

## **Offshore Insourcing in Software Development: Structuring the Decision-Making Process**

Darja Šmite<sup>1,2</sup>, Claes Wohlin<sup>1</sup>, Aybuke Aurum<sup>3</sup>, Ronald Jabangwe<sup>1</sup>, Emil Numminen<sup>1,4</sup>

<sup>1</sup> Blekinge Institute of Technology, <sup>2</sup> University of Latvia,

<sup>3</sup> University of New South Wales <sup>4</sup> Kristianstad University

### **Corresponding author:**

Darja Šmite

SE-371 79 Karlskrona, Sweden

Cell phone: +46 (0) 702 100 858

Email: Darja.Smite@bth.se

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# Offshore Insourcing in Software Development: Structuring the Decision-Making Process

## **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 delivered 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 global setting. In this paper we explore offshore insourcing decisions on the basis of empirical research literature and an empirical field study conducted at Ericsson. By analyzing decisions in two different cases we found that each offshore insourcing decision consisted of deciding what, where, when, how and why to insource. Related empirical research and field observations suggest that not all combinations are successful and alignment between different decision points has thus a prominent role. To address these concerns we built an empirically-based insourcing decision structure, which outlines a logical path through the decision options and helps selecting an offshore insourcing strategy that targets creation of the necessary alignment. The key element of the proposed approach is a structured and well-defined decision-making process, which is intended to support managers in their decision-making. The usefulness of the proposed approach is evaluated in an additional empirical case of a new offshore insourcing decision.

## **Keywords:**

Global software development, Offshore insourcing, Sourcing, Go-global decisions, Empirical field study

## **1. INTRODUCTION**

Globalization has led to significant changes also in software organizations. In result, global software engineering (GSE) 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 (Ó 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). The main challenges are usually attributed to the complexity of communication, coordination and control over the physical, temporal and cultural distances (Höfner and Mani, 2007). Some of the more specific risks are further elaborated in Section 4.

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, 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 (Ó 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 and which transferred). A recent systematic literature review points out that offshore insourcing, in particular, is not well researched (Prikladnicki et al., 2010), or there are at least too few data points. 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 based on a case from Ericsson, a large Swedish software systems development company operating in telecommunications industry. 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 offshore insourcing collaborations. Motivated by the limited systematic research work in the area, our aim is to address the following research questions:

- RQ1:** Which decision points are considered in practice when making offshore insourcing decisions?
- RQ2:** Which decision options exist for different decision points?
- RQ3:** Which order shall the decision process follow?

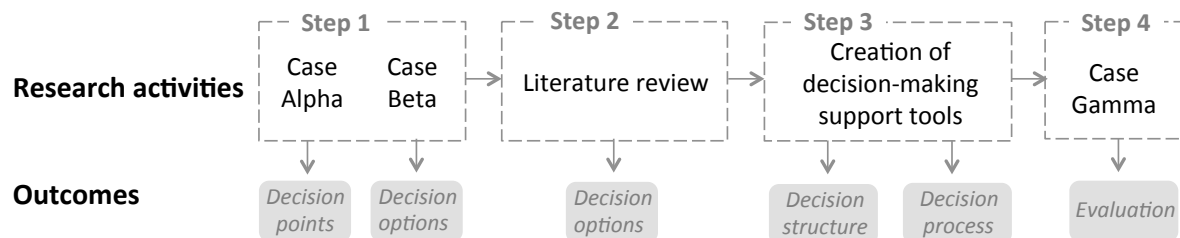
The remainder of the paper is organized as follows. An overview of the research and the research methodology are described in Section 2. In Section 3 we analyze offshore insourcing decisions based on empirical observations. In Section 4, we have chosen to present the related work in accordance with the structure of decisions identified in the empirical observations. This is motivated by the use of the related work in Section 5 to identify decision options in relation to offshore insourcing in the current literature. The findings from the empirical observations and literature are used to formulate decision support for offshore insourcing in terms of a decision-making structure, identification of decision options and to formulate a decision-making process. These contributions are described and discussed in Section 5. In Section 6 we evaluate the proposed decision support on an example of an additional empirical case. Finally, Section 7 concludes the paper with a summary of the results, validity threats and future work directions.

## **2. RESEARCH APPROACH**

According to Prikladicki et al. (2010) companies embarking on offshoring must make important business decisions such as selecting distributed sites, geographical locations, and an organizational structure. In this paper we explore how offshore insourcing initiatives are launched. This is done on the basis of lessons learned from the empirical research literature and a field study of two offshore strategies from Ericsson. Finally, we develop an empirically-based decision structure and a decision process for supporting offshore insourcing decisions in software development organizations. An overview of the research activities can be seen in Fig. 1. The figure illustrates how the research results emerged and provides the traceability of the flow of the conducted research activities for this paper:

1. First, empirical observations from studying two offshore insourcing strategies served as a basis for identifying decision categories. The resulting list of decision points and decision options was later used to form the decision structure (reported in Section 3);
2. The empirical research literature was then used to further detail decision categories and identify a wider range of decision options beyond the limitations of the studied empirical cases (reported in Section 4);
3. In Step 3 we created tools to support decision-making — a decision structure for analyzing possible decision options categorized by the decision points, and a decision process (reported in Section 5);
4. Evaluation of the proposed decision-making support tools was then tested in an additional empirical case of implementing a recent offshore insourcing decision (reported in Section 6).

The steps are further elaborated in Section 2.1-2.4.



**Fig. 1** – Overview of the research activities

### **2.1. Empirical Field Study: Cases Alpha and Beta (Step 1)**

Our research is motivated by the challenges faced by one of our industrial partners. Ericsson is a large-scale developer of software intensive systems for the telecommunication domain with sites all around the world. In this paper we report findings from studying offshore insourcing decisions made at one particular Ericsson development site in Sweden, which is involved in global collaborations primarily with other Ericsson sites in India and China. The development under study mainly concerns complex software systems or system components that follow product-line engineering principles and undergo evolutionary release cycles. Due to shortage of resources it is not uncommon that ongoing product development is transferred from

the Swedish site to offshore sites owned by Ericsson. Decisions related to such transfers (offshore insourcing decisions) are the object of this study.

In this paper we explore which decision points are considered in practice when making offshore insourcing decisions (RQ1) and which decision options exist for different decision points (RQ2). The empirical cases from Ericsson serve as the ground for addressing these research questions. 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 offshore insourcing decisions investigated in one company. As part of a research project several offshore insourcing collaborations were studied. Here we present findings about two insourced products, which were selected on the basis of richness of empirical data and availability of multiple data sources.

### **2.1.1. Data Collection**

Empirical data was collected from qualitative interviews with product managers, managers responsible for implementing insourcing decisions, and site managers, investigation of insourcing project documentation, and discussions in regular research group meetings at the company. See Table 1 for an overview of the research activities targeting empirical data collection.

Table 1: Research Activities: Data Collection from Cases Alpha and Beta

<b>Date</b>	<b>Main Research Activities</b>
Oct 2009	Interviews with four 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

All interviews were conducted in person, in Sweden, and were exploratory in nature. Interviews focused on collecting opinions and historical facts about the transfer decisions, challenges related to their implementation, expectations, and the awareness about these decisions among different levels of the organization. All interviews were approximately one hour long and were documented during the interview, the notes were then sent to the interviewees for approval.

Research group meetings were organized as monthly focus group meetings including different managers involved in offshore insourcing decisions at Ericsson, and the first, second and fourth authors of this paper. These meetings were traditionally two hours long and facilitated semi-formal discussions and feedback collection on research activities, such as case studies, and proposed decision support. The feedback received was documented in the form of meeting minutes.

Research seminars involved personnel from the studied projects both onshore and offshore, and focused on presenting research results. In particular, the first seminar was devoted to the challenges of executing software transfers, and the second seminar to recommendations for decision-making. These seminars facilitated discussions of

the findings and as a source of observations of opinions among a wider audience. Both seminars were given by the first author of this paper.

### **2.1.2. Data Analysis**

Interviews and project historical information from the field study was first reviewed for evidence supporting three categories: drivers of the decision, expectations and different decision points. We have sought to identify and describe patterns and important 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).

In Section 3.1 we describe our empirical findings from the two cases in the form of a narrative, and support the reader by highlighting our observations regarding decision points as side notes. A company representative read the created case narratives to verify their correctness. The results of the two first empirical cases are decision categories and observations regarding the process of decision-making.

### **2.2. Empirical Literature Review (Step 2)**

In order to complement our empirical findings from the field study and compensate the limitations of covering only two cases in one company we have reviewed the empirical literature on the topic of global software engineering. This includes a literature review in general and a review of empirical studies from a systematic literature review on global software engineering by Šmite et al. (2010).

The purpose of the in-depth study of the systematic literature review by Šmite et al. (2010) was to identify additional decision options in response to RQ2. To ensure a structured and systematic way of identifying the decision options, the data extraction is based on the systematic literature review and supported with other references. Thus, the articles included as primary studies in the systematic literature review on global software engineering are used.

In total 59 primary studies from Šmite et al. (2010) were analyzed. These studies represent empirical literature dedicated to the topic of global software engineering published in the time period 2000-2007 (the time frame used in the search by the authors of the chosen systematic literature review). This is not regarded as a limitation, since it is hypothesized that empirical studies published after 2007 are unlikely to identify new options for decision-making, although the actual decisions may have changed.

The data extraction, for the study presented here, started by identifying articles describing offshore insourcing experiences, as relevant to our research, and others were excluded. Next, the included articles were carefully read and coded by one of the researchers. Thematic coding was performed, in which empirical case descriptions were examined and passages related to the concepts identified in Step 1 were coded accordingly. Then all codes were compared to identify more abstract options and the codes were iteratively refined. The result of the conducted empirical literature review is a list of decision options. The literature review is presented Section 4 and the outcome in terms of decision options can be found in Section 5.

### **2.3. Creation of Decision-Making Support Tools (Step 3)**

Based on related research and empirical observations we have developed a structure for supporting offshore insourcing decisions (see Section 5). We used the five interrogative questions from the Six W's (also known as 5W&H) widely used in journalism for information gathering in order to create a logical path by establishing the major decision points. In particular, the questions were: What, Where When, How and Why. The sixth w, namely Who, was the decision-maker and thus was not included as a decision point. Thorough consideration of different decision options at each decision point helps to ensure deliberate decisions that shall decrease the risk of failure.

The offered structure can be filled with historical data and serve as a reference material for organizational learning. As a first attempt we have provided decision options on the basis of empirical observations and related research literature as described in Steps 1 and 2. Future research may identify additional options that could be added to the structure.

In order to illustrate the use of the resulting decision structure, it was decided to formulate a process that would package the empirical findings in such a way that it was made more useful in practice than just having a list of decision points and lists of options. The process was formulated based on a brainstorming session. The key concern was to formulate a generic and useful process that helps prioritizing among the options available in a specific decision-making case in relation to offshore insourcing decisions.

### **2.4. Evaluation: Case Gamma (Step 4)**

To evaluate the proposed decision process and structure we offered our research results to support a new offshore insourcing arrangement. In this case, the insourcing arrangement prescribed a relocation of software product development activities from a Swedish site to an Indian site of Ericsson. Transfers at Ericsson are executed as a separate project led by a transfer project manager. We conducted two interviews: one interview with the initial transfer project manager in the beginning and one group interview with the initial transfer project manager and a new manager who was taking over the responsibility close to the end of the transfer project. Both interviews were conducted in person, in Sweden, and were documented in the form of meeting minutes. The interviews focused on exploring decision-making process and the usefulness of the decision structure. Additionally, email exchange was used for clarifications.

Table 2: Research Activities: Data Collection from Case Gamma

<b>Date</b>	<b>Main Research Activities</b>
Feb 2012	Interview with the initial transfer managers
Feb 2012	Monthly research group meeting

May 2012	Group interview with the initial and new transfer managers
May 2012	Monthly research group meetings (16 in total)
Feb-May 2012	Email exchange

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The Gamma case forms additional observations about decision-making. The lessons learned demonstrate how the proposed decision process and structure could be used in practice. The results are reported in Section 6.

### **3. EMPIRICAL FIELD STUDY: STATE OF THE PRACTICE (STEP 1)**

In this section we first present an overview of the field study, followed by the two cases of offshore insourcing decisions at Ericsson, and then we discuss our findings and lessons learned.

#### **3.1. Overview of the Empirical Field Study**

Ericsson has been involved in offshore insourcing for a long time, and has collaborative sites all around the world. While offshore decisions matured with experiences, a retrospective view of the decisions taken in the past reveals both successful and less successful stories. Our goal here is to develop a way of studying and documenting the lessons learned in a form that could support organizational learning and future decisions.

Two cases of offshore insourcing decisions and an execution of these decisions are presented and analyzed. The cases form a basis for building an empirically-based structure for taking informed decisions in relation to offshore insourcing, which is presented in Section 5.

- The first case (Alpha) prescribed a relocation of responsibility for a software component from Sweden to India. The product development involved three sites — a product management site in Sweden and two development sites — one in Sweden and another in India. At the time the insourcing decision was studied, the work was already distributed between one onshore site and one offshore site. The decision concerned the relocation of all activities and overall responsibility for the component from the Swedish development site to the Indian site.
- In the second case (Beta) we studied a different product. The case serves as an evolutionary view of the transformation of offshoring decisions. The first decision prescribed the relocation of a software product from the development site in Sweden to an Ericsson's site in China, while the product management remained in the same place in a site in Sweden. It is common practice to have a standard procedure, process or strategy, and then individual instantiations may make exceptions from the standard. Thus, we view decisions related to the changes as variations of the strategy.

In Sections 3.2 and 3.3, we provide narratives that describe the situation before the decisions, offshore insourcing decision process, and the situation after the implementation of the decisions. The findings and lessons learned are summarized in Section 3.4.



### **3.2. Case Alpha**

The first case concerns development of a large software product component, which prior to the insourcing decision was handled by representatives from two development sites at Ericsson — one in Sweden and the other in India. These included 54 members of the Swedish site and 46 members of the Indian site. We studied the offshore insourcing decision, which aimed at transferring the remaining activities and overall responsibility to India.

#### **Initiation of the Insourcing Decision**

Alpha could be characterized as a *complex and immature*<sup>1</sup> component due to its history and domain specificity. The product has been transferred from an acquired company in the past and undergone considerable improvement ever since. At the time the decision was studied, distributed work caused *significant challenges with efficiency, which could be reduced*<sup>2</sup> by relocating the responsibility to one of the sites. There are also other reasons that triggered the offshore insourcing decision. Ericsson aimed: 1) *to free up Swedish resources for new projects*<sup>3</sup>, and at the same time 2) *to decrease the overall costs as directed by the product management*<sup>4</sup>. With these aims, *full responsibility for the development of the product component Alpha*<sup>5</sup> was decided to be transferred entirely to *the Indian site that was already involved*<sup>6</sup> in some parts of the product development. The transfer was announced in Q1/2009 and completed in Q4 the same year. To be able to hand over the work it was decided to organize the transfer *in the middle of a development release*<sup>7</sup>, and at the time of decision the development was perceived to be *in the middle of the product lifecycle*<sup>8</sup>. On completion of the transfer the Indian site was expected to *handle development independently*<sup>9</sup>, with a *10% decrease in the number of resources*<sup>10</sup>. It was expected that previous involvement of the Indian developers will ensure a *fast learning curve*<sup>11</sup>, and thus the site manager expected *return on investments on the transfer within one to two years*<sup>12</sup>.

Table 3: Case Alpha

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#### **Decision points**

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<sup>1</sup> Work to be sourced (what)

<sup>2</sup> Expectations (why)

<sup>3</sup> Expectations (why)

<sup>4</sup> Expectations (why)

<sup>5</sup> Type of collaboration (how)

<sup>6</sup> Destination (where)

<sup>7</sup> Point in the lifecycle (when)

<sup>8</sup> Point in the lifecycle (when)

<sup>9</sup> Expectations (why)

<sup>10</sup> Expectations (why)

<sup>11</sup> Expectations (why)

<sup>12</sup> Expectations (why)

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### **3.3. Case Beta**

The second case concerns a large software product development that was initially handled by the Swedish development site and later on scaled up and moved to China. In this section we discuss the first offshore insourcing decision and the evolution of the initial offshore insourcing strategy through subsequent decisions, motivated by different reasons.

### Initiation of the Insourcing Decision

Beta could be characterized as a *large and complex*<sup>1</sup> software product that has matured over the years and has been used by a significant number of customers. The growing market promised a long future for the product and there were plans to expand the development capacity even more. *Shortage of resources and inability to employ in Sweden*<sup>2</sup> motivated an initiation of an offshore collaboration already *in the beginning of the product lifecycle*<sup>3</sup>. It was decided to involve the *new development site in China*<sup>4</sup>, because of a good potential to employ skilled labor and to *gain proximity to the local market*<sup>5</sup>. This collaboration started by involving newly employed staff in China in the *joint work*<sup>6</sup> on the *development and implementation*<sup>7</sup>.

### Evolution of the Insourcing Strategy

As the competence of the offshore site grew, there was an opportunity to relocate more complex tasks. Thus, driven by *the cost reduction goals*<sup>8</sup>, Ericsson took a second decision and *transferred responsibility for development and implementation tasks*<sup>9</sup> three years after the initial offshore insourcing decision was made.

In 2005 the shortage of resources in Sweden emerged and driven by the necessity *to free up resources*<sup>10</sup> Ericsson took the third decision *to transfer*<sup>11</sup> the remaining activities to the offshore site. These were *technical product management and verification and testing activities*<sup>12</sup>. The transfer was performed *in the middle of the product lifecycle*<sup>13</sup> with many years of active development planned ahead.

Several years later, in 2008, product management driven by the *market demands*<sup>14</sup> took the fourth decision to *integrate*<sup>15</sup> the product studied with a new product, which was developed in Sweden. This led to a new evolutionary phase in product

Table 4: Case Beta

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#### Decision points

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<sup>1</sup> Work to be sourced (what)

<sup>2</sup> Expectations (why)

<sup>3</sup> Point in the lifecycle (when)

<sup>4</sup> Destination (where)

<sup>5</sup> Expectations (why)

<sup>6</sup> Type of collaboration (how)

<sup>7</sup> Work to be sourced (what)

<sup>8</sup> Expectations (why)

<sup>9</sup> Work to be sourced (what)

<sup>10</sup> Expectations (why)

<sup>11</sup> Type of collaboration (how)

<sup>12</sup> Work to be sourced (what)

<sup>13</sup> Point in the lifecycle (when)

<sup>14</sup> Expectations (why)

<sup>15</sup> Type of collaboration (how)

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development and resulted in *coupled work*<sup>16</sup> being *distributed*<sup>17</sup> across two development sites again.

<sup>16</sup> Work to be sourced (what)

<sup>17</sup> Type of collaboration (how)

After struggling with developing and maintaining the shared components for a year, the company sought ways to *optimize the interfaces*<sup>18</sup>, which emerged as the fifth decision. It was thus decided to implement a *more decoupled way of working and strive for strict modularization*<sup>19</sup> in order to *improve quality and isolate the impact of faults*<sup>20</sup>.

<sup>18</sup> Expectations (why)

<sup>19</sup> Type of collaboration (how)

<sup>20</sup> Expectations (why)

### **3.4. Findings and Lessons Learned**

The lessons learned from the field study are threefold. First of all, our observations suggest that multiple decisions have contributed to the selection of the projects, time of the transfers, receiving sites and the approach to be implemented (see Table 5).

Table 5: Summary of Decisions Concerning Alpha and Beta

	<b>What</b>	<b>When</b>	<b>Where</b>	<b>How</b>	<b>Why</b>
Alpha Decision	<ul style="list-style-type: none"> <li>• Complex and immature product component</li> </ul>	<ul style="list-style-type: none"> <li>• In the middle of an ongoing product release, middle of the lifecycle</li> </ul>	<ul style="list-style-type: none"> <li>• To an already involved Ericsson's subsidiary in India</li> </ul>	<ul style="list-style-type: none"> <li>• Full relocation of responsibility for the work</li> </ul>	<ul style="list-style-type: none"> <li>• Free up resources in Sweden</li> <li>• Reduce costs</li> <li>• Avoid distribution</li> <li>• Decrease the number of resources by 10%</li> <li>• ROI in 1-2 years</li> </ul>
Beta: Decision 1	<ul style="list-style-type: none"> <li>• Parts of development and implementation of a large and complex product</li> </ul>	<ul style="list-style-type: none"> <li>• In the beginning of a product lifecycle</li> </ul>	<ul style="list-style-type: none"> <li>• To a new Ericsson's site in China</li> </ul>	<ul style="list-style-type: none"> <li>• Involvement in joint work</li> </ul>	<ul style="list-style-type: none"> <li>• Shortage of resources</li> <li>• Inability to employ in Sweden</li> <li>• Gain proximity to the local market</li> </ul>
Beta: Decision 2	<ul style="list-style-type: none"> <li>• Development and implementation</li> </ul>			<ul style="list-style-type: none"> <li>• Relocation of responsibility</li> </ul>	<ul style="list-style-type: none"> <li>• To reduce cost</li> </ul>
Beta: Decision 3	<ul style="list-style-type: none"> <li>• Technical product management, verification activities and overall responsibility</li> </ul>	<ul style="list-style-type: none"> <li>• In the middle of the product lifecycle</li> </ul>		<ul style="list-style-type: none"> <li>• Full transfer</li> </ul>	<ul style="list-style-type: none"> <li>• To free up resources</li> </ul>

Beta: Decision 4	<ul style="list-style-type: none"> <li>• Integration with another project</li> <li>• Coupled distributed work</li> </ul>	<ul style="list-style-type: none"> <li>• Driven by the market demands</li> </ul>
Beta: Decision 5	<ul style="list-style-type: none"> <li>• Strict modularization as a more decoupled way of working</li> </ul>	<ul style="list-style-type: none"> <li>• To optimize the interfaces</li> <li>• To improve quality and isolate the impact of faults</li> </ul>

Secondly, the interdependencies emerging from the empirical study suggest that alignment between the decision points may play an important role. This can be illustrated by the findings from the Beta case – we have learned that while the product was transferred offshore i.e. for cost reduction reasons, its further integration with an onshore development (outlined by Decision 4 in Table 5) led to the loss of efficiency and quality, and thus an increase in costs. The goal of alignment is to select an offshore insourcing strategy that is likely to ensure the expected benefits. This is further elaborated in Section 5.3, where a decision-making process is described. Furthermore, to avoid potential misalignments we suggest addressing the following questions that have emerged as important for offshoring decisions:

- **Why** is an organization making an offshore insourcing decision, what are the expected benefits to be achieved or current dissatisfactory states to be avoided?
- **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?

Finally, we have learned that the implemented offshore strategies may be further refined or improved. Driven by different reasons; Ericsson has separately addressed the questions of what and how is insourced in the Beta case. Moving to strict modularization (outlined by Decision 5 in Table 5) helped to avoid the negative outcomes of the previous strategy (outlined by Decision 4). We therefore conclude that offshore insourcing decisions are dynamical in nature, which is no major surprise. Independently, the decision process must be supported as is discussed in Section 5.

Notably, there is no source that would provide concrete strategies and their alignment with the expected benefits. The need for understanding the determinants of success and failure in global software development projects thus motivated us to further study the possible decision options beyond the two empirical cases by consulting empirical literature on global software engineering, which we present in

Section 4, and to create a structure and a process for accumulating knowledge around offshore insourcing decisions, which we present in Section 5.

#### **4. EMPIRICAL LITERATURE REVIEW: STATE OF THE ART (Step 2)**

As part of our study of related work, we have gathered evidence of different decision options considered in practice. We have consulted the empirical literature on global software engineering by analyzing primary studies of a thematic systematic literature review (Šmite et al. 2010). In total 59 papers were reviewed, from which 18 qualified as relevant for studying offshore insourcing (see the list in the Appendix). These papers cover experiences from such global companies as Alcatel, IBM, Intel, Ericsson, HP, Motorola, SAP and others. Other papers focused on outsourcing or onshore sourcing (14 papers), students (16 papers), mixed experiences without separating conclusions (four papers), experts and not concrete sourcing strategies (three papers), open source (one paper), crowdsourcing (one paper), client-vendor relationships (one paper). Two papers reported the same strategies; only one of these papers was included.

As a part of the analysis we coded different options supporting decisions of why, what, when, where, and how to insource offshore based on the experiences from the cases in Section 3. Particular attention was paid to understanding the interrelations of these options, such as alignment and misalignment. In the following we present our findings with the references to the included primary studies. The findings are grouped according to the selected structure: why, what, when, where, and how.

##### **4.1. Why**

Offshoring decisions might be triggered for different reasons. While the majority of offshore collaborations are initiated purely for cost reduction purposes (Boden et al., 2007), (Carmel and Tjia, 2005), (Lings et al., 2007), (Šmite et al., 2010), other reasons surface too. Some companies suffer from a shortage of resources combined with inability to employ in high cost countries (Battin et al. 2001), (Herbsleb and Mockus, 2003), (Ramasubbu and Balan, 2007), as well as necessity to free up resources onshore for other new developments as in our empirical cases at Ericsson (Alpha, Beta). Others gain proximity to the customers (Lings et al., 2007), (Ramasubbu and Balan, 2007) tip into the global resources pool through innovation to change the source of competitive advantage (Forbath et al., 2008). There are companies targeting faster development through utilization of time zone differences (Lings et al., 2007).

In conclusion, we emphasize that it is crucial to understand why offshore insourcing decisions are made, since the clarity of expectations has a profound positive effect on project performance (Poikolainen and Paananen, 2007).

##### **4.2. What**

Related research suggests that nowadays software organizations are pushing the boundaries and insourcing all types of software work, e.g. handling entire systems, separate components, modules or subsystems, splitting the work with feature orientation in mind, or sourcing separate development activities, such as testing, maintenance, customization or development. Each such activity can be supported by ownership and responsibility or controlled from the onshore location. Furthermore, the offshore work can be independent or highly coupled with other related work packages. In such cases the clarity of the interfaces becomes crucial, especially when work packages are distributed across several offshore locations. Experiences drawn from the reviewed empirical studies suggest that complexity of the offshored work is paramount and often determine the amount of the achieved benefits. We have found multiple perspectives on how complexity could be evaluated, such as number of components and their size (Andaloussi and Braun, 2006), (Ebert and De Neve, 2001), (Prikladnicki et al., 2007 a), (Taxen, 2006), variety of required technologies (Taxen, 2006), functional complexity (Taxen, 2006), stability and clarity of the requirements (Herbsleb and Mockus, 2003), (Lings et al., 2007), (Prikladnicki et al., 2007 a), structuredness (Lings et al., 2007). The nature of the work ultimately affects the choice of suitable offshore locations and ways of working. For example, managing interdependencies might not a problem as long as the number of components is small (Kotlarsky et al., 2007). Similarly, Poikolainen and Paananen (2007) have found in Nokia that performance of simple projects is found to be generally better than that of complex ones. At the same time, another study shows that small projects with highly scattered resources show considerably less productivity compared to projects with fully allocated staff (Ebert and De Neve, 2001). Noteworthy, stable projects are more advantageous for distributed offshore development, as continuous change in the requirements makes coordination complex (Herbsleb and Mockus, 2003). Criticality of the work also matters. For example, lower value-added work is suggested to be suitable to carry out where it is cheapest (Lings et al., 2007). In addition, we have found a set of specific characteristics that are related to legal restrictions (Prikladnicki et al., 2007 b), such as export compliance, data privacy, intellectual property, and security constraints.

In summary, the What can be characterized by the type of work being sourced, its complexity, stability, criticality and legal restrictions, which are further interrelated with the choice of locations (Where) and ways of sourcing (How).

### **4.3. When**

The outcome of offshoring decisions may also depend on the time when the decision is taken. Offshoring may be initiated for new projects in the start of their lifecycles (Battin et al., 2001), (Ebert and De Neve, 2001), (Oshri et al., 2007) or existing projects (Ebert et al., 2001) in the middle of a product lifecycle e.g. for developing consequent releases (Oshri et al., 2007), (Treinen and Miller-Frist, 2006) or close to its end, when the work is sent for maintenance elsewhere (Ebert and De Neve, 2001). Our experiences from Ericsson (Šmite and Wohlin, 2010) suggest that transferring work in the middle of a release may have a significant impact on the outcome of the ongoing operation. In addition, a full transfer of existing work is said to take five to six years (Kommeren and Parviainen, 2007), (Šmite and Wohlin, 2011). This means that offshore decisions for transferring existing work shall have intentions for sufficient

time ahead to be able to ramp-up the project and allow reaching the economic benefits (Prikladnicki et al., 2007 b).

We therefore conclude that the point in the software lifecycle, in which the offshore insourcing decision is implemented, influences the degree to which expected benefits are achieved.<sup>1</sup>

#### **4.4. Where**

When getting involved in sourcing one of the key decisions is selecting the offshore location. This can be characterized by relative geographic distance (as highlighted by e.g. Ebert and De Neve (2001) and Holmström et al. (2006 a)), and temporal distance (as in e.g. Battin et al. (2001), and Prikladnicki et al. (2007 b)), which will consequently determine such factors as opportunities for synchronous work. Perhaps more importantly, offshore location may possess cultural differences when it comes to national culture (as in e.g. Herbsleb and Mockus (2003), and Prikladnicki et al. (2007 a)), organizational culture (as in e.g. Battin et al. (2001) and Taxen (2006)), and availability of a common language (as in Andaloussi and Braun (2006), and Ebert and De Neve (2001)). Empirical studies suggest that working across geographic, temporal and cultural boundaries significantly affects communication, coordination and control (Ågerfalk et al., 2005). This way, when choosing large temporal distance, companies are making it impossible for their different sites to collaborate closely (Holmström et al., 2006 a). While the three Cs of global software work are widely discussed, a comprehensive understanding of how to explore and distinguish different global scenarios is lacking. Geographic, temporal and cultural distances among different countries vary, and thus one may wonder whether the challenges faced in various collaborations differ. The importance of alignment between the expectations and the choice of offshore locations is also highlighted by Carmel and Abbott (2007) who state that nearshoring versus farshoring decisions are often traded off with costs and risks of doing business on a distance. Other characteristics of the offshore location may also significantly impact the achievement of the benefits. For example, teams with previous experience from working together are more successful than teams without collaboration history (Herbsleb and Mockus, 2003), (Oshri et al., 2007), (Treinen and Miller-Frost, 2006) and (Poikolainen and Paananen, 2007). A lack of domain and product expertise is also frequently referred to as one of the key challenges when starting global software development (Herbsleb et al., 2005), (Battin et al., 2001), (Poikolainen and Paananen, 2007), thus, skill portfolio of the offshore destination matters. Various studies emphasize the importance of different capabilities and skills of offshore developers, including domain expertise (Andaloussi and Braun, 2006), (Battin et al., 2001), (Prikladnicki et al., 2007 b), experience (Prikladnicki et al., 2007 b), quality (Ebert and De Neve, 2001), productivity (Ebert and De Neve, 2001), and lead times (Ebert and De Neve, 2001). Others focus on evaluating capability maturity of a particular site (Ebert and De Neve, 2001) (Ebert et al., 2001), (Lings et al., 2007), (Prikladnicki et al., 2007 b) and suggest that working with newly established sites

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<sup>1</sup> It should be noted that the actual time to return-on-investment may vary substantially from case to case, which is one motivation why it is important to study transfers to get a better understanding of the contextual factors and decisions affecting the break-even time of return-on-investment.

differs from that with mature ones (Herbsleb and Mockus, 2003), (Prikladnicki et al., 2007 b), (Ramasubbu and Balan, 2007). Process maturity is found to positively impact global development (Ebert and De Neve, 2001). Additionally, offshore locations can be characterized by resource availability (Prikladnicki et al., 2007 b), (Taxen, 2006), the ease of hiring and training new employees (Prikladnicki et al., 2007 b), turnover factors (Ebert and De Neve, 2001), (Prikladnicki et al., 2007 b), difficulty to get a visa and availability of direct flights (Battin et al., 2001), import and export rules (Battin et al., 2001), regulations for customs clearance (Battin et al., 2001) and security concerns (Prikladnicki et al., 2007 b).

In conclusion, we stress that offshore locations shall be selected 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.

#### **4.5. How**

Work division and allocation of roles and responsibilities also play an important role in offshore insourcing decisions; in particular due to the type of work being sourced, characteristics of the sites involved and their relationship tightly influence the outcome. It has been found that distributed work items appear to require considerably more effort to complete as similar items where all the work is co-located (Herbsleb and Mockus, 2003) and (Herbsleb and Mockus, 2003), even in high maturity environments (Ramasubbu and Balan, 2007). Distribution may also put limitations on the choice of work being offshored. For example, in (Lings et al., 2007) the authors recommend distributed development only for well-structured, well-understood and stable projects, decomposable into discrete tasks. Therefore some companies consider relocating complete components for independent, isolated work (Battin et al., 2001), (Kotlarsky et al., 2007), (Lings et al., 2007), (Prikladnicki et al., 2007 b). Others follow the principle that talent is everywhere and locate work on the basis of expertise (Kotlarsky et al., 2007). Modularized or decoupled task strategies (Herbsleb and Mockus, 2003), (Lings et al., 2007), (Oshri et al., 2007) alleviate the challenges of sharing the work and isolate the effect of cross-site changes (Herbsleb and Mockus, 2003; Höfner and Mani, 2007). 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). Companies may also want to gain the benefits of concurrent development (Ebert and De Neve, 2001), (Holmström et al., 2006 a), (Taxen, 2006) or follow-the-sun approach (Holmström et al., 2006 a), (Treinen and Miller-Frost, 2006) to speed up the projects. However, the latter approach is said to be better suited for defect resolution and not development (Holmström et al., 2006 a).

Formation of teams in global projects varies. While some companies strive for loosely coupled teams (Herbsleb and Mockus, 2003) or matrix organization (Ebert and De Neve, 2001), others are leveraging on the closely coupled, virtual teams (Damian et al., 2007), (Damian and Zowghi, 2002), (Ebert and De Neve, 2001), (Herbsleb and Mockus, 2003), (Holmström et al., 2006 a), (Lings et al., 2007), (Oshri et al., 2007), (Prikladnicki et al., 2007 a), (Treinen and Miller-Frost, 2006). Sharing the development work on a distance means working in virtual or closely coupled teams (Damian et al., 2007), (Damian and Zowghi, 2002), (Ebert and De Neve, 2001),



(Herbsleb and Mockus, 2003), (Holmström et al., 2006 a), (Lings et al., 2007), (Oshri et al., 2007), (Prikladnicki et al., 2007 a), (Treinen and Miller-Frost, 2006). This increases coordination and communication overhead, which in turn may prevent the realization of the expected offshore benefits. However, an even more important factor is related to the number of sites participating in the project (Battin et al., 2001), (Damian et al., 2007), (Damian and Zowghi, 2002), (Ebert and De Neve, 2001), (Holmström et al., 2006 a), (Kotlarsky et al., 2007), (Prikladnicki et al., 2007 b), (Taxen, 2006), (Treinen and Miller-Frost, 2006), which determines the complexity of engagement (Prikladnicki et al., 2007 b). Experience shows that work division to more than two sites is disadvantageous (Lings et al., 2007), especially when the time difference is large (Holmström et al., 2006 a). The learning curve of the project staff is said to slow down with more locations involved (Ebert and De Neve, 2001).

Finally we conclude that alignment between the different aspects of offshore strategies and expected offshore benefits emerges as one of the key areas in decision-making to be addressed.

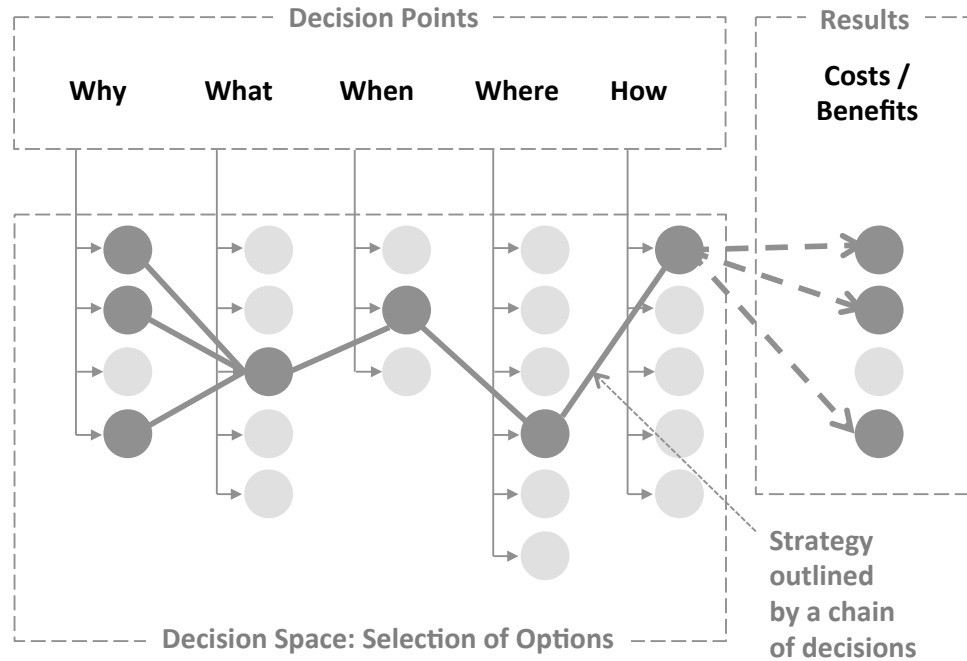
## **5. DECISION-MAKING SUPPORT TOOLS (Step 3)**

### **5.1. Decision structure**

Previous research has shown that the use of structured decision models in combination with relevant information increases the effectiveness and quality of corporate decision-making (Nutt, 1998; Dean and Sharman, 1996; Hitt and Tyler, 1991). These results are further verified empirically in e.g. Elbanna and Child (2007) who further concludes that structured decision-making exceeds non-structured decision-making when it comes to effectiveness. This is in-line with literature on traditional decision theory (e.g. Savage, 1954; Luce and Raiffa, 1957) on how to maximize the expected utility from a decision. This literature being normative, states how decisions should be made in order to maximize the expected utility from a decision. According to Luce and Raiffa (1957) this is done by choosing the action that maximizes the utility from a finite set of actions that are mapped according to a finite set of different states that describes the various possible dimensions of the decision. The structure of the decision is made up by the different outcomes of the chosen variables or decision points. The decision-maker thus chooses the mix that maximizes the expected utility from the decision. Given the support in literature for the usefulness and effectiveness of structured decision support, the two cases and literature on offshore insourcing have been used to create the structure and the process described in this section.

The developed structure comprises decision points and decision options (see Fig. 2). In our field study we observed that managers involved in offshore insourcing decision selected what, where, when, how and why to insource (4W&H). We call them here – the main decision points, which are also the five interrogative questions from the Six W's widely used in journalism for information gathering. One of the W (who) was the decision-maker and thus is not included in the decision process. Decision points outline the structure of the decision process, while decision options offer alternative ways of forming offshore insourcing strategies. Note that in the figure, the decision space is fictitious and the number of options as well as the outlined strategy

are used to illustrate a possible decision space. An important role is given to deciding on motivations and expectations, in other words why offshore insourcing is considered, since they are important background variables for the sourcing strategy. We suggest focusing the analysis of offshore insourcing decisions on the probability of achieving the expected benefits as an outcome of a certain combination of variables in the decision options.



**Fig. 2** – Decision structure

Selection of offshore insourcing strategies shall target creation of alignment and careful selection of decision options. Alignment in the offshore insourcing decision process is particularly important — we have learned that certain aspects of offshore strategies in the wrong combination may lead to undesirable outcomes, which is one reason for supporting the decision-making. For example, distribution of highly coupled work items that require active collaboration might clash with the inability of synchronous interaction, if the insourcing destination is situated in a far away time zone. Thus, the application of the decision structure for organizational learning can help continuous knowledge and experience accumulation. Evaluating the viability of decisions taken in the past shall help companies avoid implementation of misaligned strategies in the future. In practice, the structure can also help companies to identify and plan the implementation of the insourcing decisions, study the feasibility of these decisions and learn from existing experiences overtime, and last by not least make the decision process and the actual decisions explicit.

## **5.2. Decision options**

Many believe that the root of all problems in global software projects is the lack of awareness of the unique threats of global collaborations (DeLone et al., 2005). Due to limited experience or expertise with sourcing, managers are forced to experiment and quickly adjust their tactical approaches (Carmel and Agarwal, 2001). Definition of alternatives may alleviate decision processes and help assessing the viability of

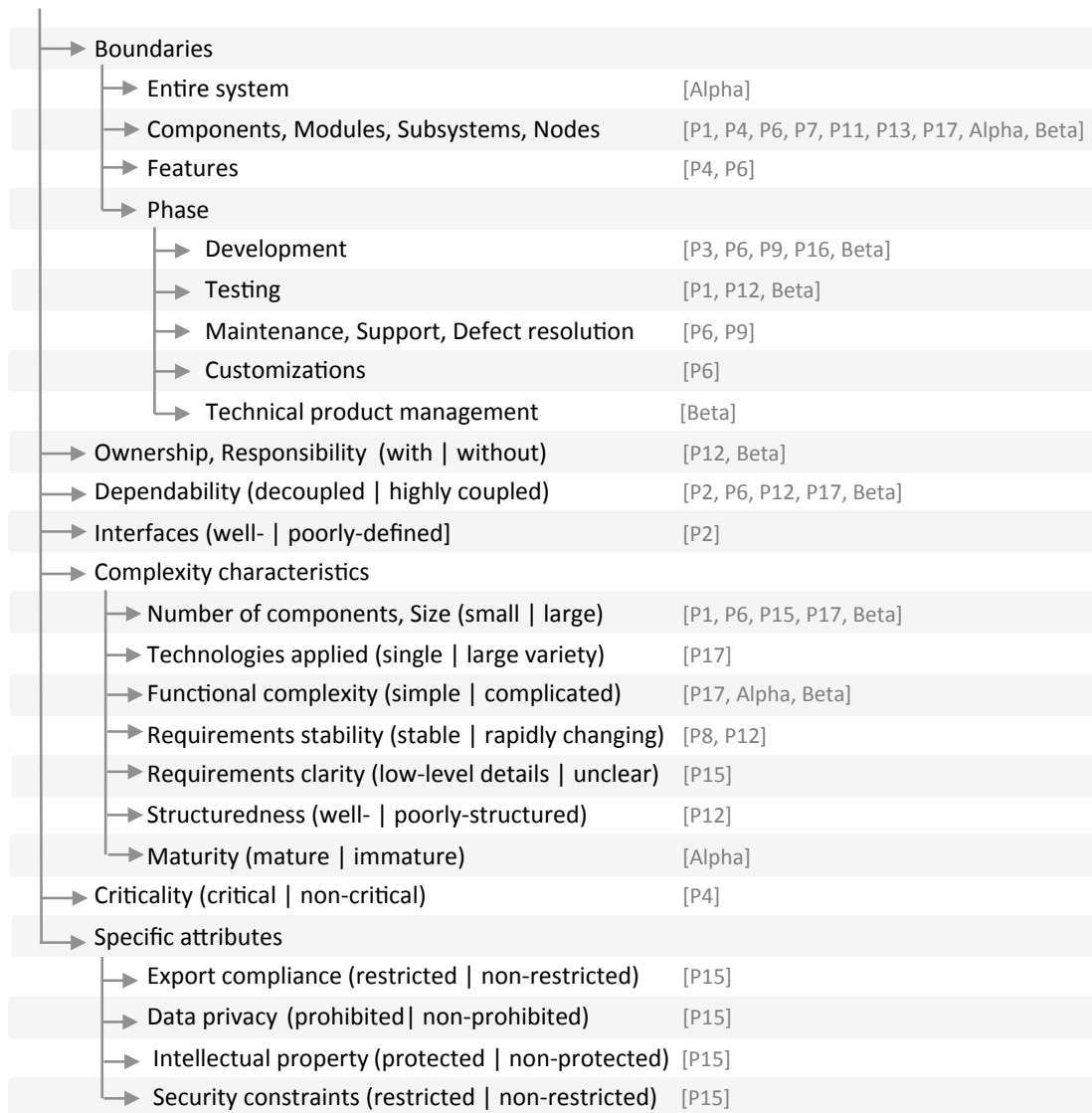
different strategies. An overview of different decision options is created on the basis of the empirical findings (reported in Section 3, referenced as Alpha and Beta) and the related literature analysis (reported in Section 4, referenced in Appendix) and is visualized in Fig. 3-7. It shall support understanding alternatives for choosing why, what, where, when, and how to insource.

### Why

→	Reduction of development costs	[P3, P12, Alpha, Beta]
→	Availability of resources	[P2, P8, P16, Beta]
→	Freeing up resources onshore	[Alpha, Beta]
→	Proximity to customers	[P12, P16, Beta]
→	Access to skilled employees	[P12]
→	Faster development	[P12]
→	Consolidation of work in one place	[Alpha]
→	Optimization of resources	[Alpha]

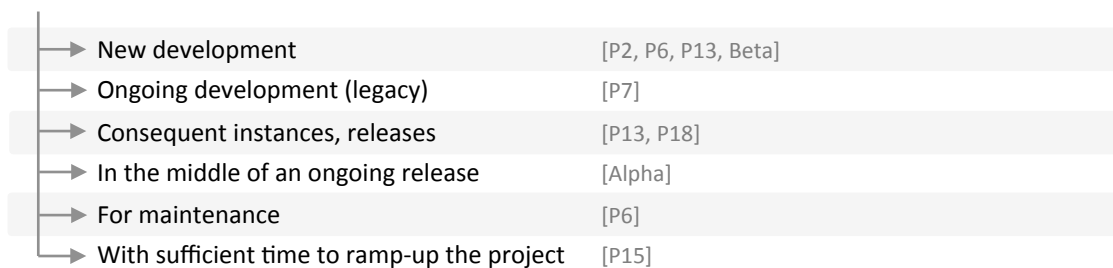
**Fig.3** – Decision Space: Why

## What



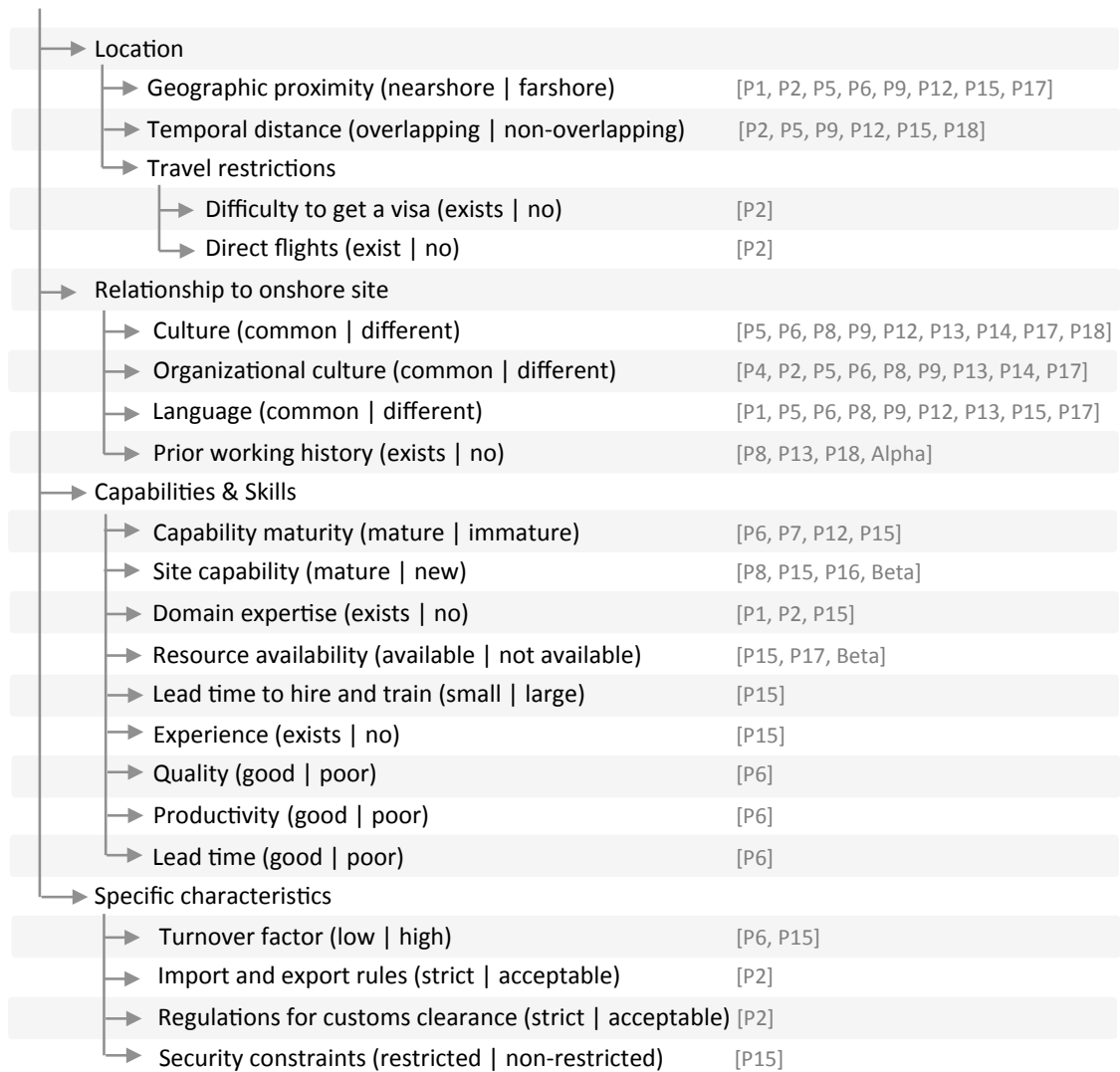
**Fig.4** – Decision Space: What

## When

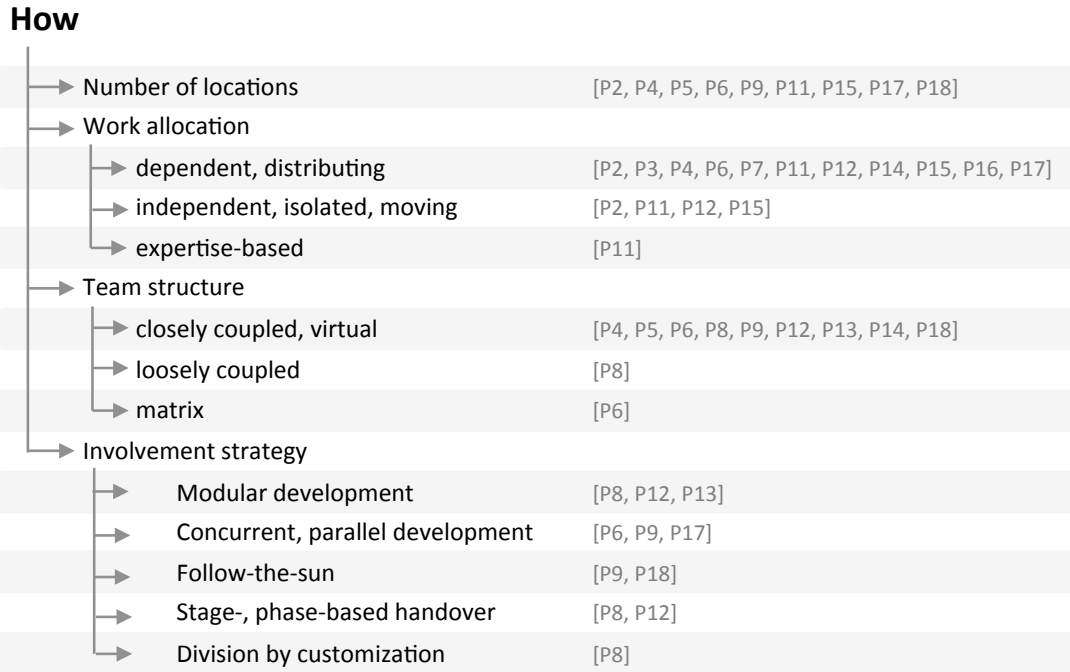


**Fig.5** – Decision Space: When

## Where



**Fig.6** – Decision Space: Where



**Fig.7** – Decision Space: How

### **5.3. Decision process**

#### **5.3.1. Overview of Dynamic Decisions**

Interestingly, in case of Alpha, the decisions were made in the following order: *Why, What, Where, How, When*. First the drivers for offshore insourcing surfaced in the organization. Then the management sought to find a suitable candidate for the transfer, and because the distributed work in Alpha project was not optimal, it was decided to select Alpha for the transfer. India was a natural consequence of the previous decision point. Due to the previous involvement of the Indian site, it was decided to transfer the product with full responsibility. Finally, the execution of the transfer was coordinated with the current project activities and decided to take place within a year from the moment the announcement of the transfer decision.

In the Beta case the chain of decisions after defining *Why* insourcing is required continued with selecting *What* will be insourced and to *Where*, which led to answering the question *When*, and finally selecting *How* it will be done. Further evolution of the insourcing strategy was motivated by different reasons (*Why*), and led to selecting *What* and *How* in Decision 2, *What, When* and *How* in Decision 3, and changing *How* the work is organized in Decisions 4 and 5.

It can be seen that the decision chain in every case can form a different insourcing strategy as seen in Fig. 2. Notably, some of the options can be more or less locked to the context of the case, for example as in the case with Alpha where the only option was a transfer to India or Beta, in which subsequent decisions targeted only a few decision points. Furthermore, any offshore insourcing decision is bounded by the locations of the existing sites. To establish a new site cannot and should not be taken as part of one specific transfer; it is a high-level strategic management decision. Based on these findings we argue that it might be relevant to implement a more stepwise

decision-making process as presented in the next section. The target of insourcing decisions is maximizing the offshore insourcing benefits. However, this requires the control of uncertainty in other decision points i.e. alignment of the what, when, where, and how to be sourced.

### **5.3.2. Decision Process in Use**

The decision structure has been developed to systematize the decisions space and the options available. Although the decision points are listed in a specific order in Fig. 1, the actual order of the decision points (questions) may differ from case to case. Therefore, we offer a process that is intended to support managers in their decision-making. The following general process is recommended for the decision-making:

1. Why to source?  
The first step is to fully understand the goals, objectives and the expected outcomes by offshoring. Once the reasons behind the decision to offshore is fully understood then it becomes possible to make informed and correct decisions regarding the different options and hence also the viable strategies.
2. Create the decision space  
Next, the decision space in Fig. 1 should be captured. Thus, it is important to go through all options for each question as shown in Fig. 2. If needed new options can be added to the mind map in Fig. 2. It is important that different options are captured and information is obtained from different stakeholders.
3. Identify locked decisions  
When going through the options in Step 2, it may become clear that for some questions there is only one option. This means that a decision is locked or pre-decided. This may be due to decisions taken earlier or on a different level in the organization. For example, a company may have a development site in India in relation to this type of products, and hence starting a new site elsewhere may not be an option.
4. Select a limited number of viable strategies, e.g. 5-10.  
Based on having all options, it is possible to create all strategies, i.e. all combinations of paths through Fig. 1. Some paths may not be possible due to that certain combinations of options are not relevant in the given context. It is recommended that the stakeholders jointly agree on a set of viable strategies. Based on all viable strategies, it is recommended to identify a suitable subset of strategies to study in more detail, for example, 5-10 viable strategies.
5. Study selected strategies in more detail  
The selected strategies from Step 4 are studied in more detailed to provide a good basis for prioritization of the different strategies and then a well-founded and informed decision is possible to make in the final step.
6. Prioritize among the selected strategies  
Finally, it should be possible to prioritize the best strategies for doing the offshoring and hence to make an informed decision.

## **6. EVALUATION: DECISION-MAKING SUPPORT IN PRACTICE (Step 4)**

During its creation the proposed decision support was presented and discussed in the research seminars and evolved on the basis of the feedback received from industrial participants involved in the research project. The final version of the decision structure and decision process was separately evaluated in a new transfer case at Ericsson (Case Gamma), where one of the researchers has been acting in a consulting and supporting role. We sought feedback on the relevance and usefulness of the decision structure and decision process, including the relevance of the decision points (Fig. 2) and the decision options (Fig. 3) in the structure, the ways to apply the decision structure in practice, and any improvement suggestions if necessary.

Case Gamma was an ongoing transfer, which was initiated in the beginning of 2012 and executed in the first half of the year. The transfer concerned development of a medium scale software product component, which was initially developed by 20 developers in the Swedish site, and now transferred to an equally sized development team in India. In the following we describe the findings from discussing the steps of decision-making in the Gamma case according to the process in Section 5.3.2.

1. Why to source? — The need for the offshore insourcing emerged at the Swedish site, when the proof of concept development received the first customer and more developers were required. It was thus decided to free up resources from one of the ongoing product development. The “why” question was the driving force for the transfer.
2. Create the decision space — Since the actual transfer decision was taken high in the management hierarchy, the local manager, who we interviewed, did not know whether any decision factors have been evaluated and/or any specific models applied during the offshore insourcing decision-making. Thus, to some extent there was no decision space left when the manager handling the transfer got involved. However, the manager agreed that it would have been natural to try to formulate the decision space as presented in the decision structure.
3. Identify locked decisions — As a consequence of the previous item, several decision items were perceived as locked by the managers when he got involved. Or in other words, when the responsibility for executing the transfer was delegated to the local manager, the following decision points were already locked:
  - The Development Unit management decided that ongoing development shall be fully relocated (How), and chose the product with sufficient number of developers (What),
  - The choice of the product drove further the decision for the location (Where), since one more product from the same domain was relocated to a site in India, it became the offshore destination in the Gamma case as well,
  - Management at the Center of Excellence then decided on the schedule, driven by the demand for relocation of the Swedish developers, and it was decided to execute the transfer in the first half of 2012 (When).Finally, no options really remained for the local manager.
4. Select 5-10 viable strategies — The local manager agreed that it would have been suitable to select a subset of the options. It would have been infeasible to evaluate a large number of options (if they would have existed).
5. Study selected strategies in more detail — Not applicable
6. Prioritize among the viable strategies — Not applicable



Although, a number of options did not really exist for the manager handling the transfer process, he confirmed that if they had existed the process as such would have made sense. Unfortunately, the cases available when working with an industrial partner may not always be optimal from an evaluation of research point of view. However, the manager at least confirmed that the process seemed useful if the options would have existed when he got into the process.

The interviewed manager saw the decision structure as a tool that secures a better overall picture before a decision is made. The questions raised, targeted the dynamic part of the decision structure, e.g. whether the past history of the product shall be taken into account and whether a complete history of preceding decisions is important. In our view the historical information is a part of important organizational learning. While alignment is created for the current decision, the outcome of the previous strategies shall help the organization in understanding what works and what does not work in their own context.

We also learned that the decision options were seen as more supportive from the practical point of view than the high-level abstraction of the same questions outlined by the decision structure. The options provided a useful source of important questions to be asked when considering insourcing decisions.

We conclude that the questions raised by the decision structure have industrial relevance and the data collected from research literature and the two empirical cases can support practitioners in identifying the options during the process of decision-making.

## **7. CONCLUSIONS**

### **7.1. Summary and Conclusions**

In this paper, the objective was to explore the key factors influencing offshore insourcing decisions. This was approached through an empirical field study of two insourcing collaborations in an international software company supplemented by findings from related research literature. We have observed that an offshore insourcing decision comprises of selecting the *what, where, when, how* and *why* to insource, and identified various decision options.

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 benefits 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 align the *what, where, when, how* to the *why*.

Alignment 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. This means that the variation in decision sequence and involvement of

different stakeholders may potentially lead to different strategies. To support deliberate decision-making we offer an offshore insourcing decision structure and decision process, which shall assist in selecting insourcing strategies from available decision options and evaluating the feasibility of selected strategies.

The proposed structure addresses the current gaps in research pointed out in a recent systematic literature review (Prikladnicki et al., 2010). In particular, our exploratory study addresses an offshore insourcing perspective, is both empirically-based and contains industrial feedback as a part of empirical validation, focuses on the project level, and not just organizational level, and provides comprehensive contextualization of the results. It can be concluded that decision structure with its options and the decision process both fills a research gap and is potentially useful to industry to take more informed decision regarding offshore insourcing decisions. The developed structure and process were positively received at the case company, and they are formulated in such a way that they are most likely useful for other companies too. New decision options may emerge when the structure and process are applied in a different context; this is probably the only way to reach a comprehensive picture of the decision space and hence options available for the decision-makers.

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. Structured decision experience shall also contribute to continuous organizational learning and research progress in this field.

## **7.2. Limitations and Threats to Validity**

Our study has several limitations. The empirical field study implied two constraints. First of all, the available cases (Alpha and Beta) do not form a complete picture of all types of offshore insourcing decisions. Secondly, our analysis was done retrospectively and was limited by the availability of information. Therefore we were unable to study different decision options under consideration. To address these constraints we performed a literature study and sought to supplement our empirical observations with other related empirical findings. We used the decision points identified in the field study (what, where, when, how and why) for thematic analysis of decision options, as we believe these are relevant for other insourcing decisions. Thus, the focus is on evaluation of the decision structure and decision process with the objective of showing their applicability and credibility. More cases at other companies are needed to validate the decision-making support tools. The applicability of the decision structure and option space is limited to the scope of offshore insourcing decisions, although some parts may be useful also for outsourcing. The intention was to focus on in-depth case studies rather than studying sourcing decisions broadly through e.g. surveys. Thus, our exploratory study is limited by the empirical context i.e. offshore insourcing. Nonetheless, we assume that the offered decision support can be also useful to study offshore outsourcing decisions, and onshore insourcing and outsourcing decisions, although these are areas for further studies. More specifically, we suggest that similar investigations of offshore insourcing shall be performed to increase the reliability of the decision-making support tools, and other sourcing strategies to shed the light into the generalizability of the decision structure and option space.

Research validity threats in this research were addressed through empirical evaluation, triangulation and peer debriefing as suggested by (Creswell, 2003). We evaluated the decision-making support tools in an empirical case (Gamma) as described in Section 6. Since the offshore insourcing decision in the case studied (Gamma) was taken very high in the management hierarchy and the evaluation process appeared after the actual decision was made, we do not claim the full validation of the decision-making support, but only industrial evaluation. In addition, during creation of the decision-making support tools 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. 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.

Finally, the offered decision support material shall not be viewed as a final or single solution applicable to all offshore insourcing decisions, since the objective of the research results is to facilitate the decision-making process and not necessarily represent reality.

### **7.3. Future Work**

Future work needs to focus on evaluating the structure and process presented in different contexts. Furthermore, there is a need to evaluate and extend the decision options in different industrial contexts. More research is needed to understand to what extent different options are context-dependent and to what extent they can be generalized to other contexts. Thus, research needs to focus on collecting industrial experiences, including the actual realization or non-realization of targeted offshore insourcing benefits through the implementation of selected strategies.

Another line of future research is to conduct a similar study for offshore outsourcing to understand how the findings here are applicable to the outsourcing situation. This may lead to decision support that can address both offshore insourcing and outsourcing.

### **ACKNOWLEDGEMENTS**

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### **APPENDIX**

- [P1] Andaloussi and Braun, 2006
- [P2] Battin et al., 2001
- [P3] Boden et al., 2007
- [P4] Damian et al. 2007

- [P5] Damian and Zowghi, 2002
- [P6] Ebert and De Neve, 2001
- [P7] Ebert et al., 2001
- [P8] Herbsleb and Mockus, 2003
- [P9] Holmström et al., 2006, a
- [P10] Holmström et al., 2006, b
- [P11] Kotlarsky et al., 2007
- [P12] Lings et al., 2007
- [P13] Oshri et al., 2007
- [P14] Prikladnicki et al., 2007, a
- [P15] Prikladnicki et al., 2007, b
- [P16] Ramasubbu and Balan, 2007
- [P17] Taxen, 2006
- [P18] Treinen and Miller-Frost, 2006

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