Towards an Understanding of Sourcing Decisions

Darja Smite[1,2], Claes Wohlin[1,3], Aybuke Aurum[3], Ronald Jabangwe[1], Emil Numminen[1]
[1] Blekinge Institute of Technology, [2] University of Latvia,
[3] University of New South Wales

Corresponding author:
Darja Smite
SE-371 79 Karlskrona, Sweden
Cell phone: +46 (0) 702 100 858
Email: Darja.Smite@bth.se

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Abstract

A variety of new forms of business are enabled through globalization and practiced by software organizations today. While companies go global to reduce their development costs, access a larger pool of resources and explore new markets, it is often assumed that the level of services shall remain the same after implementing the sourcing decisions. In contrast, critical studies identified that global software development is associated with unique challenges, and a lot of global projects fail to mitigate the implications of a particular environment. In this paper we explore offshore insourcing decisions in an empirical field study conducted at Ericsson. A set of questions for consideration emerged from empirical observations of a software transfer project and was used as a basis for building an insourcing decision model. We discuss the ingredients of insourcing decision process and emphasize that due to a wide variability in the choices, the steps towards a global initiative are not, and should not be the same for every company and project. Finally, the companies should carefully select their what, where, when, how and why strategies paying attention to alignment of each selected decision and their contribution to the achievement of the expected benefits.

1. INTRODUCTION

Globalization has led to significant changes also in software organizations. In result, global software development has become business as usual driven by availability and costs of resources accessible around the world, and other benefits. While there are many assumed beneficial aspects of offshore development, critical studies have identified that these benefits are neither clear-cut nor can their realization be taken for granted (Conchuir et al. 2006), (Ebert 2007). This is due to considerable complexity of global sourcing and cross-site collaboration, which adds a set of specific risks on top of the regular ones (Karolak 1998), (Ebert 2007).

Understanding the reasons behind sourcing failures is however not a straightforward task, due to the diversity of sourcing scenarios. Experiences of internal (insourcing) versus external (outsourcing) collaborations (Poikolainen and Paananen 2007), and nearshore versus farshore collaborations (Carmel and Abbott 2007), to name a few, suggest that it is fair to assume that strategies that apply in one context might not necessarily apply in another. The implication of this is that the steps towards an offshoring initiative are not, and should not be the same for every company and project (Conchuir et al. 2006), (CFUS 2008).

Although a wealth of academic literature exists on examining sourcing options, it generally addresses the decision of whether or not to outsource (Šmite et al. 2010), (Tanriverdi et al. 2007) while specific components of possible decisions appear

relatively unexplored (e.g. which particular development should be kept within the company, or transferred to another site). There is also little academic literature that compares different sourcing decisions. As a result a vast majority of so called "go-global" decisions are not supported by deliberate analysis of return on investments and systematic risk management. In fact, some organizations have been criticized for outsourcing simply because "everybody is doing it" (Weidenbaum 2005). Consequently, companies spend years and valuable resources on learning by trying, and all too often failing.

Likewise our empirical investigation emerged from the willingness to explain the realization or non-realization of expected offshore benefits in Ericsson, a large Swedish software systems development company operating in telecommunications domain. Ericsson is an international corporation involved in offshore insourcing — internal collaboration with several geographically, temporally and culturally distant sites. In this paper we illustrate the line of decision-making associated with software transfers, transition of work from one site to another. Motivated by the lack of systematic research work in the area our aim was to addresses the following research question:

RQ: What shall be considered when making offshore insourcing decisions?

The rest of the paper is organized as follows. Empirical background and motivation for our field study are outlined in section 2. In section 3 we analyze the key elements of offshore insourcing decisions based on empirical observations and related field literature. These findings are further incorporated into a structured model for exploring and evaluating different sourcing decisions, described and discussed in Section 4. Finally, Section 5 concludes the paper with a summary of the results.

2. EMPIRICAL BACKGROUND AND MOTIVATION

2.1. Field Study Description

Empirical observations discussed in this paper can be classified as a field study (Zelkowitz and Wallace, 1998) based on multiple sources of evidence related to an offshore insourcing project investigated in one company.

Ericsson is a large-scale developer of software intensive systems for telecommunication domain with sites all around the world. The main focus of our field study in Ericsson was a software transfer project (*Alpha*), which prescribed final relocation of responsibility for a software component from Sweden to India. The project involved three sites — a headquarters site in Sweden, which handled product management (site A), a different site in Sweden initially handling responsibility for development (site B), and a site in India receiving the development responsibility as a result of the offshore insourcing decision under investigation (site C).
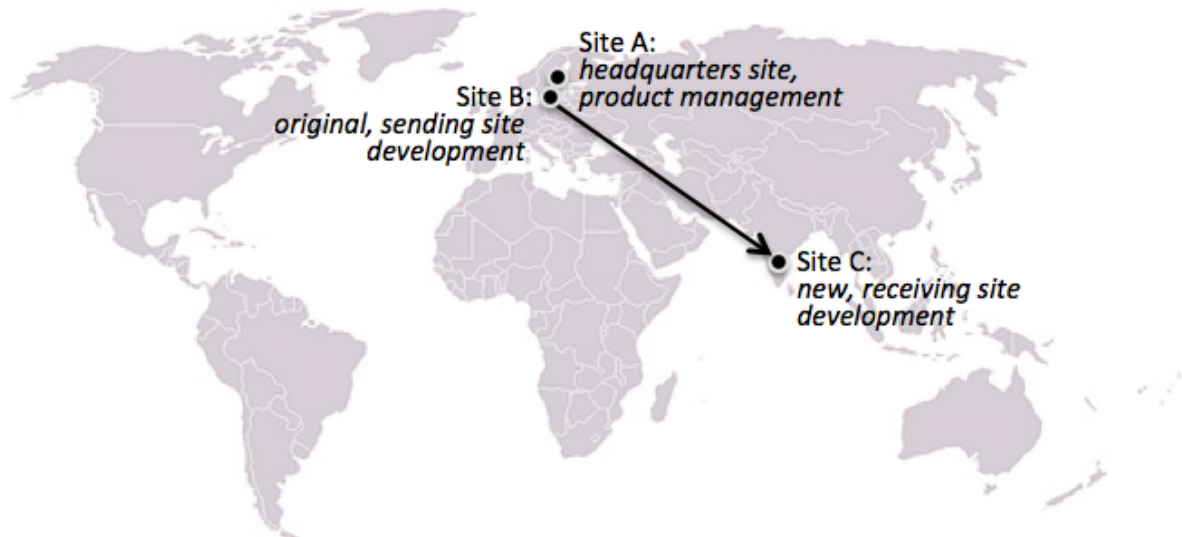
Fig.1 – Global Collaboration Under Investigation

2.2. Research Design

Project data was collected from multiple sources, namely, qualitative interviews with software engineers, product managers, managers responsible for implementing sourcing decisions, site managers, investigation of sourcing project documentation, and discussions in regular research group meetings at the company. An overview of the research activities is given in Table 1.

Table 1: Research Activities

Date	Main Research Activities
Jun 2009	Interviews with developers
	• two interviews with Indian site representatives
	• three interviews with Swedish site representatives
Oct 2009	Interviews with two product managers
Oct 2009	Research seminar on transfer challenges
Nov 2009	Two group interviews with the transfer project manager and product development manager
Mar 2009- Nov 2010	Monthly research group meetings (16 in total)
Mar 2010	Interview with the Swedish site manager
Aug 2010	Research seminar on transfer decisions

Although the number of interviews is relatively small, interviewing personnel with different roles and responsibilities enabled different perspectives. All interviews were conducted in person, in Sweden, and were exploratory in nature. Interviews focused on collecting observations about the transfer decisions, challenges related to their implementation, results expected and achieved, and the awareness about these decisions among different levels of personnel. All interviews were documented during the interview process, the notes were then sent to the interviewees for approval. Research group meetings and informal discussions were used for cross-validation of the gathered observations with the managers involved as research stakeholders, and

to guide further investigation. Research seminars involved a wider audience and aimed at disseminating and discussing the research findings.

Although the selected study does not form a complete picture of all types of offshore insourcing decisions, empirical observations from an offshore insourcing software transfer were used to analyze different aspects of decision-making. In particular, interviews and project historical information was reviewed for evidence supporting the following three categories: characteristics of the decision, situation before the decision, and expected situation after the implementation of the decision. We have sought to identify and describe patterns and themes of consideration from the perspective of the participants, and then to understand and explain these patterns and themes from the decision-making perspective (Creswell 2003). The three categories used for structuring the decisions were inspired by the change implementation model suggested by Pieters (2002). In his model Pieters suggests weighing the gains from implementing the changes, in our case — offshore insourcing decisions, with the losses, and emphasizes the importance of evaluating the transition phase, in our case — implementation of offshore insourcing decisions. This is because numerous experiments demonstrated that having a vision is insufficient for success, as people often fail to realize the necessary steps for transition (Pieters 2002).

Exploratory in nature, our research led to further findings considering offshore insourcing decisions. Several important themes for consideration emerged from analyzing the history of the project under study. In the next section we provide detailed description of the offshore insourcing decisions. The project narrative is divided into descriptions of decisions, and situations before and after the implementation of these decisions. We also outline our line of thinking by mapping the extracts to the themes for consideration emerging from empirical observations. These findings were further used to build a model for supporting offshore insourcing decisions from a bottom-up perspective (see Section 4).

2.3. Project Alpha

2.3.1. History of Decisions Taken

Situation Before the Decision

The transfer decision for Project Alpha was taken in Ericsson by the development site manager in Sweden. The reasons for this were twofold: 1) *to free up existing resources for new projects*[1], and at the same time 2) *to decrease the overall costs as directed by the headquarters*[2]. With this aim a *product component*[3] that has been initially developed by an external software company and later bought by Ericsson was chosen. The component was transferred from the acquired company and has been since developed in a distributed way involving two development sites (in Sweden and in India) with product

Table 2: Themes for Consideration

Decision Themes
[1] Motivation (why)
[2] Motivation (why)
[3] Work to be sourced (what)

management performed at the headquarters site. *Distribution was regarded as challenging*[4] ways of collaboration and thus additionally motivated the transfer decision.

The component selected for sourcing was characterized as *complex and immature*[5] due to its history, and the *experienced developers*[6] from the Swedish site has been *investing significant resources*[7] into improving the software up till the sourcing decision was taken. Before the transfer 54 members of the Swedish site and 46 members of the Indian site (*total of 100 employees*[8]) handled the product development.

[4] Current costs (context)

[5] Work to be sourced (what)
[6] Current benefits (context)

[7] Current costs (context)

[8] Current costs (context)

Implementation of the Decision

The sourcing decision prescribed *full allocation of responsibility for the selected component*[9] to *Ericsson's subsidiary in India*[10], which was already involved in product development. The decision was executed as a separate transfer project with a dedicated project manager and allocated *budget for active training and exchange visits*[11]. It was announced in Q1/2009 and completed by the end of the year. The transfer happened *in the middle of a development release*[12]. This influenced the overall capability of the decreasing experienced resources and slowly increasing inexperienced resources to handle the ongoing work.

[9] Type of collaboration (how)
[10] Destination (where)

[11] Expected costs (outcome)

[12] Point in product life cycle (when)

Expected Situation After

On completion of the transfer the Indian site was expected to *handle development independently*[13], with the *10% decrease in the number of resources*[14]. It was expected that previous involvement of the Indian developers will ensure a *fast learning curve*[15], and thus the site manager expected *return of investments into the transfer within one to two years*[16].

[13] Expected benefits (outcome)

[14] Expected benefits (outcome)

[15] Expected benefits (outcome)

[16] Expected cost/benefits (outcome)

Outcome

Outcome

The transfer of a complex and immature software product component led to significant challenges and required *unforeseen resources for training*[17] and *documenting*[18] the product before handing over the responsibility. After the transfer was completed, *five Swedish developers continued their work onsite*[19] and *several Swedish developers were relocated to India*[20] to ensure access to product expertise, if needed. The number of Indian staff

[17] Costs during transfer
[18] Costs during transfer

[19] Costs after transfer
[20] Costs after transfer

reached 80 employees. As planned, *most of the Swedish employees were further involved in the new projects[21]*. Product development was still provided from the headquarters site in Sweden, thus some challenges of distribution remained. This required *additional effort from product managers for coordination of requirements[22]* from even larger distance.

Finally, after the transfer was completed the management made a decision about the future of the transferred software component. It was decided to switch development into *maintenance mode in the beginning of 2011[23]*, and continue product suppo*rt during at least five years[24]*. As a consequence, *half of the Indian developers are being slowly phased out within the first two years[25]* after the transfer.

[21] Freed-up resources

[22] Costs after transfer

[23] Reduced amount of work
[24] Expected end for ROI period

[25] Costs reduced due to downsizing

2.3.2. Lessons Learned

Analysis of the sourcing decision-making for project Alpha suggests that several unforeseen risks have manifested during and after the implementation of the transfer decision. The gained experience generated a list of questions for consideration in the future decisions, which we grouped under decision themes and coded using five interrogative questions from the Six W's widely used in journalism for information gathering. The following themes emerged from observations (discussed in more detail in the following section):

- **Why** is an organization making an offshore insourcing decision, what are the expected costs/benefits to be achieved and which costs/benefits are dissatisfactory in the existing setting?
- **What** shall be sourced and whether the selected type of work is suitable for the selected offshore insourcing strategy?
- **When** shall the offshore insourcing strategy be implemented and whether this will have any effect on the achievement of expected benefits?
- **Where** will the work be located and whether the offshore destination is optimal in terms of proximity and skills for the demands of the work and collaboration?
- **How** will the work, roles and responsibilities be divided and whether the chosen work division is suitable for the overall offshore insourcing strategy?

Each of these themes comprises of questions for consideration in the process of decision-making and decision options. The chain of decisions made afterwards may influence the probability of achieving the expected benefits and thus shall be approached with considerate attention. In the next section we triangulate our observations with the related findings and try to better understand the decision options and how these are interrelated.

3. THEMES FOR CONSIDERATION AND DECISION OPTIONS

3.1. Why – Motivation and Expected Outcome

First of all, it is essential to understand the drawbacks of the current setting. Managers often perceive offshore sourcing options as a panacea for processes that may not be yielding the desired results (Ilan Oshri et al. 2009). However there are associated risks that may hinder success of sourcing decisions such as, the possibility that the processes may not function as expected, also known as "operational risk", or the possibility that the sourcing relationships, e.g. supplier-client, may not yield ideal results also known as "structural risk" (Aron and Singh 2005). These and other potentially counterproductive risks make it imperative that offshoring decisions are not carried out blindly without any clear expectations and goals. Thus, primarily, an analysis should be conducted to understand the inhibiting factors associated with the current situation (Ilan Oshri et al 2009).

An understanding of the current situation and the associated drawbacks enables the organization in identifying the current problematic areas in different processes. In-turn this facilitates in deriving and defining clear expectations and goals of the offshoring strategies. Comprehension of the drawbacks of the current settings facilitates in aligning these drawbacks to the drivers or motivations for offshore decisions. Ultimately, examination of the rationale and drivers behind these decisions, and identification of the current drawbacks, helps in deriving realistic goals and expectations in relation to cost and potential benefits. We therefore emphasize the need to have a clear link and alignment between the drawbacks of the current situations, the rationale for offshore insourcing, and the expected outcome.

3.2. What – Type of Software Work

The transfer in project Alpha was more expensive than expected mainly due to the complexity and immaturity of the selected component. More complex or immature products have been recognized to require more training, more documentation, and lead to a longer learning curve of the new developers. We thus suggest that selection of the work for offshore insourcing plays an important role in decision-making. Our observations of transferring existing product development from one location to another also suggest that coupling of the work matters — independent components are easier to transfer than inter-dependent ones (Šmite and Wohlin, in press).

Related research suggests that nowadays software organizations are sourcing all types of software work, e.g. handling a product, component, functionality, or separate development activity (Mockus & Weiss 2001). Although there are yet no common best practices determining the success or failure of offshoring different types of work, empirical observations confirm our findings that certain characteristics of the work can alleviate or challenge the outcome of these endeavors. Similarly experiences drawn from numerous GSE initiatives in telecommunication and automotive industries (Ebert 2007) suggest that global development of mere IT applications or internet services is fairly easy, while embedded software faces major challenges; big savings have been also reported from sourcing well-defined processes that require

little control (e.g. maintenance projects), technical documentation or validation activities.

3.3. When – Software Lifecycle

Depending on the situation, offshore insourcing decisions can be made for new project in the start of their lifecycles or existing projects in the middle of a product lifecycle or close to its end. In the Alpha project the transfer was executed in the middle of a release. This caused extra stress on the ongoing operation, since teaching and learning requires significant efforts from the old and new developers. In addition, a full transfer resulting in independent productive performance is claimed to take five to six years (Kommeren and Parviainen 2007), (Šmite and Wohlin, in press), which confirms our findings that a transfer decision shall have intentions for at least a seven to eight years long period to allow reaching the economic benefits. We therefore conclude that the point of software lifecycle, in which the offshore insourcing decision is implemented, influences the degree to which expected benefits are achieved.

3.4. Where – Destination

The sourcing destination in project Alpha was selected with particular consideration. Our observations suggest that characteristics of the offshore destination, such as maturity and attrition levels, play one of the crucial roles in determining the success or failure of future collaboration. In our field study Ericsson in India was own subsidiary, which provided significant level of control associated with insourcing relations (Tanriverdi et al. 2007), (Carmel and Tjia 2005). Therefore the turnover of employees was reduced with the help of internal promotion campaigns and fostering of corporate identity, despite the common view that attrition especially in India is very high (Conchuir et al. 2006).

Distance or proximity of the collaborating sites may influence the success of the relationship and nearshoring versus farshoring decisions are often traded off with costs and risks of doing business in a specific destination (Carmel and Abbott 2007). Challenges experienced in distributed development on a large distance between Sweden and India motivated the further offshore insourcing decision that relocated all development activities in one site. In this case, previous involvement of the Indian site meant that key developers already existed and suggested an easier implementation of the transfer decision. A lack of domain and product expertise is frequently referred to as one of the key challenges when starting global software development (Herbsleb et al. 2005), (Battin et al. 2001). In result, the selected destination had a minimal negative impact associated with the increase in the costs of coordinating product management activities remaining in Sweden.

In conclusion, we emphasize that offshore location decisions shall be based on task attributes and how these are influenced by the necessity to meet (travel time and costs), asynchronously interact (time zone overlap), speak a common language (linguistic similarity or language skills), etc.

3.5. How – Type of Collaboration

Work division and allocation of roles and responsibilities also play an important role in offshore insourcing decisions, especially since these are tightly influenced by the type of work being sourced, characteristics of the sites involved and their relationship. Our observations indirectly support previous studies that have demonstrated that distributed work items appear to take considerably longer to complete as similar items where all the work is co-located (Herbsleb and Mockus 2003). Likewise, the difficulties of handling product management on a distance at Ericsson confirm that software development phases such as requirements engineering become challenging when cross-functional stakeholder groups specify requirements across cultural, language and time zone boundaries (Damian and Zowghi 2002). The transfer decision thus favored allocation of a complete component to one site. Although the component was still related with a product family, it enabled the benefits of modularized or decoupled task strategies, such as isolation of the effect of changes (Herbsleb and Mockus 2003). Related research suggests that modularized development shows good results, when tasks are well separated and supported by ownership, while projects with tasks broken down too much fail (Ebert 2007). It is worth emphasizing that ownership and responsibility for the work performed in the sourcing destination influences motivation (Beecham et al. 2008) and was also noted to consequently decrease the level of attrition of the employees at Ericsson.

4. OFFSHORE INSOURCING DECISION MODEL

The discussion above can be stated as a decision-making problem based on Luce and Raiffa (1957). The main objective of the decision analysis is to maximize the expected utility from the made decision based on the chosen action or strategy and the resulting state of the world. In the above setting this means that we want to maximize the difference between the present and future *why*. In the studied case strategies for doing so consisted of a chain of related decision points, taken within the identified themes for consideration. This way, after defining the expected outcome — freeing up resources in Sweden and obtaining cost benefits through offshore insourcing to India — the chain of further decisions consisted of selecting *what* have been chosen to be sourced, *when* and *how*. In a formal setting the decision analysis is made by defining a finite set of actions and states of the world, i.e. future states that we do not control but make the decision about. The resulting value of the decision is then defined by the combination of the action or strategy chosen and what state becomes the true state. The assumption underlying the analysis is that we have complete information and can characterize the setting, which the decisions concerns in correct and finite states. For these states we can define suitable actions to maximize the outcome value of the decision. Accordingly, decision points emerge from selecting different options available under the identified themes.

4.1. The Model

Empirical observations led to breaking down offshore insourcing decisions into key questions for consideration that we call decision themes. Related literature was

consulted for cross-examination of the findings and complementation of each of decision themes with possible options available within the decision space. Thus the model outlined in this section emerged from an exploratory thinking (bottom-up perspective).

The model comprises of three states and five key consideration themes (See Figure 2). These themes provide general questions for consideration of decision options and help to distinguish different sourcing strategies. The proposed model assists development of a detailed plan for implementation of a strategy and can be also helpful in an evaluation of possible alternatives.
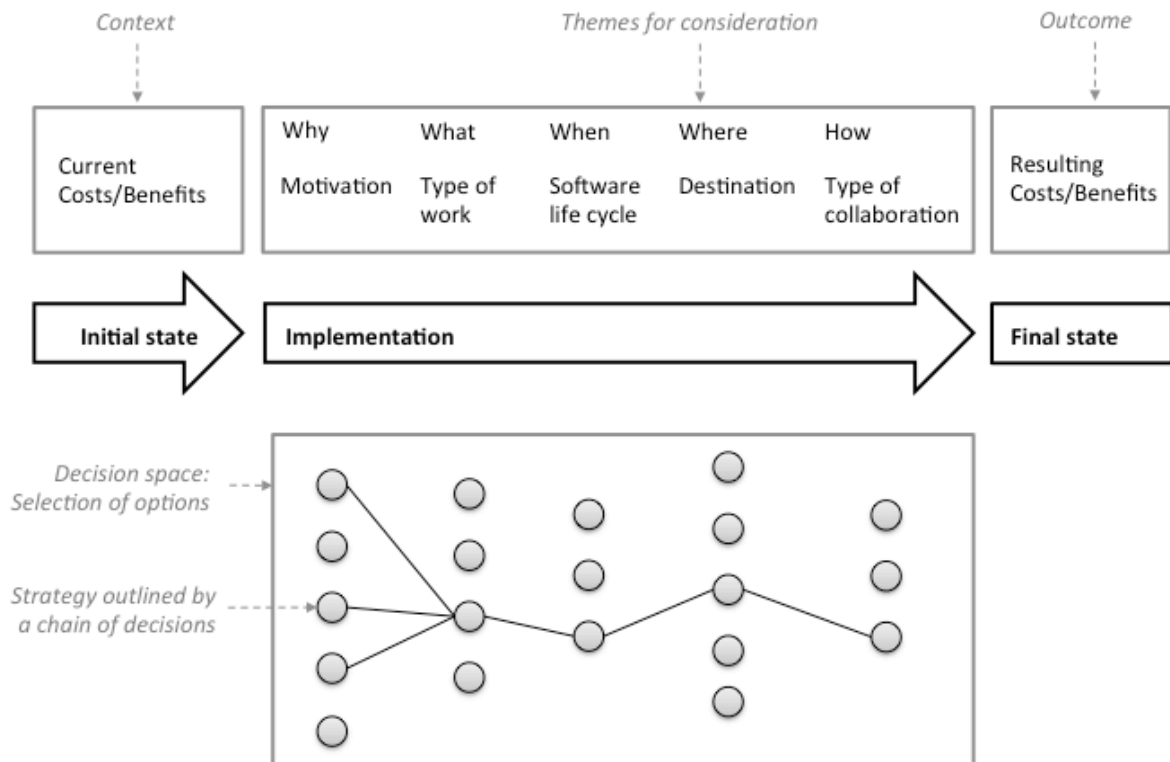

Fig.2 – Decision Model

We suggest focusing analysis of offshore insourcing decisions on the probability of achieving the expected costs/benefits through a certain combination of variables in the decision options. This is especially important in the light of our findings — comparative analysis of different sourcing scenarios showed that certain approaches in the wrong combination may lead to undesirable outcomes. For example, distribution of highly coupled work items that require active collaboration might clash with the inability for synchronous interaction, if the sourcing destination is situated in a far time zone. Thus, paying attention to the decision points suggested in this paper and supplemented by continuous knowledge and experience accumulation shall help to evaluate the viability of selected decisions and perhaps avoid pitfalls.

At the same time the observations lead to conclude that there might be no single best approach to sourcing, as different strategies e.g. to work division can be more or less effective, depending on a variety of circumstances (Herbsleb and Mockus 2003). The implication of this is that it is essential to evaluate the risks and costs associated with

of each strategy and the chain of selected options when planning sourcing decisions and assess the suitability of the work under consideration for the chosen work division approach.

4.2. Dynamic Decisions

Based on the analysis in this paper it might be relevant to implement a more dynamic decision-making instead of having a static decision view on decision-making as the traditional decision analysis assumes, i.e. it is one decision to be made. The target of transferring the project is maximizing the *why*. However, maximizing *why* requires the control of uncertainty in the *what* is transferred over time for the expected outcome to be realized. Depending on the uncertainty in the *what* different sourcing strategies, i.e. *how*, should be implemented. Given the level of complexity in the project a longer time horizon should be used for the offshore insourcing to reach the economic break even. By having a longer time horizon the offshore insourcing can be made as a sequence of decisions providing an opportunity for information gathering along the way. This would reduce the uncertainty in the *what* and provide the possibility to stop the sourcing at early stage if implementation does not meet target ratios. It is also important to analyze the timing of the decision, i.e. the *when*. In the example of the studied transfer strategy time to build the competence for the specific project was necessary for the organization to succeed. This means, that investing into training and prolonging the onsite support reduced the uncertainty in the *what*. Finally, the expected ROI of the project can also be affected by the *where* decisions. Based on previous sourcing implementations, different sites fit different projects. Ultimately if the *what* does not meet the expected criteria the company can take back the project at a known cost for development. The dynamics of the decisions can be illustrated using the studied project and instantiating the model in the following example (see Fig. 3).

Theme	Selected options	Context	Expected outcome: costs/benefits
Why	Free-up resources Reduced costs	Inability to employ in Sweden	Availability of developers ROI in 1-2 years
What	Product Alpha	54 developers in Sweden 46 developers in India Overhead of distributed work Experienced developers Complex product Immature product Limited documentation	Costs of documentation
Where	India	Some experience exists Insufficient existing resources	Fast learning curve New employment Training
When	Middle of a release		Overload of existing staff Decrease in scope of delivery
How	Full transfer		Transfer costs Cost for after-transfer support

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Fig.3 – Model Instantiation: Decision Chain in Project Alpha

It can be seen that the decision chain in every case can take a different road regarding the sequence of decisions. Also, some of the options can be more or less locked to the context of the case. Finally, we conclude that it is important to evaluate context-related consequences of each selected option, and align the strategy with the expected outcome at the end.

4.3. Limitations and Threats to Validity

First of all, the offshore insourcing decision model shall not be viewed as a final or single model applicable to all offshore insourcing decisions, since the objective of the model is to facilitate decision-making process and not represent reality.

The applicability of the model is limited to the scope of offshore insourcing decisions. However, we assume that it can be also useful to model offshore outsourcing decisions, and onshore insourcing and outsourcing decisions. We suggest that similar investigations of offshore insourcing shall be performed to increase the reliability of the model, and other sourcing strategies to shed the light into the generalizability of the model.

Research validity threats in this research were addressed through triangulation and peer debriefing (Creswell 2003). We triangulated different data sources (related literature, interview data, informal discussions and project documentation) to build a coherent understanding of the offshore insourcing decisions. Peer debriefing was used to provide an external view on the findings from the co-authors that have not been directly involved in collecting and analyzing the empirical data. In addition, the credibility of the empirical narrative outlined in this paper is supported by confirming it with the case company and by having two co-authors who have spent a prolonged time in the field.

5. CONCLUSIONS

In this paper we aimed at exploring the key factors influencing offshore insourcing decisions. This was approached through an exploratory study based on related research findings and an empirical field study of one global transfer project in an international software company. We have found that an offshore insourcing decision comprises of selecting the *what*, *where*, *when*, *how* and *why* to source. Although companies claim to start offshoring because of less offensive reasons than simply reducing costs, the main driving force for offshoring has always been related to costs (Carmel and Tjia 2005). This means, that the main objective of the decision analysis is to maximize the expected utility from the made decision based on the chosen strategies. This requires a deliberate analysis of the factors that influence the outcome of the decision. In our study we have observed that particular decision points can be interrelated and thus it is essential to aligned the *what*, *where*, *when*, *how* to the *why*. This is however not an easy task, since companies may lock themselves early in the decision process to e.g. available types of software work, existing offshore locations, points in the lifecycles of the products, and experienced work division modes.

Finally, on the basis of our observations we offer an offshore insourcing decision model, which shall assist in evaluating of existing costs and benefits, expected costs and benefits, and selected implementation scenarios. Although optimal strategies and solutions are yet to be explored in more detail, we believe that the raised questions provide a structure for exploring, evaluating and comparing different decisions, and planning their implementation. Experience structured accordingly shall also contribute to continuous learning in this field.

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