultural Distance (CULT), Barrier of Language (BALA), and the different Time Zones (TMZN). The capabilities of the employees are not quantified by these factors. They refer to a higher abstraction level.
- The **Buyer's Outsourcing Maturity** defines cost drivers which specify the offshore outsourcing maturity of the buyer. Three factors are critical: Buyer's Outsourcing Experience (BOXP), Buyer's Project Managers (BUPM), and Contract Design (CODS). The BOXP refers to the actual experience of the buyer with offshore outsourcing projects. The BUPM evaluates the capabilities of the buyer's project manager regarding their offshore qualification. The CODS refers to the complexity of a collaboration contract.
- The **Provider's Outsourcing Maturity** defines cost drivers which specify the offshore outsourcing maturity of the provider. Two factors can influence the effort: Provider's Outsourcing Experience (POXP) and Provider's Project Managers (PUPM). The POXP refers to the actual experience of the provider with offshore outsourcing projects. The PUPM evaluates the capabilities of the provider's project manager regarding their offshore qualification.
- The **Coordination Factors** mirror the cost drivers which refer to the interaction between two partners. The additional effort is represented via three factors: Outsourcer's Fit (OFIT), Project Management (PMGM), and Team Spirit (TESP). The OFIT refers to the correct selection of respective partner. The wrong partner increases the effort. The PMGM refers to the increased effort which is inherent in any offshore outsourcing project. The TESP influences the possible effort, too. If the team spirit arises with the aid of team building meetings, common goals, and a mixture of off- and onshore team member, the possible effort decreases.

As a first step we identified the additional cost factors of offshore outsourcing software development projects: We identified eleven additional ones and defined them as the starting point for the amplification of the COCOMO II. Second and third (cp. Figure 1), we need to categorize these additional factors to quantify them with numerical values. This has been done according to the COCOMO II categories and values. We tried to develop our categorization on theoretical thoughts, literature research and most of all on expert opinions. We are aware of the lack of validation because of the missing data base of actual offshore outsourcing software development projects. But we are confident that the approach is one step in the right direction and will be calibrated further. To present all of the categorizations and the whole process

of the value assignment would go beyond the scope of this paper[6]. Therefore, we exemplarily demonstrate step two and three on the additional factor: **Outsourcing Factors**

Categories	Value	Categorization criteria
Very Low	1,00	Both companies are from the same country and the same geographical region
Low	1,08	Both companies are from the same country but from different geographical regions
Nominal	1,15	Both companies are from the same [20]-group, but belong to different countries
High	1,22	The companies belong to different [20]-groups

Table 3. Categorization and value assignment of the cost driver CULT

Table 3 indicates the second and the third step for the cost driver CULT: The criteria for the categorization and the conduction of the value assignment. The cultural distance is often used as an instrument for e.g. performance assessment in the international business area [18]. The concept of the cultural distance is based on [20]. We used it as foundation for our categorization. The occurrence "very low" is presumed if both companies are from the same country and the same geographical region. In this case the cultural distance is so low that there is no influence by it. If companies are from the same country but from different geographical regions there is already a measurable cultural distance which is indicated by the value 1.03. This has been discussed with expert and rises from personal experience. The nominal and high values emanate from the Hofstede concept[7].

Categories	Value	Categorization criteria
Very Low	1.00	Both companies have the same mother tongue
Nominal	1.10	The companies use different mother tongues, but one of them is the project language
Very High	1.21	The companies use different mother tongues, none of them is the project language

[6] For further information e.g. the complete list of the categorization and the value assignment, do not hesitate to contact us.

[7] It can be argued that there are differences between the distance of different cultural distances (e.g. ANGLO vs. GERMANIC and JAPAN vs. GERMANIC), so that it can be useful to implement very high as an additional value for the cost driver CULT. But the authors leave that to the user, because the calculation for these distances can be made based on the equitation of [20].

Table 4. Categorization and value assignment of the cost driver BALA

Table 4 indicates the second and the third step for the cost driver BALA: The criteria for the categorization and the conduction of the value assignment. The first value has no influence. From the second to the third level the value rises as well as the additional effort to communicate. Some of the characteristics have been skipped because there exist only these three possibilities and the differences between them are extensive.

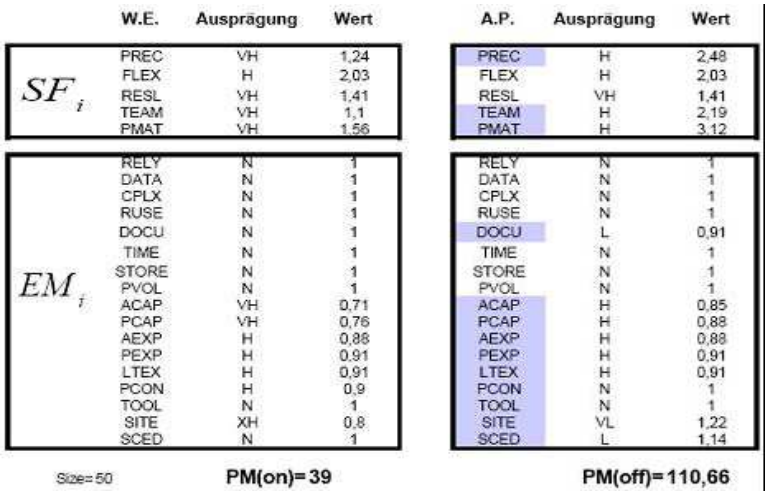
Categories	Value	Categorization criteria
Very Low	1.00	8 hours overlap of the office hours
Low	1.025	5-7 hours overlap of the office hours
Nominal	1.050	3-4 hours overlap of the office hours
High	1.075	1-2 hours overlap of the office hours
Very High	1.10	<1 hours overlap of the office hours

Table 5. Categorization and value assignment of the cost driver TMZN

Table 5 indicates the second and the third step for the cost driver TMZN: The criteria for the categorization and the conduction of the value assignment. As perceivable the time zones do have an impact, but not as remarkable as the other cost drivers of this factor. We did calibrate the factor as shown because in the literature this factor is named as a given effort factor but not as critical as the others. We did calibrate it with expert.

We finish this section with a simplified and illustrative example of effort estimation of an offshore outsourcing software development project: a company wants to develop the project X either in house or offshore. They found an Indian provider [21]. As a first step they calculate the effort in house (39 PM). The constant *A* has not been calibrated[8] and the estimated KSLOC are 50. Second they calculate the effort still with the original COCOMO II, but with parameters fitted for the Indian provider (110, 66).

[8] *A*=2.94 according to COCOMO II.



Afterwards the amplified model has been used to estimate the effort. In this model the additional cost drivers have been added to the second (distributed) estimation. We simplified again because we only used the minimum and the maximum values of the *EMO*.

COCOMO II in house	COCOMO II distributed	Amplification best case	Amplification worst case
39	110,66	165,76	944,37

Table 6. Effort estimations (*PM*): Just COCOMO II and with the amplified model

The data of table 6 indicate that the effort of offshore outsourcing software development projects increases at best about 50 % and at worst case about more than eight times. Under the presumption that the wage level in Germany is eight times higher than the one in India, there is still a cost advantage, if not the worst case arrives.

5 Summary and future prospects

The paper addressed effort estimation of offshore outsourcing software development projects. It demonstrated an approach of effort estimation of offshore outsourcing software development based on COCOMO II. We added cost drivers as **Effort Multipliers**. This is work in progress. Naturally the model needs more calibration and validation. But, even for traditional software development project it is impossible to count the precise size of efforts and get a correct estimation. The proposed model provides estimation of the range, not the precise figure. But it helps to predict the outcome of a global software development project whereby the overall risk can be reduced.

A key research question is multi-sourcing, because to simplify we have reduced the number of collaborative companies to two. It would be interesting to examine the additional effort if more than two companies are involved. For future prospect it would also be a research goal to conduct a differentiated examination for which role in the software development process the effort increases. Calibration on the basis of more expert opinions and data basis has to be made. Auxiliarily, an expert intercommunion about additional cost drivers would be reasonable to find possible overlapping and missing cost drivers.

Acknowledgement

This compound project is a cooperation of the Forschungszentrum Informatik (FZI), the institute AIFB of the University of Karlsruhe as well as several industrial partners and has a runtime of 36 months. The goal of the OUTSHORE project is the determination of critical success factors of an offshore outsource software development project. Based on these criteria, a decision model will be created for the project run-time simulation, which enables the risk analysis of this kind of projects.

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Processing People?

A Labour Sociologist's Perspective on Risk Management in IT-Offshoring Projects.

Patrick Feuerstein

Processing People?*

A Labour Sociologist's Perspective on Risk Management in IT-Offshoring Projects

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Abstract. Risk management in IT-Offshoring projects is closely connected to problems of organizing IT-work in distributed project-teams. Drawing upon the sociological debate on IT-work as a kind of 'knowledge work' and referring to first results of two case studies conducted in transnational project-teams of a German and Indian IT-company the author describes internal contradictions that occur when IT-companies try to standardize their working processes and thereby reduce the scope for individual decissions of the employees.

1 Introduction

This workshop focusses on a topic which can be discussed from very different perspectives: Risk management is a technological problem, it involves management practices, it reflects legal issues and it affects those who are working in these projects. The sociological debate on IT-Offshoring is somehow different from discussions in the management literature, as literature shall be called in the following that is aimed at giving managers a kind of orientation in organizing Offshoring-projects successfully. Of course management literature includes various contributions from social sciences as well as from economics or computer sciences. The important difference to the sociological debate is, however, that it primarily focusses on the practical aspects of IT-Offshoring. It is intending to give instructions on how to manage Offshoring. Sociological interest, instead, would tackle questions like: How can IT-work be organized transnationally and what conflicts and contradictions occur, for example between management and employees, when work is taken offshore?

Still, some points discussed in the sociological debate on Offshoring of IT-work also play a major role in the management debate although they

* The author would like to thank Dr. Nicole Mayer-Ahuja for her helpful comments to improve this article.

are addressed in a different way. Hence sociological perspective on risk management might be a useful contribution to this workshop.

This paper emerged from a research project, the author is currently working on together with Dr. Nicole Mayer-Ahuja. The project is on IT-Offshoring between Germany and India and is funded by the German Research Foundation (DFG). It started in May 2006 and will be finished in November 2008. In this project, the focus is on the organization of transnational project-teams in high skilled IT-work. That comprises IT-services as well as software development, but not BPO projects, for instance in Call Centres.

The project tries to broaden the picture that is usually drawn of work in transnationally operating companies in current academic and political debates in several respects: on the one hand this shall be achieved by focussing on IT-services instead of treating Offshoring as a largely industrial phenomenon. On the other hand, the study tries to examine the validity of the often stated tendency towards disembeddedness, i.e. towards a separation of transnational economic activities from location-specific structures and practices. Arguing that the complex premises and modalities of IT-work have hardly been addressed so far, the project aims at reconstructing them by focussing on IT-Offshorings "double embeddedness": into the structures of transnationally operating companies on one hand and into different local regimes of production and reproduction on the other hand. The latter would contain education systems and labour market policies, but also individual family backgrounds, and the impact of living and working in an IT-hub like Bangalore, for example.

Drawing upon qualitative case studies in one leading German IT-company with subsidiaries in India and one leading Indian IT-company with subsidiaries in Germany, the project is, then, trying to identify central aspects of the functional logic of highly qualified labour in transnationally operating IT-companies.

It has to be admitted, though, that the project is currently just in the beginning of the systematic analysis of the data, which has been gathered during a two-months stay in Bangalore, South India and during the visits in the German subsidiaries of our sample companies[1]. At the present stage, thus, a lot of questions remain unanswered, but even preliminary

[1] In both sample companies, semi-structured interviews have been conducted with roughly 30 managers and employees on different levels of hierarchy each. The interviews have been recorded and transcribed afterwards. The resulting texts are being analyzed applying the method of content analysis. This phase is not finished yet. In addition to these interviews the study refers to several interviews with experts on the IT-sector, politicians and city-developers.

results may be useful in order to qualify the discussion about the implementation of strong business processes in the name of risk management.

2 The Management Perspective: Dealing with Risks of IT-Offshoring

According to BITKOM's[2] Guideline for Offshoring, the 3 most important risks that companies are concerned about with regard to IT-Offshoring are:

- increased costs for communication and coordination
- unplanned costs for transition, transaction and cooperation mostly in the starting phase of Offshoring and
- the high administrative effort, which might outweigh the reductions of cost (BITKOM 2005, p.16f)

Obviously, all these risks causing increased costs root in organizational problems of IT-offhoring projects. McKinsey's Global Institute (MGI) also stresses the relevance of organizational issues in IT-offshoring projects in the study "The Emerging Global Labor Market" (MGI 2005, p.9) stating that

> "Those companies that find the propect of offshoring difficult generally face company-specific barriers of three types: operational issues, management attitudes to offshoring and structural issues."

Hence risk management can be considered to be closely connected to questions of work organization.

An important part of the debate about managing IT-Offshoring projects and avoiding its risks is about the creation and implementation of robust and standardized business processes, as precondition for successful Offshoring (BITKOM 2005, p. 35). Certificates for business processes like CMMI, Six Sigma or ISO 900x series become increasingly important when companies choose an offshore service provider. No surprise then, that India, as the world's biggest offshore service provider, is hosting the largest number of certified IT-companies in the world (Upadhya/Vasavi 2006, p. 64).

As a sociologist, I would argue that the strategy of reducing risks by implementing strong processes in the labour process of IT work follows a

[2] BITKOM is the German Association for Information Technologies, Telecommunication and New Media e.V., representing more 1000 companies in Germany

tayloristic logic of managerial control: Risks are to be avoided by making the execution of working tasks as independent from the executing person as possible. Therefore, the implementation of process models is supposed to go hand in hand with the implementation of strong knowledge management systems[3]. But although standardization is probably the dominant tendency according to the management debate on IT-Offshoring, there are other approaches as well, that doubt the effectiveness of processes and emphasize the importance of people in software development. To cite the Agile Alliance's Agile Manifesto:

> "The point is that the most important factors to consider are the people and how they work together, because if you don't get that right, the best tools and processes won't be of any use. Tools and processes are important, don't get me wrong, it's just that they are not as important as working together effectively." (cited from Grenon/Rainville/Guimont 2004, p.7)

From this point of view, the emphasis has to be put on the actual management of people, on the way they cooperate and work together. Of course, later on, the Agile Software Approach is also taking the form of a process, which questions the clear distinction between process and people orientation that is drawn in this paper. But as the authors of Covansys' Hybrid Value-Driven Delivery Model, an agile offshore delivery process, state:

> "Agile is a set of principles and best practices putting emphasis on communication and flexibility instead of relying on rigid processes and large amount of documentation." (Grenon/Rainville/Guimont 2004, p.7)

Process orientation in this paper shall therefore refer to the kind of processes that would be implying a more tayloristic mode of control, i.e. a higher degree of task fragmentation and less complex and closely monitored tasks for the single developer. Of course, it has to be analysed critically in how far the existence of standard procedures really affects the every-day work of employers. There can be no doubt, however, that the implementation of standard process models aims at controlling and monitoring a companies' processes more effectively, which might well be felt on the shop-floor level as well.

[3] For a critical discussion of the implications of knowledge management as a means of managerial control, see McKinlay 2005 or Alvesson/Kärreman 2001.

3 The Sociological Perspective: Organizing Knowledge Work

This thought already implies a good step towards what sociologists would be concerned with: Although the sociological debate is not primarily focussed on the practical problems that arise when sourcing IT-work globally, the organizational issues which are referred to as the risks of IT-Offshoring and Outsourcing in management handbooks, are also discussed by sociologists especially among those interested in work organization and labour.

In the sociological debate, software development or IT-work in general has been labelled as a kind of "knowledge-work", supposedly constituting a central aspect of the dominant mode of production in the society's shift from industrial to knowledge society. Although it is worth debating to what extent knowledge work really takes place (see Thompson/Warhurst/Callaghan 2001), the promoters of this concept agree on the impact which this kind of work supposedly has on its mode of organization.

Knowledge work is considered to be highly innovative and creative because of its dependency on changing (customer) demands and the importance of research and development tasks. Therefore, it is argued, the management cannot foresee the whole work process in advance and fragment it into smaller and less complex tasks that could be assigned to individual programmers.

A tayloristic mode of control with its high degree of division of labour and task fragmentation as well as strict regulation of the execution of tasks is therefore often considered to be impossible when talking about knowledge work (Willke 1998, p.169f, Robertson/Swan 2003, p.835f).

Instead, management of knowledge work is supposed to rely on normative or indirect forms of control (Kunda 1992), whereas hierarchical forms of coordination and control are considered contraproductive (Töpsch/ Menez/Malanowski 2001, p. 307, Robertson/Swan 2003, p.832). Moreover, hierarchical coordination is supposed to be replaced by reliance on self-coordination, which would allow for a more complete usage of coworkers' abilities (Heidenreich/Töpsch 1998, p.16, Alvesson 2000, p. 1102, Castells 1996, p. 246), but limits the possibilities to standardize the working process (Hermann 2004, p. 20). In theory, then, employees in these jobs are granted a high level of autonomy in planning and executing their working tasks (Abel/Pries 2005, p. 111, Thomson/Warhurst/Callaghan 2001, p. 926). At the same time, stable corporate structures are supposed

to lose importance due to an increase in project work, facilitating telework as well as non-standard employment relationships.

If this was true, companies would obviously become more dependent on individual employees, enhancing their negotiation power at the labour market.

Due to these specific characteristics of so called knowledge work, especially the limited possibilities of clearly defined, separated working tasks and standardized procedures, high qualified service work, like software development and IT-service work, used to be considered very difficult to transfer globally (Boes 2005, p.17). But the last two decades made this picture change a lot: From the 1990s, IT-work has actually been transferred to low-cost destinations, and software companies have started to develop software in project teams spread all over the globe.

4 The Impact of Outsourcing and Offshoring on IT-Work

The rise of IT-Offshoring is argued to be part of a broader trend towards standardization within the IT-sector (Boes/Kämpf/Knoblach/ Trinks 2006, p. 7). This standardization has mainly two aspects:

1. On the one hand, services and products get standardized: They are considered to be best suited for Offshoring, if a low degree of complexity and creativity is needed for their execution or production.
2. On the other hand, the companies' structures and business processes get standardized on the supplier side as well as on the demanding side. Generally both sides try to stick to certified processes, as it is considered to be optimal if both sides have similar processes in place. This is supposed to reduce the need for extensive communication. (BITKOM 2005, p. 35)

Carol Upadhya and A.R. Vasavi (2006, p.63f), focussing on Indian IT service-companies, identify 3 reasons for this trend:

1. The last two decades have given rise to a more factory-like software development process in general. This is caused by "the increasing complexity of software products, [...] the imperative of continually reducing time to market due to sharp competition, and the consequent need to divide work among many software engineers" (Upadhya/Vasavi 2006, p.63) This trend is enabled by the emergence of structured programming and object-oriented programming languages, making modular programming possible.

2. Offshoring and Outsourcing business is very much customer driven. As reducing costs is still one of the most important reasons for Outsourcing and Offshoring, customers are closely monitoring the projects and governing them by strict timelines. So, service providers are under heavy pressure to increase productivity and efficiency, which makes them adopt more structured forms of organization.
3. The introduction of international quality certifications like ISO 9000 series and CMM are also considered to strengthen the trend towards standardization and routinization.

Upadhya/Vasavi argue that the trend towards standardization of products and services also affects the working processes in IT companies and thus reduces the quality of work for employees in this sector.

This position is challenged by authors arguing that standardization of products and services does not affect the working processes as such to a great extent. As Ilavarasan/Sharama (2003, p.6) conclude in their study on Indian IT-companies:

> "Thus, one can conclude, that software work seems to be unroutinizable at the moment and will continue to be so for a long time."

According to this position, software work is still very dependent on the employees, who need to be granted "enough space to use [their] creativity and imagination in the work" (Ilavarasan/Sharama 2003, p.6). The quality certificates are rather seen as marketing to attract and satisfy customers than as a means to increase managerial control.

So, in the light of the above discussion and given the notion of IT-work being knowledge work - with its special characteristics - the following questions arise: Is there a unique tendency towards IT-Offshoring? What kind of contradictions occur in the labour process, considering different management strategies? And, does the nature of knowledge work limit the standardization and routinization of software work?

5 Process Implementation in German and Indian IT-Offshoring Companies: Impressions from Case Studies

The first question can easily be answered: There is of course no single way of Offshoring, but very different Offshoring strategies. The most important distinction here may be the distinction between service-companies

which usually operate out of low-cost-locations and product-companies which tend to be based in Europe, Japan or the U.S. The project tries to cover this spectre by conducting case studies in one Indian service-company and one German product-company.

Usually, it would be argued that standardization would be much more important in service-companies due to higher competition and customer pressure. In product-companies - painting a very rough picture here in order to make the point clearer - however, one would expect to find unrestrained knowledge work.

But the first interviews of the study already showed that the dividing line is by far less clear: Standardization is indeed more pronounced in the service-company but there is considerable scope for individual decision left. On the other hand, the product company has already implemented many processes which should actually not work at all in the sphere of knowledge work.

It may thus be argued that a certain mid-level of standardization is generally required when distributing high-skilled IT-work across the globe. But at the same time, excessive implementation of process models can destroy the basis for successful and satisfying IT-work, generating new organizational problems instead of solving the old ones.

The following sections shall give some idea of the working realities that are referred to here:

5.1 First Case: The Service-Company

The first company (company A) is one of the big Indian IT-service companies with 60.000+ employees. This company has offices and customers throughout the world, but the major part of the business still comes from the U.S. They have just entered the European market, which is considered very difficult to handle. So there are just a few customers in Germany at this time.

The portfolio of this company contains the whole range of IT-services, from rather simple support and maintenance projects to more complex software development and research projects.

Employees and managers from two project-teams dealing with German clients were interviewed. One project team was doing a support project for the web-portal of a big German company that included technical support as well as content management. The other project developed a new application for a German customer from the financial sector.

The market for IT services being very competitive, Indian service-companies are not only competing among themselves but also with big

multinational companies that have opened their own development centres in India. This puts additional pressure on the service companies to reduce the costs and to be as efficient as possible. To prove their effectiveness, Indian service companies put very much effort in the certification of their business processes. Company A for example is certified for ISO 9001, CMM Level 5 and mandatory implementing Six Sigma. According to managers of this company, customers demand the effective implementation of these process models as a precondition for starting a project.

Hence, there are standard prescriptions for every kind of service the company offers, with detailed descriptions of the necessary project steps and a detailed list of requirements to be met and documents to be produced before entering the next stage. According to the standard descriptions for the different kinds of projects carried out by the company, the course of every project is planned in very much detail in the first phase of the project. Together with the customer, a clear list of tasks is negotiated and for each task the necessary time for completion is defined. The estimation of the necessary working time is based on the experience in former projects and sector-wide best practice standards. This way, the overall task is fragmented into smaller and less complex subtasks, that are assigned to the programmers in the project team. Usually, the distribution of working tasks is not discussed within the team but assigned by the project manager. The time-frame of these tasks is more about hours than days and is assigned to the programmers individually.

This already standardizes the labour process and the working tasks of the employees to a great extend. But this tendency is still increased by a very tight system of technical control over the labour process.

The progress of the execution can be constantly monitored by the superiors via a tool that is not only used to assign tasks to the members of the project team, but also to track working times spent on these tasks. The employees are to document their work on a daily basis with this tool. This tool plays the double-role of being the basis for accounting and project management at the same time. All in all, the structures and processes implemented in this company form a very standardized and factory-like labour-process. As Indian colleagues put it in their study on Indian IT-service companies:

> "A significant outcome of the rationalisation of software production is that programming and other IT work are being reduced to measurable quantities of time, effort, productivity, and output mimicking in many ways the old Taylorist system of factory management." (Upadhya/Vasavi 2006, p. 65)

But this way of management is causing its own contradictions, too. By reducing the complexity of working tasks and decreasing the employees' level of autonomy in the work, the attraction of work is reduced as well. As a consequence, the service-companies in Bangalore are facing a higher rate of attrition compared to the product-companies (see Upadhya/Vasavi 2006, p. 66f). Routinization and the monotonous character of work is one of the major complaints among developers in company A. Employees who have left the company also talk about the low visibility in this big company and the feeling of being lost. So employees tend to head for a job in product companies whose work is considered to be much more attractive.

According to project managers in company A, this does not yet pose a threat to projects' delivery. The standardization of the working tasks accompanied by an effective knowledge management system that is given a high priority has enabled this company to reduce the dependency upon its employees to a large extend. As the project managers told us, it only takes them around three weeks to train new employees to replace leaving team members and there are backup plans for every position in the team.

But talking to developers showed a somehow different picture. Even though routinization and standardization of the working processes is advanced in this company, the working process is far away from being totally independent from the employees. As developers explained, there are definitely delays in the course of the project if a person leaves the company. Very often this does not mean a delay to the timings of the overall project, as it can be compensated by an increase of the working times of the rest of the team. The team faces increased workload every time a person leaves the team, so the delay caused by leaving team-mates does not yet lead to shifted timings but to overtime work of the colleagues. Hence leaving team-members can still be considered a risk for project timings as the capability to increase overtime work for the team is limited.

Additionally, the process descriptions, although they reduce the whole production process to less complex tasks that can be done in several hours by an individual developer, are far from completely eliminating complexity. There remains the need for communication, as task definitions are unclear or dependent on other tasks causing the need for close cooperation of the developers. This cooperation happens on a very informal basis, so that the willingness and motivation of the employees affects the efficiency of the cooperation to a high degree.

The cooperation can be even more difficult if programmers do not stick to the coding guidelines or simply forget to document their code

in compliance to companies' standards. So, ensuring compliance to the defined standards and guidelines is an issue for the company, as process descriptions and guidelines to follow have reached a high level of complexity by themselves, making it very difficult for the developers to keep at least parts of them in mind.

For the service company, the situation is roughly as follows: The competition for customers forces the service company to signal quality and standardize the processes according to reputable process models. This way, the working processes get standardized and routinised, decreasing the attractiveness of work but not abolishing the dependency on the employees. Accordingly, poor motivation of the employees might still be a risk for the success of the project.

This could be the reason for service companies in Bangalore to offer various benefits apart from work as our sample company does. They build big campuses and put much effort in the quality of the buildings and the work environment. If asked for the positive aspects of working at company A, most of our interviewees named the work environment and the campus before the character of work or the technologies they were working in. Another attempt to bind people to the company - a quite surprising one from a German perspective - is the company's strategy to create couples within the company, making each other stay in place. This strategy shall be realized by granting "dating allowances": Employees having a date with another are refunded for the costs of the date.

So, company A obviously feels the need to fight attrition even by quite unusual measures which signals the remaining dependency on the employees even in such a highly standardized working process.

5.2 Second Case: The Product-Company

The other company (company B) is a big German product-company, with a subsidiary in Bangalore, employing around 40.000 people worldwide, out of which around 3000 are in Bangalore. This case study comprised interviews with developers and managers from one team of this company, developing a module of a new standard software package in Bangalore. The rest of the software is developed in different locations all over the world, whereas the most important part is still done in Germany.

The team is again subdivided into several subunits, each dealing with a separate functionality of the module. All subunits are managed by project managers in Germany and a counterpart in India, but the division of labour between the German manager and his or her counterpart in Bangalore varies considerably. This results in different communication and

cooperation structures within these teams. I will get back to this point later.

Company B does not face the same pressure to implement standard process models as there is no direct customer contact in the development process. So company B is not certified for any CMM Level, but for ISO9000 series. As managers told us, it was not introduced for signalling quality but for internal quality assurance and raising productivity. The last years, this company failed to reach their margins, so that there is laid high priority on increasing productivity in the next years. For this purpose, the management is testing the implementation of Six Sigma in some projects as well, but the compliance to Six Sigma is not compulsory yet.

Still, it is not only the smaller number of certificates making a difference to the service-company here, moreover, it is also the relevance of these process descriptions in the work process that makes work in the product-company less standardized and routinised.

There are guidelines and templates for the execution of working tasks in this company as well, but they are not that much taken into account by the employees. Some guidelines are implemented in the IDE's of the programmers so that basic coding conventions are automatically followed, but the majority of guidelines is given in different documents. Similarly to the service-company, these guidelines are that complex no developer is completely aware of them. Additionally, the compliance to these guidelines seems to be less strict. Developers admitted that in high pressure phases of the project they just skip the process requirements and finish their job, as the processes are seen more like obstacles in the development process. The project managers also differ in the way they insist on the compliance to the coding guidelines.

That affects the working tasks themselves. Developers are not given short-term tasks as they are in the service-company. The time-frame of tasks in the product-company is more about days and weeks than hours. And the execution of tasks also requires more problem solving capabilities because the tasks are not defined in that much detail. As the development of one part of the software is highly dependent on the development of other parts of the software being developed in other subsidiaries of this company, there is a huge need for communication and cooperation between the developers of the different parts. That introduces a considerable amount of unpredictability to the working processes developers have to deal with.

Company B also does not rely that much on technical control. There is no knowledge management system in place, and project management is much less computer-based, as there is no time- and task-tracking tool. Tasks are distributed in team-meetings and can usually be discussed within the project-team.

As a result, the labour process in company B is more dependent on the employees than in the service-company. Accordingly, attrition causes much more trouble to timings of this company's projects because it takes long to replace leaving team-members. Project managers estimated that it usually takes about half a year to turn a new employee into a fully productive member of the team. But as the employees - at least the ones that have been interviewed in this case study - appreciate the work they are doing and value the level of autonomy they are granted in executing their work, usually employees do not leave because of the work's quality.

Still, the work's quality is not the same in all the subunits. As stated above, the way different subunits are managed by German project managers and their Indian counterparts varies from subunit to subunit. Some subunits are very much involved in strategic decisions concerning the technical design of the overall software package and the plans for the further development of their module and others are not. This difference considerably affects the satisfaction of the developers as the overall technical design limits the developers' possibilities to implement their own ideas and to create their own solutions. The teams with less participation were facing higher attrition rates and ran into problems concerning the timings of their deliveries.

Additionally, as company B is increasingly emphasizing the implementation and compliance to standard process descriptions as stated above, the work quality might change in all the teams in future. This might undermine the motivation of the employees posing organizational problems to this company as well. As a colleague stated in her case study of an Australian IT-company:

> "The case study emphasized the dialectical relationship between autonomy and control. In effect, managers, facing the heightened indeterminacy of creative employees labour, walked a tightrope between autonomy and getting profitable work done by the deadline. For employees, this necessity of profitability meant autonomy was limited to the use of their skills and their time. Management could have increased profitability by routinizing the work, but employees would have left, which would be how they would express

their resistance, as the work would no longer fit their social identity." (Barrett 2004, p.790)

Current situation is similar for company B: Offering very attractive work for the employees, company B is not facing trouble with high attrition rates yet. But the less controlled and more autonomously organized labour process bears some risks concerning profitability and efficiency of work. The attempt to introduce standard process models or to ensure compliance to already existing process prescriptions in order to reduce these risks faces resistance in the employees' job orientation and their demand for creative and challenging work.

6 Conclusion: Relevance of individual and structural factors in risk management

Although attrition - according to statements from the management of both companies - does not endanger the productivity of projects and lead to problems in keeping the deadlines yet, it still points to the limits of process orientation as a means in risk management in general. Referring to two case studies in IT-companies in Bangalore, this paper stressed mainly two points:

1. It is possible to standardize IT-service work to a large extent to increase the productivity of projects and to reduce the risk rooting in a very people dependent approach to software development, as it is done in the service-company of our sample. But even the highly standardized labour process of the service company is still dependent on the employees in a way that their motivation and commitment is crucial to the success of the projects. This is even far more the case in the product company of our sample.
2. India, or especially Bangalore, with its booming IT-industry poses some difficulties to the companies, as employees, empowered by the labour market, are very flexible and very demanding concerning the offered jobs.

Hence, the implementation of strong business processes and a more structured approach to software development might be an important point in risk management, but in destinations like India, where a booming industry offers lots of opportunities for the employees, enabling them to be very choosy and demanding regarding the job they want to do, the sheer reliance on processes might cause additional problems without solving the old ones.

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Further Steps in Analyzing the Dimensions of Hofstede's Model of National Culture for Potential Relevance to Risk Analysis in Global Software Development

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Further Steps in Analyzing the Dimensions of Hofstede's Model of National Culture for Potential Relevance to Risk Analysis in Global Software Development

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Abstract. This paper investigates a theoretical model of national culture by Hofstede as a possible tool for managing risks caused by the influence of cultural diversity and culture within the domain of global software development. For this purpose, data from an explorative qualitative survey is examined. Examples of influence of cultural diversity and culture are given based on this survey. These results are then put into relation to the applicable dimensions of Hofstede's model. At the same time, hypothesis for possible insights for risk management are developed, as well as possible limitations.

Keywords: Cultural Diversity, IT Nearshore, IT Offshore, Hofstede, National Culture, Risk Management, Global Software Development

1 Introduction

The utilization of global production resources is not new to the industry, but in the past two decades the trend of global sourcing has reached the services industry in general and IT services in particular, with USA and UK as leaders in this development. In recent years it can be observed that the execution of these sourcing practices has found some acceptance also in German speaking countries, even among small and medium sized enterprises [1].

The service sector implies strong integration of the customer into the production process as constitutive feature [2]. Therefore, communication between individuals of different nationalities is a more critical part of global sourcing in IT services than in classical industries. In IT services we often find highly specific services or products, and perfect specification of the requirements is the exception, which increases the importance of communication and interaction within the production process.

General research on effects of cultural diversity shows that communication and interaction of individuals can strongly suffer due to the differences between the

involved cultures (e.g. [3], [4]). This can also impede organizational and inter-organizational communication flows and interaction. Scientists are just beginning to analyze the characteristics of these effects within the domain of global IT services and software development (e.g. [5], [6]).

This paper concentrates on the discussion of a theoretical model as a possible tool for risk management concerning the influence of culture and cultural diversity within the domain of global software development. For this purpose we elaborate some basic definitions in the next section. Hofstede's model is explored in Section 3 together with some basic elaboration of our survey. Section 4 focuses on the discussion of our hypothesis and findings and Section 5 provides some conclusions.

2 Definition of Major Terms

Culture is a collective concept that can be used to differentiate between groups. Groups differing in culture have different beliefs, attitudes and values influencing their actions. They can be identified on different levels of a society, e.g., inhabitants of nations or regions, members of organizations and occupation groups [7].

National culture is as set of beliefs, attitudes and values that are typical for inhabitants of a nation and influencing their actions [7].

Corporate culture can be understood as a system of three layers. The lowest layer consists of basic unaware issues or assumptions and influences the layers above. The second layer consists of publicly proclaimed values. The third layer consists of what Schein [8] calls artifacts. They are the parts of corporate culture that are easily observed, they are the result of the interpretation of the values from the second layer based on the assumptions from the first layer. Examples for elements of the third layer are the behavior of the employees, the corporate products and buildings [8].

The *culture of an occupation group* consists of the common beliefs, attitudes and values that influence the actions of this group and that span the border of organizations [8], [7].

We subsume the following activities within the IT domain under the term *Software development*:

- Individual software development
- Migration of software from one platform to another
- Development of standard software
- Application management and associated services

Global Software Development (GSD) is characterized by the involvement of people at different geographical locations that interact across national boundaries to coordinate the development by means of synchronous and asynchronous media [9].

Within this paper the terms *nearshore* and *offshore* will be used to describe the location of utilized resources within IT. Nearshore resources are considered to be resources utilized by a user and his organization that are located in a different country than the user's domestic organization. Offshore resources are resources utilized on a different continent [10]. In this paper the classification of the resources is based on a

European perspective. When we refer to IT near- and offshore, we presume utilization in the area of GSD without pointing this out explicitly.

Risk management is a process that has the goal to maximize the gain from positive risks (opportunities) and to minimize the impact of negative risks. To achieve these goals risk management has to define and execute controls that address the identified risks in a proper manner [11]. Within the risk management process the following steps have to be undertaken (based on [11] with modifications):

1. Identify risks (possible events with impact on cost, schedule, quality, or people)
2. Determine likelihood of occurrence (e.g. low, medium, or high)
3. Determine the degree of impact (e.g. low, medium, or major)
4. Define controls to avoid or mitigate impacts of selected risks
5. Execute the controls

In comparison with domestic sourcing strategies in software development additional sources of risks that are specific to GSD are temporal distance, geographical distance, and cultural distance [12]. The further discussion will concentrate on cultural distance as sources of risks.

3 Hofstede's Model of National Culture

Of special interest in our context are models of national cultures. Different models have been developed to allow to measure and compare national cultures and to explain behaviour of individuals by their cultural background. Such models can help to predict possible problems in intercultural cooperation and to develop or judge possible countermeasures; in this way they can also be used as tools within risk management. We provide examples of such use of the model below.

The best known model in this respect is the four dimensional model by Hofstede [13] which has found great acceptance and has been widely applied (e.g. [14]). Hofstede's model is the result of empirical research. The creation of the model began with analyzing the data of value surveys that where carried out among IBM employees at company sites in different nations in the late 1960s [15]. The analysis showed differences between countries that could be linked to four dimensions. These four dimensions that allow to quantify and compare cultures are: *power distance, individualism (vs. collectivism), masculinity (vs. femininity), and uncertainty avoidance*. Later studies by Hofstede and other independent researchers supported the findings and enhanced the list of countries for which data is available. In a later book Hofstede's model has been enhanced by a fifth dimension: *long-term (vs. short-term) orientation* [7]. These dimensions are quantified by an index, allowing measuring and comparing national cultures. Table 1 shows these dimension measures and examples of practical consequences in business.

It should be mentioned, that other models or dimensions that are of potential interest in this field do exist, e.g. Schein's model of cooperate culture [8], Hall's dimension of perception of time [16], and Kumar and Bjorn-Andersen's dimensions of IS designer values [17]. Some of the latter dimensions have been successfully applied to an investigation on offshore software development in India in a recent

publication [6]. The dimensions power distance and individualism of Hofstede's model have also been applied in this investigation, however, cases of influence of culture or cultural diversity could only be found for the dimension power distance.

3.1 Possible Benefits of Hofstede's Model as Tool for Risk Management in GSD

An important idea of risk management is to anticipate the risks of relevance to the managed activities. There exist lists about which risks can possibly be expected within GSD in general, also for the effects of cultural diversity or culture (e.g. [12], [11]). However, there is little systematic information on how the likelihood of these risks and their possible impact is influenced by the location of GSD activities, even though it is known that the location influences these risks [11].

If it would be possible to use Hofstede's rich data, which covers 74 (PDI, IDV, MAS, UAI) and 39 (LTO) countries respectively, to support the risk manager to form an opinion regarding potential risks in a given situation, this would be of great benefit for practitioners and should also be of advantage for further research. The data of Hofstede's model could also be used to develop new ideas for controls and judge their efficiency related to the GSD locations they are going to be applied at.

Another possible benefit is that the data of Hofstede's model could be used to ensure the sensibility of a (risk) manager to the actual cultural diversity between his domestic and other cultures.

When a GSD location of interest is rather new to the global IT industry, there is little or no experience of the influence of cultural diversity or local culture on GSD activities. In such a case, a tool to help assess the risks that cultural diversity and culture may be posing to a GSD activity would be of very high value.

This paper provides hypothesis for each of the benefits named above, and will point out limitations that exist. For some dimensions this paper is limited to examples of influence of cultural diversity or culture, due to given limitations in space. But as far as examples related to a dimension are discovered, at least one will be given, to ensure to enhance the knowledge available from [6].

3.2 The Qualitative and Explorative Survey

This paper refers to the data of a qualitative and explorative survey in the GSD domain which was undertaken by the Institute of Information Systems at the University of Hamburg [10]. The survey covers different aspects of the use of near- and offshore resources ranging from strategies and goals over process reorganization to the effects and management of culture or cultural diversity.

Table 1. Dimensions and indexes of Hofstede's model of national cultures

Explanation of Dimension and Index	Examples of Extremes Index Values
The *power distance index* (PDI) measures "the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally."[1] [7, p. 46]	High PDI: high emotional distance between boss and subordinates; the subordinates are unlikely to approach their boss or contradict directly Low DPI: consultative leadership, low emotional distance between boss and subordinates; subordinates do not fear to contact and/or contradict the boss
The *individualism index* (IDV) measures the position of a society between the two extremes individualism and collectivism. "Individualism pertains to societies in which the ties between individuals are loose: everyone is expected to look after himself or herself and his or her immediate family. Collectivism as its opposite pertains to societies in which people from birth onward are integrated into strong, cohesive in-groups, which throughout people's lifetimes continue to protect them in exchange for unquestioning loyalty." [7, p. 76]	High IDV: the following goals are of importance for employees: a job should leave enough time for personal life; it should offer the freedom for an individual approach and should be of a challenging nature Low IDV: the following goals are of importance for employees: opportunities to improve or learn new skills through training; good physical working conditions; full use of skills and abilities in the job
The *masculinity index* (MAS) measures the degree of overlap between emotional gender roles. A high index is assigned when gender roles are clearly distinct. Then one role is supposed to be assertive, tough and focused on material success. The other is supposed to be modest, tender and interested in quality of life.	High MAS: decisive and aggressive management; conflicts are resolved by letting the strongest win; more money is preferred over more leisure time Low MAS: intuition and consensus as management principles; conflicts are resolved by compromise or negotiation; more leisure time is preferred over more money
The *uncertainty avoidance index* (UAI) measures "the extent to which the members of a culture feel threatened by ambiguous or unknown situations."[2] [7, p. 167]	High UAI: there is a tendency towards more formal laws and informal rules controlling employment;[3] there are rules or rituals that are dysfunctional; time is money: people like to be busy; expert opinions from the work floor are important Low UAI: rules are often better followed; high positions are open to generalists with or without knowledge of the domain; people work hard if necessary but like to relax
The *long-term orientation index* (LTO) measures the position of a society between the extremes of long- and short-term orientation. "Long-Term orientation stands for fostering of virtues oriented toward future rewards – in particular, perseverance and thrift. Its opposite pole, short-term orientation, stands for the fostering of virtues related to the past and present – in particular, respect for traditions, preservation of 'face', and fulfilling social obligations." [7, p. 210]	High LTO: some main work values are learning, honesty, adaptivity, accountability, self-discipline; importance of lifelong personal networks, leisure time is not important Low LTO: some main work values are freedom, rights, achievement, and thinking for oneself; personal loyalties vary with business needs; leisure time is important

Target groups were users of IT near- and offshore in German speaking countries and the UK, service providers from Middle and Eastern Europe, Asia and Africa and further experts with knowledge and experience relevant to the matter of interest (e.g. consultants). Within the field research phase from February till July 2006 more than 50 experts agreed to be interviewed, among them 21 users of IT near- and offshore, 17 of which were from Germany, two from the UK and two from Switzerland (see Table 2).

This paper does not aim to give a comprehensive overview of the survey results. Rather it concentrates on the described goal to possibly identify examples of the

[1] Institutions also include family, school and community [7]

[2] The avoidance of uncertainty and ambiguous situations should not be mixed with risk avoidance; only unfamiliar risks are feared by cultures with high uncertainty avoidance [7].

[3] In countries with high PDI, the existence of power can replace those rules [7].

relevance of Hofstede's model as a tool for risk management and to explain observations. For this the data regarding near- and offshore users, which has already been completely processed using open coding,[4] was analyzed regarding the influence of cultural diversity or culture possibly being explained by Hofstede's dimensions. If such cases were found, the data was also checked for possible contradictions within other countries for the observed effects of the related dimension; for this some examples will be given. Even though the survey was not primarily undertaken to evaluate Hofstede's model as a tool for risk management, it nevertheless serves to inspire a number of interesting hypothesis.

Table 2. Overview of expert interviews with users of IT near- and offshore.

Case code	Main industry of user	Interview Partner		Case code	Main industry of user	Interview Partner
CH-BY-01	Financial Services	CEO		DE-IN-03	Financial Services	Manager
CH-UA-01	IT Consulting	CEO		DE-IN-04	IT Services	Manager
DE-BG-01	IT Services	Manager		DE-IN-05	IT Services	Manager
DE-BY-01	IT Services	Manager		DE-IN-06	IT Services	Manager
DE-CZ-01	IT Products	CEO		DE-PL-01	IT Services	CEO
DE-CZ-02	IT Services	Project Manager		DE-RO-01	Industry	Project Manager
DE-CZ-03	Financial Services	Manager		DE-UA-01	IT Services	Manager
DE-EE-01	Industry	CEO		DE-UA-02	IT Services	CEO
DE-ES-01	Financial Services	2 Managers		UK-IN-01	IT Services	Project Manager
DE-IN-01	IT-Services	Manager		UK-IN-02	IT Services	Project Manager
DE-IN-02	Industry	Manager		-	-	-

Explanation: User's country [a] – provider's country [a,b] – number for uniqueness

[a] Countries are coded by top level domains;
[b] This is the country of the relation to the provider the interview was focused on, not implying that there are no further relations to providers nor that these where not mentioned in the interview.

4 Linkages between Hofstede's Dimensions, Risks, and Possible Controls

In the following we explore the possible use of Hofstede's model as a tool. As a basic foundation for our discussion the scores of countries within the survey or mentioned later on are displayed in Table 3.

[4] Open coding is a data processing technique that has it's root in the research method called "Grounded Theory" [18], but has developed to an also separately applicable processing method for qualitative data [19].

Table 3. Scores for the dimensions of Hofstede's model (based on [7]):

	Scores				
Country [a]	**PDI**	**IDV**	**MAS**	**UAI**	**LTO**
BG	70	30	40	85	-
CH	26[b]	69[b]	72[b]	56[b]	40
CZ	57	58	57	74	13
DE	35	67	66	65	31
EE	40	60	30	60	-
ES	57	51	42	86	19
HU	46	80	88	82	50
IN	77	48	56	40	61
PL	68	60	64	93	32
RO	90	30	42	90	-
UK	35	89	66	35	25
Highest and lowest score within the dimension for all countries with data available					
Min.	11	6	5	8	0
Max	104	91	110	112	118

PDI = power distance index; IDV = individualism index; MAS = masculinity index; UAI = uncertainty avoidance index; LTO = long-term orientation index;
[a] No data available for BY and UA
[b] German speaking population

Power Distance, Communication and Hierarchy

In general the Indian employees prefer or insist to communicate with someone of the same hierarchical position on the user's side. This principle is especially important in the case of escalating problems (cases: DE-IN-01, DE-IN-02, DE-IN-03). With steep hierarchies on the Indian side and rather flat hierarchies on the western side, this can quickly turn into a problem, because higher and top management on the western side becomes strongly involved into operational business (cases: DE-IN-02, DE-IN-04), for which these positions on the western side often do not have time, motivation, and competency.

This is a clear effect of high power distance index (PDI) as defined in Table 1, as it shows that in India hierarchies are accepted and people are expected to respect them. The emotional distance mentioned above was also observed by some users (cases: DE-IN-03, DE-IN-04, DE-ES-01 [only at the beginning of cooperation]). On of them reported that after cases of escalation, especially to higher management:[5]

> "[…] there is lots of activism and hectic [on the Indian side; Remark of the authors], without any advances in the subject matter." (DE-IN-03)[6]

Moreover, an effect of culture in the area of communication and hierarchy that is also clearly attributable to high PDI was reported by a Western European project

[5] A very interesting way to contain most of the escalations on the user's side on the shop floor is the introduction of virtual hierarchies within the shop floor team. These virtual hierarchies are of no relevance to the western team, but announced to the Indian side to achieve that the first levels of escalation can 'legitimately' be dealt with by shop floor team members on the user's side (case: DE-IN-03).

[6] Translated by the authors from German language.

manager with resources in the Czech Republic: He was authorised to sign an agreement and arrived to meet a Czech top manager for this purpose. As the top manager understood that "only" a project manager came for signing the papers, the meeting was delegated to a person about three levels lower in hierarchy (case: DE-CZ-02). There was no meeting or communication with the top manager or his direct subordinates on that visit and any later visits. This user also reported that the Czech's side was concerned with sticking to the reporting path, also a possible indication of strong process orientation, and that he could not contact higher management without escalation. In this case we can not decide whether process orientation is an element of corporate culture or culture of the occupation group.

We could spot only one additional case of some effects on communication issues related to hierarchies: In this case Spanish employees where upset when mails from the German shop floor to the Spanish shop floor where also sent in copy to higher positions in hierarchy or escalations where started (case: DE-ES-01).

So the impression is that PDI has more often effect on issues related to hierarchy and communication in India than in other locations ranking considerably high in PDI. A possible explanation could be a strong process orientation on the Indian side. Such an orientation is reported by seven users with Indian counterpart (exception: DE-IN-06) and even by some other user with experience with India (case: DE-UA-01). These users describe the problem solving or working style as less pragmatic and more systematic then on the user's side.

Our interpretation: A high PDI can have impact on communication issues related to hierarchy. This is impact can be increased by a strong process orientation. The reason is that such an orientation, in combination with high PDI, leads to a spread of activities, responsibilities, and competencies over the hierarchy within the processes.

Individualism and Benefit of Personal Informal Relations

Two users identified personal informal relations as possible solution for a reasonable part of the escalations. Personal informal relations helped to informally solve (case: DE-IN-04) avoiding escalations or achieve mutual clarification of the cases more efficiently (case: DE-IN-03). They may also allow the informal agreement of services that have not been agreed upon in the contract (case: DE-IN-06):

This links to the effects of collectivism (low individualism index [IDV]), enabling the client with trustful relations to be considered as member of the in-group of the staff of the provider. This status is the basis for preferential treatment: "[…], in the collectivist society the personal relationship prevails over the task […]" [7, p. 103].

Some other positive effects of personal informal relations are described, which can be expected to be supported by the in-group effect:

- Increase of open communication (case: DE-CZ-02, DE-IN-05)
- Unofficial information about problems (cases: DE-CZ-02)

> „There were some colleagues [on the Czech side; Remark by the authors]; from them I still received information secretly, as it became critical" (DE-CZ-02)[7]

- Higher loyalty and lower personnel turnover (case: DE-IN-01)

[7] Translated by the authors from German language.

– Higher commitment (case: DE-IN-01)

One user even sees sympathy as a condition to be able to stay in business with his Ukrainian counterpart (IDV: N/A). This user also points out that for business with American (IDV: 91) or German counterparts personal antipathy would mean no problems for business relations (case: DE-UA-01).

Possible recommendations / hypothesis for risk management concerning locations with low IDV:

- Control: Given the limited effectiveness and efficiency of contracts for international relations [20], the typical budget for contract design should be reduced (in comparison to locations with higher IDV) in favour of reserving resources for establishing and maintaining personal informal relations (e.g. travel, social events).
- Control: In locations with high PDI these relations should also be established and maintained between the top and higher management of both sides.
  Since the subordinates on the provider's side usually do not question the directives of top and higher management, good relations on the shop floor will be of little benefit if decisions are made by the management that do not match the interests of the user. In countries with lower PDI, due to the consultative fashion of leadership, there are some chances that local shop floor employees can influence such decisions to the favour of the user. So with decreasing PDI the intensity of efforts by higher management can be reduced.
- Judgement: Poor personal relations are likely to result in standing back behind other customers or experience of bad services.

For locations with a higher individualism index (IDV) rating the suggestions can be interpreted reciprocally.

The applicability of suggested controls may not be limited specifically to GSD, but the possible positive impact of managing IDV related risks can well be considered higher than for many other industries. This is because the effectiveness and efficiency of contracts is limited in international business relations and it is a major problem to defining all-embracing acceptance criteria [20]. The opportunity to use personal informal relations for solving arising problems and addressing necessary changes in service has greater potential impact.

Individualism as Inspiration for Definition of a Control

High personnel turnover is a problem in many near- and offshore locations. In a collectivistic society the desire for the working place to be an in-group to the employees is always present, not meeting this need leads to lower loyalty [7]. So this leads us to suggest the following control:

- Control: For countries with low IDV the emergence of in-group feelings among local employees and maybe beyond the locations should be supported to increase loyalty.

Of course this will most likely not eliminate the problem in countries where there is a fierce competition for the working force, but chances are good that it can reduce the personnel turnover to some extent. Such an effect is reported by one user (case: DE-IN-01).

Uncertainty Avoidance and Productivity

Germany has a considerably higher uncertainty avoidance index (UAI) than India, and some symptoms as described by Hofstede and Hofstede (2005) can be observed. For Germany the sentence "time is money" [7, p. 189] is certainly true (high UAI). An example of time as a "framework for orientation" [7, p. 189] (low UAI) can be found in our data: An expert from Germany reports that his database administrator was shocked to find out that an Indian employee at the provider's side would start a batch process (which would take some considerable time) and would then watch this process instead of working on other tasks in the meantime (case: DE-IN-04). Another example of a different perception of the value of time was also given by one user who noticed that the amount of work employees at the Indian location finish within a working day is less than the amount his local employees finish within a shorter working day. The reason for this observation is seen in more breaks and a relaxed attitude towards work (case: UK-IN-01):

> "If I compare what my team in Britain achieves within 7.5 hours, then we achieve more than someone in India in 8 hours. They have a lot of breaks, they are much easier going and they don't perceive work as stressful as we would imagine. It's just what they do."(UK-IN-01)[8]

This user also reports that Indian personnel will only be available for actual productive work for between 55% to a maximum of 75% of working hours, whereas British personnel will be available for about 85% of the time. Only one user considers productivity of the Indian side to be higher (case: UK-IN-01).

This is one possible explanation for the Indian's calculations of personnel expenditure often exceeding the user's own calculations or calculations by other providers, an observation frequently reported by European users, (cases: UK-IN-02, DE-BY-02,[9] DE-IN-02, DE-IN-03, DE-IN-04, DE-IN-05). The Indian calculations could only in some cases be reduced to some extent, and fully only in one case (case: UK-IN-02).

Higher productivity than in India is reported by one user for Hungary, being close to the UK, and generally for Eastern Europe (case: UK-IN-01). A German user reports equal productivity of German and Czech workforce (case: DE-CZ-01).

Possible recommendations / hypothesis for risk management concerning locations with low UAI:

- Control: Where possible, information about workforce productivity should be investigated in advance. Otherwise the business case should be calculated assuming lower productivity than at locations with higher UAI.
- Control: Own calculations of expenditure should be made for comparison in any case.

Limitation:[10] Britain has even lower UAI than India, nevertheless the user reports higher productivity for his domestic location.

[8] Translated by the authors from German language.

[9] In comparison to calculations by the chosen provider from Belarus.

[10] Here we present limitations that are visible from our data; more general limitations to the approach will be discussed in Section 5.

Some possible explanation is: Some Asian and African cultures by tradition have a cyclical perception of time [21], [22]. This concept of time is characterized by the belief that time repeats, as morning, noon, evening and night repeat [23]. Within the logic of this concept time can not be wasted, since it will come back again. This concept of time also applies for the culture of India [23]. Industrialisation has a long-term influence on the perception of time by the members of a society, since it implies the need of precision and synchronization [21]. As India is not that far advanced in this process, the traditional perception of time could support a stronger effect of the low UAI. For Britain two factors reduce the effect of the low UAI: Industrialisation has reached the whole population already a long time ago with effect on the attitude towards time and a linear perception of time within British culture [23]. Within a linear perception of time it is valuable since it always advances, if passed and not used it is considered to be wasted [23].

Uncertainty Avoidance and Tolerance for Ambiguity

For some effects Hofstede's model would lead to other expectations: e.g., low UAI should lead to "tolerance for ambiguity and chaos", but many cases show, that concerning specifications and working instructions the Indian side has very high expectations (cases: DE-IN-03, DE-IN-04, UK-IN-01, UK-IN-02):

> "They like their preparation to be a little more rigorous. For example: If we were developing a module that had interfaces produced by some other part of the organization, I think the European culture would be happy to start producing that module and add in the interfaces as we went forward. Whereas I think the offshore model is assemble everything in front of you before you start work." (UK-IN-01)

Our interpretation: The high expectations by Indian locations concerning specification and working instructions can be explained by the strong process orientation, which we described before. This culture of the occupational group limits or overrides the effect of the low UAI.

Long-term Orientation and Long Hours

It should be expected that in cultures with high LTO "leisure time is not important" [7, p.225]. Cases show that working over time (cases: DE-IN-01, UK-IN-01) and on weekends (case: DE-IN-04) is not a critical topic in India, e.g., employees were ready to work over a period of one month on weekends, do long hours and even work on an important national holiday (case: UK-IN-02). Employees even had to be kicked out of office (case: DE-IN-01) to force them to take a rest:

> "The motivation is extreme; they will work as long as needed. There will be no discussion about long hours or anything. They don't appear unwillingly, they appear – I would say – by intrinsic motivation. We already had

people that we had to kick out of the office, because they just enjoyed it." (DE-IN-01)[11]

Assuring Sensitivity for Real Cultural Differences

Two users of nearshore resources where surprised by the effects of cultural diversity they experienced, both from Germany. The locations that caused the surprise where Spain (case: DE-ES-01) and Hungary (case: DE-IN-06). A look into of the data for Hofstede's dimensions could have prevented the surprise, since it is visible that these countries score differently, for the case of Spain even considerably. In both cases a part of the differences noticed by the users can be linked to the higher PDI.

5 Outlook

We have presented results of a survey on IT near- and offshore and put them into perspective with respect to the widely known model of Hofstede regarding culture. The survey and its discussion can not produce representative results in all cases, especially not for the Middle and Eastern European countries which are represented only once or a few times in the sample. Another limitation is that the survey was not primarily undertaken to evaluate Hofstede's model for risk management. Nevertheless the data provides valuable insights that can be put into relation to Hofstede's and other models and dimensions of culture for explanation of the phenomena observed, creation of hypothesis and validation and enhancement of the existing models and findings.

That is, for three dimensions (individualism, uncertainty avoidance, long-term orientation) of Hofstede's model we give indications for the practical relevance within the sphere of IT near- and offshore. We can also support the findings of Winkler et al. (2007) that power distance is potentially of high relevance for the subject matter. For one dimension we could not find any indication (masculinity). Note that the description of the effects of the dimensions of Hofstede's model is sometimes rather soft and that the discriminatory power between the described effects of the dimensions is in some cases rather low. We tried to provide only cases where the relation between the cases and the effects of a dimension seems rather clear to us.

It has also become clear, that the effect of a dimension can be different than Hofstede's research and findings would suggest, due to the influence of other cultural factors which are not covered by the dimension of national culture. These factors can be specific to the country, to corporate culture or the culture of the involved occupational group. These requirements are also supported by other research on culture in the domain of IS [24]. To figure out in more detail and more reliably to which aspects of GSD Hofstede's dimensions can be applied, and which models or dimension need to be combined with each other, wider and possibly quantitative research is needed. We are able to show for the mentioned additional dimensions of Hofstede's model that this is a promising challenge.

[11] Translated by the authors from German language.

Even if we have findings, that support Hofstede's model in one country or one case, one has to be careful to transfer these findings to other cases and countries. That is, all research that applies Hofstede's model to a new domain, location, and maybe even combination of locations can lead to new knowledge.

Knowing this, Hofstede's model in combination with other models and dimensions can be useful for practical risk management to gain a deeper understanding of effects of culture and cultural diversity in the domain of GSD. Especially putting the models into relation to existing experience with a location to understand effects that have occurred can help to develop new controls that address these effects efficiently. In situations where there is no information or no experience with a location or a combination of locations, findings of general research on the different levels of culture mentioned could be gathered and be a base for the estimation of possible influence. If no or little existing research can be found, Hofstede's model can at least allow making "an educated guess". Our general hypothesis for controls can serve as example. They can be applied if no further information is available and falsified or confirmed for different locations.[12]

Last but not least we have given one example how creatively practitioners solve problems that arise from cultural diversity within the domain of GSD.

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Cultural Differences in Multinational Team Communication in an IT Service Organization

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Cultural Differences in Multinational Team Communication in an IT Service Organization

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Abstract. The aim of the study is to increase understanding about connections between dimensions of culture and communication. More specifically, we aim to find helpful explanations for new problems experienced in an IT services organization, when the number of multinational teams increased. As the problems appeared to stem from different understandings regarding communication, a case study was conducted among teams consisting members from two cultures, Finnish and Indian. Connections between national culture and communication were investigated with interviews and observation as the main data collection methods. Hofstede's model about cultural dimensions was applied, and communication needs were used as indicators of communication. Data were analysed with content analysis and grounded theory. The results indicate that power distance and individualism had strongest connections to communication in the studied teams. A model about the connections between cultural dimensions and communication behaviour is proposed.

Keywords: multinational team, multicultural team, culture, communication, distributed team

1 Introduction

1.1 Background

There are situations where a globally distributed or virtual multinational team is the most suitable or only acceptable choice for building a project team. This situation can be an outcome of e.g. need for large and specialized labour pool, acquisitions, joint ventures, reduction in development cost, strategy driven globalized presence, shortening of time-to-market and proximity to the customer [16]. For companies the increase of geographic and cultural dispersion means a lot of possibilities but also many challenges [10]. Cultural issues may influence the way work is performed and managed. Technological innovations, such as ICT (Information and Communication Technologies) tools and methods for communication and collaborative working have enabled multinational virtually working teams, but it has not extinguished the impact of cultural differences [31]. Communication aspects like informing, problem solving and monitoring progress are found to have a significant impact on effectiveness of virtual teams even within one culture [21].
This study concentrates on how national culture is related to communication in multinational teams. The study discusses on the salient elements of communication in the multinational environment; what kinds of connections national cultures have to communication. The starting point of this study was the observation in the case organization, in a multinational IT service organization, that new kind of challenges arose when software projects started to use distributed multicultural teams in a larger scale. This case provides us the opportunity to study cultural issues in Finnish-Indian collaboration in the field of IT service business, to be exact in application development and maintenance services.

1.2 Research on Culture

Iles and Hayers [9] have stated that an international organization develops from the domestic/ethnocentric phase through the international/ethnocentric and the multinational/polycentric phases towards the global/geocentric and finally to the transnational/geocentric phase. Transnational organizations require managers to have a diverse set of intercultural competences [2] [19]. In transnational teams, three powerful cultures operate simultaneously: national, corporate and occupational or professional culture [30]. National culture indicates an individual's orientation towards hierarchy, time, individualism, etc. [27]. Corporate or organizational culture includes a particular company's or organization's values, rituals, heroes and symbols [27]. Occupational or professional culture refers to the culture among a specific occupation or professions, such as engineering culture [30].
A way to get into cultural differences is to divide culture into dimensions and analyze how cultures vary in those. Models on cultural dimensions have been presented by Hofstede [7], Trompenaars and Hampden-Turner [29], Hall [5], Kluckholn and Strodtbeck [12], and Adler [1]. The five dimensions of the model developed by Geert

Hofstede [7] [8] for classifying national cultures and analyzing work behaviour are used in the study. In his studies of IBM personnel working in about 50 countries Hofstede [8] identified the following dimensions of culture: power distance, uncertainty avoidance, masculinity-femininity, individualism-collectivism, and long-term vs. short-term orientation. The model was selected for this study because it is widely used in management research, and it includes both of the national cultures, Finland and India, which are the point of interest in this study.

1.3 Research on Communication

Communication means exchanging messages, which carry information between a sender and a recipient in a certain physical and cultural context [33]. Communication in an organizational context can be divided to four levels: (1) intrapersonal, (2) interpersonal, (3) group and (4) organizational [15][18]. Interpersonal communication is a requisite for small-group or team-level communication that is interaction among three or more people who are working to achieve commonly recognized goals [15]. Teams are expected to improve communication in organization, since the task of a team is to share information and to delegate work [24]. The importance of face-to-face communication has been highlighted in many studies [20][21][23]. However, in international operations, teams and organizations are often distributed and suffer lack of physical, face-to-face meetings.

Communication has a close relation to culture. “Culture is learned, acted out, transmitted, and preserved through communication” [26]. A challenge of intercultural communication is that proper and effective communication in one culture can be improper and ineffective in other cultures [17][28]. Cultural differences can be realized in different communication patterns [20]. In low-context cultures, communication is expected to be clear and direct, or explicit. Reading “between the lines” is not needed as in high-context cultures. In low-context cultures, everyone should be able to understand the message because the person and the situation are not particularly relevant to the discourse. Opposite to high-context cultures where some people have more privileged access to information than others, in low-context cultures everyone have equal access to information [5].

Communication can be approached also from the point of view of communication needs, defined as the needs communication parties, or senders and recipients, have when communicating. Paasivaara [21] has identified communication needs in product development projects. They were categorized into five groups: informing, problem solving, monitoring and providing transparency, giving feedback, and relationship building. The study states that understanding the communication needs in general helps to establish appropriate communication practices [21].

2 Research Design

2.1 Research Question

The goal of this study was to find out what kind of connections exists between cultural dimensions and communication. The context is multinational teams where the team members are from two different cultures. Paasivaara's dissertation [21] is used as a basis when studying communication. Paasivaara [21] studied communication needs, practices and problems in inter-organizational product development projects. However, she excluded cultural aspects of communication. Hofstede's model [8] with five dimensions of national culture is applied in studying culture. The research question is based on both existing studies on cultural dimensions and communication, and on practical observations in the case company. The research question is as follows.

RQ: What kind of connections exists between cultural dimensions and communication?

2.2 Research Approach

Qualitative case study approach is suitable for research aiming to build theory which emerges from observations and interviews out in the real world rather than in the laboratory [3][22]. According to Yin [32], a case study "benefits from the prior development of theoretical propositions to guide data collection and analysis". Accordingly, the case study approach was used in this study.

A qualitative study allows combining several data collection methods and thus it provides a better validity for the results [3][22]. In this study, data were collected with open-ended and semi-structured interviews. In addition to fourteen individual interviews, both direct and participant observations were performed. Also project definition report, status reports and meeting minutes were reviewed from ongoing projects. Furthermore, project closure reports of already finished projects were reviewed. The first interview concentrated on understanding the organizational situation. The other interviews were semi-structured starting from selected themes. The themes were related to differences between Indian and Finnish communication practices, how multicultural background affects to team communication and which kind of communication challenges the teams have faced. Five Indians and nine Finns were interviewed. Interviewees were chosen by using purposeful sampling [32] from different roles and positions. All the interviewees had experience in working in a Finnish-Indian team. The interviews were conducted in Finland but partly the teams were distributed to different geographical locations.

In the first phase deductive data analysis was used. Transcribed interviews were entered to an excel sheet as long lists; in one list Finns' comments and in other list Indians' comments. Then the comments were analyzed and categorized based on dimensions of culture [8] and categories of communication needs [21]. As a result, tables of connections with the existing communication categorization were created for

each cultural dimension. After writing the preliminary results, one group interview with both Finnish and Indian participants was carried out. This resulted in some adjustments and corrections. In the second phase of analysis, the coding procedure from grounded theory approach was used for developing the proposed model from the collected data [13]. After the first phase of categorization, we identified events which were related with each other [13]. The data were analyzed using qualitative content analysis. Having its main use in the field of mass communications analyzing e.g. newspapers and magazine articles, content analysis is also useful for the analysis of qualitative interview and questionnaire data [25]. Content analysis is considered as 'codified common sense' as it is only a refinement of the ways of describing and explaining aspect of the world in everyday life [25]. Content analysis helped us to move to the axial coding phase, where we try to develop explanations for the connections between variables [13]. Based on the understanding acquired in the analysis, we proceeded to suggesting a model of connections between the communication related behaviours and dimensions of culture. The final communication behaviour categories were formed based on the Paasivaara's study [21] but considering the salient elements of communication of multinational case teams and how behaviours were related to cultural dimensions.

3 Results

Some cultural dimensions like power distance had salient connections to communication behaviour, while others such as masculinity had less obvious connections. Not all cultural dimensions had connection with all communication behaviours. Anyhow, between Indian and Finnish culture all dimensions of culture seemed to be somehow related to teams' communication behaviours. We found out that a specific cultural dimension could either strengthen or weaken the communication behaviour. In other words, cultural aspects can affect team communication by increasing or reducing certain communication practices. The connections between cultural dimensions and communication related behaviour are illustrated in Table 1 and explained below.

Several connections between power distance (PD) and communication were found. High power distance seemed to increase information flows defined by the organizational structure. Instructions and orders run from up-to-down while reporting progress followed the structure upwards. Moreover contacts were normally monitoring focused, which seemed to be because of centralized decision making. High power distance seemed to lead unequally distributed information since the ones with power had knowledge and right, and also obligation, to make decisions. Lower PD instead appeared to reduce the tendency to centralizing decision making since power was distributed to different organizational levels. Lower PD also seemed to distinctly increase information sharing, two-way information exchanges and was related to informal information flows.

We observed collectivism (COLL) to increase several types of communication behaviours. A collectivistic culture is premised on the relationships and thus when people are communicating with each other regularly also information flows between

them naturally. When communicating information is shared and mutual understanding is created. Thus collectivism seemed to increase also transparency in teams. As in a collectivistic country it is not proper to point out a person from a group, feedback – positive or negative – should be directed to the whole team. In positive case team members at the same level should be rewarded equally and achievements are announced most likely in front of bigger group so that all can be part of the success. By definition a part of the collectivism dimension is high-context communication style [7]. This appeared in teams as collectivistic people were used to get and also provide context information even when a simple question was asked. The other end of the dimension, individualism (IND) appeared to reduce communication of context information since additional information was only provided when asked specifically. Other persons' time was appreciated by not spending it too much so communication was tried to be effective. Thus individualism pushes information flows to structural routes as people involved are contacted directly without bothering others. Individualism also reduced centralization of decision making, when more people felt being in a position to make decisions.

Links were identified between high uncertainty avoidance (UA) and providing and demanding transparency, and adherence to control points like procedural guidance and schedules. To avoid uncertainty team members were expected to report the real situation and raise an issue if something was hindering progress. A sign of high UA was also that team members had a feeling that managers were keen on being aware of the situation all the time. Low uncertainty avoidance appeared to reduce the need for transparency and adherence to control points, when more ambiguity could be tolerated. Because of the same reason, progress reporting was acceptable to be ambiguous. Thus context information was needed to be able to understand the actual situation.

Masculinity (MAS) and femininity (FEM) were not found strongly affecting communication behaviour in project teams. Only remarkable connection was related to communication of achievements. Masculinity seemed to strengthen the importance of recognizing success. Positive feedback should always reach also the manager and outstanding performers should be presented to the whole team or to the business unit. Masculinity and femininity have connection to equality and importance of relationship by their definition [8] and thus also connects to interpersonal communication and indirectly to team communication. Anyhow, relationship issues were not found to be among the most salient cultural related communication behaviours and thus not included into the model.

The fifth dimension of Hofstede's model varies from long-term orientation to short-term orientation [8]. Finland was not included when this dimension was studied and India is almost in the middle of the continuum so it is hard to compare the differences. Communication aspects like not admitting mistakes, not using negatives and not discussing different opinions openly in meetings that were found to be common in Indian culture can be considered as face-saving behaviour. Concern of face is a part of the fifth dimension [8], however clear evidence which communication behaviour the dimension strengthens and weakens was not found, and thus the dimension was excluded from the model.

	High PD	Low PD	COLL	IND	Low UA	High AU	MAS	FEM
Information flows by structure	+	-		+				
Centralized decision making	+	-		-				
Need for context information			+	-	+			
Transparency	-	+	+		-	+		
Recognizing achievements			+				+	
Adherence to control points					-	+		

Table 1: Connections between cultural dimensions and communication related behaviours (+ behaviour strengthens, behaviour weakens).

4. Discussion

When comparing our findings to the scores in cultural dimensions of the studied countries, Finland and India [8], we can actually see that the results do not show a pure polarization of results. Some cultural dimensions more typical to Indian or Finnish team members seemed to strengthen certain communication behaviour, while another cultural dimension in the same country seemed to weaken the same behaviour. Our model cannot be used for predicting whether these connections would offset each other. This should be also taken into account in practical management work as a warning against using stereotypes. Awareness of the differences and what behaviour they are connected with is important, but the particular circumstances are even more important.

According to Hofstede's study on cultural differences, the differences between Finnish and Indian cultures are highest in power distance [8]. Hierarchy is connected to the relationships between people in an organization, who make decisions and which information is shared. Also communication channels, meaning who informs who, and which routes communication flows in organization, depend on power structure. Thus, it was not surprising that also in this study both high and low power distance was related to employees' communication behaviour. The highest differences in communication needs between Indian and Finnish employees seem to stem from power distance and individualism. Individualism mostly impacts information flows. Different attitude to hierarchy leads to dissimilar communication habits. It was found that Finns are used to communicate directly with the one who is considered to need the information or who may have the answer to a current problem. This finding corresponds to existing literature. Mäkilouko [19] found out that direct communication style caused complex communication problems in multicultural teams. As a consequence of direct communication style a large number of people gave directions to the multicultural teams, and often the directions were partly conflicting. Also the observation that the Indians expect more management

supervision than Finns offers support to the existing literature. According to Mäkilouko, in hierarchical teams attention should be paid to careful planning of intermediary goals and especially supervision [19]. Finnish manager were not prepared to this but they had to adapt to the new situation and reserve more time to monitoring and guidance. The implications of this finding should be taken into account in practical management work.

Combining findings from interviews, observations, and documentation review enabled triangulation and thus gained better validity [22][32] for our study. External validity describes how well a study's findings are generalizable beyond the immediate case study [32]. Since this study dealt with multinational teams with Finnish and Indian team members in only one organization, the results should not be generalized as such. A study with a single unit of analysis is dependent on the context of the case. Thus, the results may be influenced by contingency threat as described by [14]. The study was conducted during eight months' period and already in that period changes and improvements in cooperation with the studied teams were noticed, but not to the extent that this would have caused so much change that our research would have been interfered beyond our control [14].

Firstly, a limitation of this research arises from the subject studied. We all have our unconscious values that affect even when we are consciously trying to be neutral. The study was conducted in Finland by Finns in a project-based organization lead by Finns. Finding indicators, which would describe equally different cultures in the world, is a challenge in cross-cultural research. The Western way to illustrate cultures has been criticized especially by Chinese and Japanese researchers so it has been noticed that also describing culture is culture-bound [11].

Secondly, using prior assumptions has a risk that e.g. deeply culturally embedded issues may not get enough attention [22]. However, existing theories can also help in searching focusing the research and analyzing the data [6][13]. Even if existing theories directed topics of the interviews, the researchers were open also to other issues that emerged from the data.

Thirdly, the limited sample of this research does not allow broad generalizations as discussed before. But within the same company the results can be utilized in the other accounts. The results could possibly be applied also to similar situations were a Finnish company is leading the cooperation and an Indian organization is in some kind of subcontractor position. Results do not seem to be closely connected to IT business. However, communication habits and cultural norms can vary in organizations operating in other fields.

It was found that many issues can be explained by differences in national cultures but existing literature reminds that actually the real reason could be somewhere else outside cultural issues [16]. In addition, there are also problems due to cultural differences and they may highlight deficiencies, but how often culture is the real trigger of the problem, is not clear. When studying cultural problems, other reasons for challenges should be examined simultaneously. Professional culture was not in the scope of this research and also generally it is the culture studied the least [30]. Thus, it could be useful to examine professional culture and how it varies between countries as well. This study was conducted in one organization in a selected industry. A

similar study could be conducted in some other organizations in the same industry, as well as in some other industries to confirm the findings of this study.

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Risk Reduction through Semi-Captive Outsourcing

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Risk Reduction through Semi-Captive Outsourcing

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Abstract. We report on our real world experiences and offer some solutions for common outsourcing problems. Captive outsourcing – and especially the semi-captive approach which encourages independent activities of the subsidiaries – leads to a stable mutually beneficial structure that reduces many risks associated with outsourcing.

Keywords: Outsourcing, Captive Outsourcing, Risk Reduction, Subsidiaries

1 Introduction

Outsourcing traditionally means finding a subcontractor for a specific project. The business relationship ends when the project is over. However, there is much to be gained in terms of economic stability and risk reduction by founding subsidiary companies in offshoring countries and outsourcing projects consistently to them. This paper offers real life experience from our own outsourcing projects with different subsidiaries in eastern Europe.

1.1 Company background

pi-consult gmbh was founded in 1999 in Karlsruhe, Germany. We have grown from a pair of computer science students to a company with 135 employees worldwide, including subsidiaries in Bulgaria, Belarus and Russia. We are specialized in optimizing company communications by consulting and implementation of solutions for marketing process optimization (product “BrandMaker”, www.brandmaker.com), e-mail response management, translation management and a content management system. Also, pi-consults offers OEM development for individual software projects. Our customers include Arbeiter-Samariter-Bund Deutschland, Boeringer Ingelheim, Commerzbank, DekaBank, EnBW, Gruner+Jahr, Opel, and the confidential OEM clients.

2 Traditional vs. Captive Outsourcing

The other papers in these proceedings contain a wealth of information about different problems with outsourcing and the associated risks, so we will not add long and redundant descriptions here – commonly, outsourcing adds overhead, reduces control over the process, and introduces many new unknowns. Communication is nearly always cited as the most critical issue, which agrees with our own experiences: How can we make sure that the developers understand the problem, ensure project progress and quality? These aspects are worsened by offshoring with different time zones, language and culture.

2.1 Comparison Matrix

In the following table, we compare several key aspects between traditional and captive outsourcing. Most issues are self-explanatory, but there are also some interesting factors which are covered in more depth below.

Table 1. Comparison of different aspects: Traditional vs. Captive Outsourcing

Aspect	Traditional	Captive
Entrepreneur Risk / Commitment	Low-Medium	High
Initial Investment	Medium	High
Operational Costs	Comparable	Comparable
Resource Flexibility	High	Low
Consistency, Availability	Low	High
Control over Assets and Finances	Low	High
Influence on Development Methods and Infrastructure	Low-Medium	High
Team Structure, Company Culture, TRUST	Fragmented	Closer
Common Sense, Understanding, Domain Knowledge	Depends on duration	High
Efficiency (feasibility of short projects)	Low	High

It might be counter-intuitive that we are talking about risk reduction and at the same time list “entrepreneur risk: high” as first aspect of captive outsourcing. The reason is that there is of course a higher financial risk connected with founding (or acquiring) a company in an offshoring country than with performing a single outsourcing operation the traditional way. The point is that the payoff from captive outsourcing is much higher in the long run, and the benefits and associated risk reductions add up.

Also, captive outsourcing offers possibilities where that the traditional approach fails: It is no problem to perform small projects efficiently and with economic success, since the teams are already established and know the end customer’s context and requirements. This reduces the setup and introduction to a minimum, making even projects with one man-month efficient and profitable to outsource.

At the same time, control over the tools and methods used for development ensure low frictions between the developers and the project managers, while in traditional

outsourcing it is time-consuming or even impractical to establish own best practices at the developer's side.

And of course there is the political and strategic aspect: Do you want to trust complete strangers with the development of your key product, or do you prefer a tighter control and an environment of trust and mutual relationship?

2.2 Some Risks and Solutions

During our founding of subsidiaries in Eastern Europe, we encountered a number of challenges which are fairly typical for captive outsourcing. This section lists many of them together with our solutions.

Since this is a real life experience report, we cannot guarantee that these approaches will 100% work for any such case, but we have done well with them. Company culture has a large influence here, and the methods needed for more static global players with tens of thousands of employees are certainly different from those for a dynamic company growing towards 200 employees.

- **Founding**: We already had a business relationship with the founders in the offshoring countries or even knew them personally. Trust is a key element here and minimizes the founding risks which are rather large as discussed previously.
- **Mindset**: The communist past of the former East Block is still visible in the behavior and expectations of the employees. Hierarchies are important, and self initiative as well as passion for the work have to be learned. A transfer of company culture helps, e.g. with visits of their team leaders to Germany and vice versa. This also reduces the common risk of cultural differences and is only possible in a longer relationship, not during single offshoring projects.
- **Infrastructure**: Initially, the freshly started capitalist economy in the offshoring countries had several negative side effects, e.g. unreliable infrastructure, but also the necessity to protect the expensive equipment with armed guards at night. These wild west scenarios have become much better during the last years due to the growing maturity of the economy.
- **Competition**: The market for well qualified IT professionals today is a challenge in Eastern Europe, too – it is not trivial to find new team members. We counter this effect with e.g. a co-operation with local universities and offering seminars and courses for graduate students, improving our profile and contacting interesting graduates directly.
- **Fluctuation**: In order to reduce the rate of programmers leaving the company, we offer work benefits that are similar to a German company, but completely non-standard in the offshoring country: Paid vacation, a company sponsored German life insurance and automatic yearly raises to combat inflation are some of these features that create a firmer bond between company and employee.

2.3 Semi-Captive Outsourcing

The classical captive outsourcing model means establishing or buying a local company and leading it like a subdivision of the own company, i.e. direct orders, little room for local decisions, and high financial dependency.

In contrast to this, our approach – which we call Semi-Captive – highlights local responsibility and entrepreneurship. The subsidiaries are encouraged to develop further business of their own, e.g. offer their outsourcing services to other customers and develop as well as market their own applications.

This has several benefits: The self-respect and motivation is much higher, which increases stability, and the subsidiary is less dependent on a constant flow of projects from the mother company – lessening the impact of the common captive outsourcing problem, namely the necessity to keep the job pipeline full at all times because it is not easy to reduce resources quickly (at least not if one wants to increase them again in the foreseeable future…).

On the other hand, the semi-captive approach still offers much more control and business opportunities than traditional outsourcing: it is possible to e.g. order zero profit projects when extra competitiveness is needed, and the mother company can establish its own set of standards and tools as described above. And of course the internal outsourcing costs are lower than the rates the subsidiary officially charges other customers.

3 Conclusion

We have outlined our practical experience with captive outsourcing and highlighted some of the problems encountered and solutions found. In our experience, especially the “semi-captive” approach with high local responsibility and entrepreneurship offers many advantages – the stability for both sides is higher, growth in the subsidiary automatically benefits the mother company, and the long term relationship reduces risks for both sides.

Of course, as with any long term relationship, this approach needs constant work in order to succeed. In traditional outsourcing, if a project goes wrong you select the next outsourcing provider for the next project – with captive outsourcing, you have to make sure that a project problem does not become a relationship problem and damages future cooperation. An open company culture helps a lot, i.e. focusing on solutions and not assigning blame to specific persons.

Thus, a well established semi-captive outsourcing structure offers possibilities that are difficult to obtain in traditional approaches and benefits both sides, leading to mutual growth and success.

Prevention of Failure Situations in Offshore Software Projects

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Prevention of Failure Situations in Offshore Software Projects

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Abstract More and more projects are developed offshore. The main factor of success for the implementation of software systems in a global environment is project management and an organization structure that considers specific requirements of an offshore project execution. In this paper we present a classification of failure situations and criteria to identify those problem situations at an early stage. Strategies and options are provided to prevent offshore software projects from a complete failure. Finally specific milestones for checking the quality of the project management and organization structure are defined for including them as standard activities in different stages of the project plans of offshore software projects.

1 Introduction

In offshore software projects failure situations can occur as in every other conventional software project [2]. The reasons for failure situations in offshore software projects can be found for the most part in an insufficient management of these global projects. Software projects are characterized by a high complexity which is strengthened by the extremely fast technological change in this area. A further characteristic of software projects is the large number of changes requests during the project course. In offshore projects there are further challenges like language, cultural and temporal differences at a distributed worldwide implementation. Due to these general conditions and requirements in offshore software projects a good project management [9] is decisive, based on an early-warning system for the success or failure.

In Section 2 the common project definition is extended regarding the specific requirements of an offshore software project. Subsequently, in Section 3 the base dimensions and further factors to measure success or failure of offshore software projects are described. Based on these dimensions and factors a classification of failure situations is introduced. Section 4 describes criteria to identify problem situations in offshore software projects and how an early-warning system can be established for such a project. In Section 5 strategies and options are discussed that can be used after problem situations occur. Specific milestones for checking the

quality of the project management and organization structure are defined in Section 6. A conclusion and the plans for further work can be found in Section 7.

2 Offshore Software Project

For a classification of failure situations in offshore software projects it is necessary to have a definition of such projects. The term project which particularly also applies to software projects is defined as follows [14].

Project definition according to DIN 69 901 (German industry norm):

- Uniqueness of the conditions
- Target-setting
- Limitations (time, budget, resources)
- Separation from other projects
- Project-specific organization

A project stands out due to this definition by the uniqueness of the general conditions and requirements, which make each project to a unique intention. There are defined aims, which are to be reached by the project and delimitations like milestones or a fixed budget, which may not be exceeded [6]. Furthermore a project can clearly be separated from other projects and/or from the daily business. Each project has its own project-specific organization, i.e. an organization chart and regulations exists for the duration of the project as well as responsibilities in the context of the project.

In a software project the artifacts to be realized are software components, concepts, feasibility studies or similar results in the area of the software development. In offshore software projects exists the following additional conditions:

- The tasks of the project are distributed worldwide, i.e. there are linguistic, cultural and temporal barriers.
- There are huge differences regarding the costs of the individual project members, which must be considered during the planning of the budget.
- The project management and communication effort are substantially higher than in non-offshore projects, which must be also considered during the budget planning.

3 Classification of Failure Situations

In offshore software projects different failure situations can occur. This includes problems, which can still be corrected in order to be able to complete the project successfully up to projects that completely fail. Besides failure situations which can appear at onshore software projects particularly the offshore difficulties are taken into account.

3.1 Base Dimensions

Success or failure of a project is essentially measured in terms of the following base dimensions:

- Scope of work
- Time
- Budget

This precondition to measure success or failure of a project is that target specifications can be compared with actual values. I.e. that for these dimensions appropriate specifications must be available in form of a signed offer or another agreement, e.g. a contract. This just applies especially to offshore software projects, since here additional challenges occur. The mentioned dimensions can be defined as follows:

Scope of work: The service to be provided by the contractor must be clearly defined. This should be carried out in software projects in form of a detailed description of the functionality of the application system to be realized. The use of formal methods for the performance specification increases substantially the measurability of the results based on the target specifications. Textual descriptions provide space for interpretations which can be interpreted by customer and contractor differently due to the ambiguity of the natural language. Formal descriptions of processes, functions and data structures are approved regarding the practice. Prototypes play an important role for the understanding of the business people apart from textual and formal descriptions to get an impression from the result of the development in earlier phases of the project. If the service to be provided is not the implementation of a software component but an analysis then the required results should be defined in form of a listing of a table of contents of the document to deliver. Content of such documents can be process models for workflows to be implemented, descriptions of the user interface etc. Additional limits are the number of artifacts, for example the number of screens to be implemented. The analysis is not often done offshore because the biggest part of the analysis tasks have to be done onshore. The operation of IT systems, which is frequently provided by offshore companies, cannot be regarded as a project. But for operation scope of work, time and budget can also be defined.

Time: The planned period of time is provided in every project. In most projects a rough milestone plan is defined in the pre-phase of the project. There is at least a finish date on which the artifacts to be delivered shall be used.

Budget: The budget is provided either by costs or a number of person days with corresponding daily rates, which can differ depending upon qualifications. In offshore software projects the differences between different categories are huge, depending on the origin of the specific team member.

Only if all three dimensions are exactly determined, the project is defined in a mathematical way. This paper refers to projects in which a client assigns an offshore contractor for a service in the area of software development. For a not clearly defined project for which a comparison of plan and actual values cannot be made, for example due to missing definitions, success or failure is not determinable. According to META

Group already 80% of the US enterprises fail at the determination of the success or failure of software projects due to the fact that measurable target specifications, measuring instruments etc. are missing. I.e. failures of projects often arise based on the impression of the customer, to have not got what he had ordered, without having defined this clearly before the project has started.

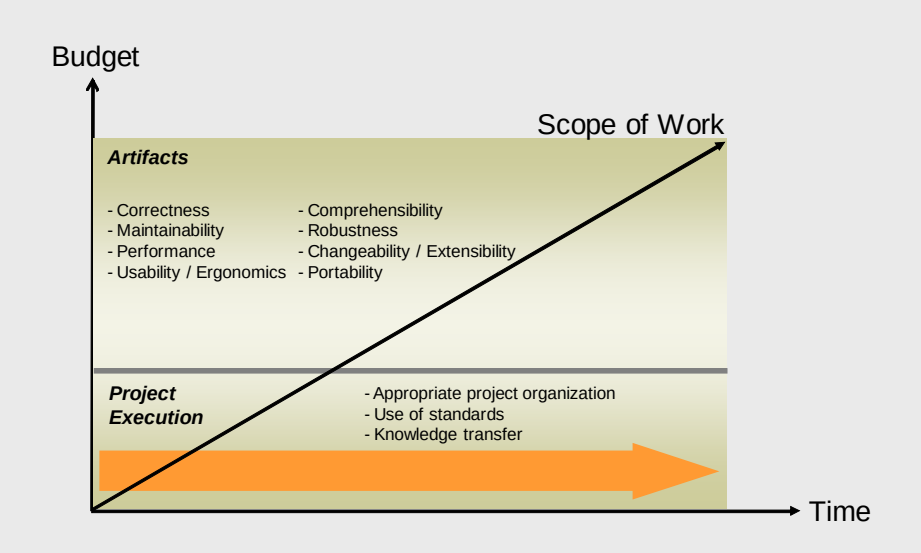

Figure 1. Limitations and quality criteria of a project

3.2 Further Factors

Besides these base dimensions mentioned above, there are some further factors, which influence the success or failure of a project. These factors can be divided in quality criteria of the delivered software [3] and the quality criteria of the offshore project execution [11].

The quality criteria for the delivered software components are:
- Correctness
- Maintainability
- Performance
- Usability / Ergonomics
- Comprehensibility
- Robustness
- Changeability / Extensibility
- Portability

The quality criteria of the offshore project execution are:
- Appropriate project organization

- Use of standards
- Knowledge transfer

These quality criteria of the delivered software components can be specified and be proofed as follows:

Correctness: Correct software must accomplish the following: Compute accurate results, operate safely and causes the system containing the software to operate safely, perform the tasks required by the system containing the software, as explained in the software specifications, achieve these goals for all inputs and recognize inputs outside its domain.

Maintainability: The maintainability of a system is difficult to proof. It depends on the structuring and documentation of the system. This can be assured and checked by the definition and the compliance of standards for comments in the source code up to standards for the configuration management of the software components.

Performance: Performance can generally be defined by the specification of the maximum response times which are still acceptable for an application system. Such general specifications, however, are not reasonable in most projects since the response times can and may differ depending on the function. For example a report, that is provided once the day and that selects huge amounts of data, may last longer than a customer search in a call centre screen. I.e. a definition of the response time on function level is necessary for the measurement of success or failure. This is however available at fewest projects.

Usability / Ergonomics: Due to subjective estimates on basis of experiences with old systems, which were replaced, projects are often classified as failure. For example users may complain about additional efforts, which arise due to the operation of a new graphical user interface in comparison with the usual, keyboard operated mainframe interface. The proof of Usability / Ergonomics can only be done checking specific application cases against predefined aims, for example that capturing a new customer is feasible in a determined time.

Comprehensibility: The comprehensibility of a system depends also on the structuring and documentation of the system. This can be assured and checked by the definition and the compliance of standards mentioned at the maintainability.

Robustness: The robustness of a system has to be proofed by specific tests.

Changeability / Extensibility: The changeability / extensibility of a system depends also on the structuring and documentation of the system. This can be assured and checked by the definition and the compliance of standards mentioned at the maintainability.

Portability: The portability of a system depends on the used technology and also on the structuring and documentation mentioned at the maintainability.

The quality criteria of the offshore project execution can be specified and be proofed as follows:

Appropriate project organization: The specific project organization must fit to the specific requirements of an offshore project considering the linguistic, cultural and temporal problems.

Use of standards: The use of standards for the software development is the main precondition to get software components that comply to quality criteria for the software components.

Knowledge transfer: Often a lack in the knowledge transfer in offshore projects [1] is identified not until the application system is taken into operation and the contractor removes the employees from a project. The success or failure depends on whether employees of the customer can independently carry out the operation and if necessary the maintenance due to the knowledge acquired in the context of the project. The quality of the documentation of the application system, both from the business and from the technical side is the precondition.

3.3 Classification

Based on the base dimensions and further factors listed before failure situations in offshore software projects can be divided into the following classifications:

(1) Failure / Collapse of the Offshore Software Project

Description: The project ends and one or several of the following situations have been occurred:

- The service to be provided has not been fulfilled.
- The defined functionality is not finished at the defined milestones.
- The budget was dramatically exceeded.

There are further nuances of a failure of an offshore project depending which situations occur in which strength. The worst case scenario occurs, if all three situations come together and there is any possibility of an agreement regarding the scope of work, time or budget.

Time of occurrence: At the end of the project.

Result: Stop of the project.

(2) Failures / Deficiencies in the Delivered Artifacts

Description: Quality lacks in the supplied artifacts occur.

Time of occurrence: During the course of the project since the first delivery of artifacts.

Result: Delay of the project, additional costs and efforts.

(3) Failures in the Offshore Project Execution

Description: Information lacks or delays due to management and organization failures in the offshore project execution occur. These problems can already be identified in the first phases of a project, before lacks at artifacts arise or a failure of the whole project occurs. The following cases of problems can be distinguished:

- Information lacks and delays due to additional translations occur. For example the specification is in German, translated to English and then sent to the Indian developers.
- Information lacks and delays due to the time shift between the locations occur.
- Information lacks and delays due to the missing Face-to-Face communication occur.
- There is no sufficient knowledge transfer between offshore contractor and customer. The customer cannot use the available results or he can only use them partially and has to order additional services from the offshore contractor.
- Positions in a project due to a different understanding of skills are wrongly assigned. If for example a software architect for a software project is recruited, in Europe an interdisciplinary acting specialist is searched, who has technical and business knowledge to define an optimal solution for the customer. In many cases the offshore contractor provides for such a requirement a pure technical specialist.

Time of the occurrence: During the whole project.

Result: Delay of the project, additional costs and efforts.

4 Criteria to Avoid Problem Situations

As in section 3 described there are problem situations in an offshore software project that can be already avoided at the beginning of a project. Other problem situations, like failures or deficiencies of the delivered artifacts, are identified late. Lacks in the offshore project management and organization can be identified at an early stage.

4.1 Criteria at the Start of an Offshore Software Project

At the start of an offshore software project the following criteria can be checked in order to avoid problem situations and minimize risks [5, 7, 12] already at the start of the project:

- Aim definitions of the project have to be available.
- Sufficient definitions of the artifacts have to be provided. To have a sufficient definition of the artifacts is in an offshore software projects much more important than in usual software projects, since there is only rarely Face-to-Face communication possible.

- Formal description methods have to be used for the definition of the artifacts to be delivered.
- A clearly defined course of project in the form of rough phases and milestones has to be provided.
- A project organization with escalation procedures and mediation instances has to be defined.
- Project regulations and formalities, for example the definition of common time slots for a world-wide implementation have to be defined.
- The organization of project and status meetings in a global environment has to be defined.
- The project reporting has to be defined.
- The change management process has to be defined.
- The acceptance methods have to be defined.
- The quality guidelines have to be defined.
- The tools, business software etc. with the respective versions to be used, have to be defined.

4.2 Criteria during an Offshore Software Project

During the complete life cycle of an offshore software project the following criteria can be checked, in order to identify or avoid problem situations in the course of a project at an early point. Problem situations can be identified by delays, additional costs or not applicable artifacts. To minimize risks and to prevent projects from a complete failure, the following criteria can be checked during the project:

- Test scenarios have to be defined.
- The delivered artifacts have to fit to the specification and to the defined quality criteria.
- Additional translations or additional costs due to ambiguous translations have to be considered in the project plan and in the budget.
- The time shift between the locations has to be considered in the project organization, the project plan and the budget.
- Additional communication overhead has to be considered.
- Additional business travels for face-to-face communication have to be considered in the project plan and in the budget.
- The knowledge transfer has to be organized in early stages and considered in the project plan and in the budget.
- Efforts at the onshore team members with the high daily rates are minimized.
- The positions in the project are assigned in consideration of a different understanding of skills in different countries.

5 Strategies and Options

If problem situations occur then different strategies and options can prevent the project from a complete failure. Based on the failure or deficiencies that arise different measures can be taken.

(1) Failure / Collapse of the Offshore Software Project
Depending on the level of failure the following options exists: If the defined scope of work is not fulfilled the problematic artifacts have to be corrected and the go-live has to be deferred. In case of a delay of milestones the go-live has to be deferred, if this is possible. When the budget is exceeded the additional costs have to be negotiated and a financial compromise has to be made. At the worst case scenario (all three situations come together) legal measures have to be taken.

(2) Failures / Deficiencies in the Delivered Artifacts
The failures/deficiencies in the artifacts have to be corrected by the offshore contractor and the causes have to be eliminated:
- Definition of quality standards (development, tests, documentation etc.)
- Controlling and monitoring of the compliance of the defined standards

(3) Failures in the Offshore Project Execution
Depending on the problem the following measures can be taken:
- The translations have to be considered in the planning of time and budget.
- Common time slots regarding the time shift have to be defined.
- A project organization with an appropriate collaboration environment (e.g. regular status meetings as video conferences) has to be established.
- Exact (formal) descriptions of requirements to compensate the missing face-to-face communication have to be provided.
- The knowledge transfer between offshore contractor and customer has to be planned at an early stage.
- The project structure has to be changed if positions are wrongly assigned.

6 Specific Milestones

This section describes milestones to prevent offshore software projects from failure. The milestones can be included in the project plans of the specific projects. There are different milestones to check state and quality of the offshore project execution regarding the different stages of a project.

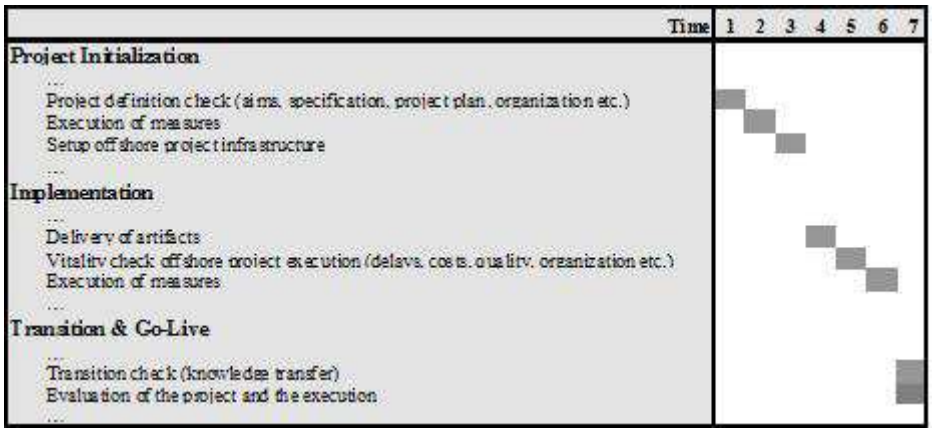

Figure 2. Specific milestones for offshore software projects

6.1 Initialization

The initialization of an offshore software project is the most important stage to decide whether the project will be successful or not. In this stage the basic project execution and organization regulations have to be defined. The following milestones check the availability and the quality of these regulations and, if necessary, take appropriate measures to eliminate the insufficiencies:

- *Project definition check:* In the project definition check the criteria of the check list defined in Section 4.1 is proofed regarding availability and completeness.
- *Execution of measures:* As a result of the project definition check a list of measures is provided. These measures have to be executed. Subsequently the project definition check has to be done again.
- *Setup offshore infrastructure:* After a successful project definition check the offshore project infrastructure including organization structure, regulations and technical components can be established.

6.2 Implementation

The following milestones check the offshore project execution in the course of the project:

- *Delivery of artifact:* The offshore contractor delivers the (first) artifacts.
- *Vitality check offshore execution:* Already after the first delivery of artifacts a vitality check of the offshore execution can be carried out. In the vitality check the offshore project execution is proofed on the base of the check list defined in Section 4.2 regarding availability and completeness.
- *Execution of measures:* As a result of the vitality check a list of measures is provided. These measures have to be executed.

6.3 Transition & Go-Live

- *Transition check:* In the transition check besides the quality of the finally delivered artifacts the knowledge transfer is proofed. It has to be checked that the defined standards are used and that the documentation is correct and complete, i.e. it contains all information that is required to operate and maintain the provided system.
- *Evaluation of the project and the execution:* In the evaluation of the project and the project execution besides a check if the defined aims are achieved the offshore project execution has to be evaluated. Problems, proven proceedings and new ideas should be documented and considered in the next offshore project.

7 Conclusion and Further Work

This paper presents a comprehensive approach to manage and optimize offshore software projects. Based on a classification of failure situations criteria to identify (future) problem situations are defined. As a result a check list to prevent problem situations in offshore projects is provided. Strategies and options are discussed to be applied if problem situations actually occur.

Future plans include the extension of the V-Model [8, 15] regarding the additional requirements of offshore software projects. Specific templates for the management of offshore projects will be provided. Furthermore specific methods and tools to support collaborative global development [4, 10, 13] will be designed and implemented.

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