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Outsourcing Strategies in Software Engineering

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Miller, Cody, "Outsourcing Strategies in Software Engineering" (2018). *Engineering and Technology Management Student Projects*. 2216.

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Outsourcing Strategies in Software Engineering

Course Title: Strategic Management of Technology

Course Number: 526

Instructor: Dr. Weber

Term: Spring

Year: 2018

Author(s): Cody Miller

ETM OFFICE USE ONLY

Report No.:

Type: Student Project

Note:

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Abstract

Over the last several years, software has become a vital component of almost every business. Success increasingly depends on using software as a competitive weapon [1]. In today's software industry, many organizations are realizing that outsourcing is becoming an imperative, strategic step to growing their business, and as a way to gain competitive advantage over its competitors.

The focus of this article, will be a literature review of current literature on outsourcing, and its strategies in the Software Engineering domain. As a software engineer at Intel, I have seen an increased need for outsourcing within our business group, and the entire software domain as a whole. This has become a necessity, in order to stay competitive, in an increasingly competitive, and challenging environment.

Globalization, and the growth of communication technologies, has allowed the world to become a place where companies are not limited to work in local areas, they can look for expertise throughout the world. Unlike physical goods, software components, if required, can be transferred to the place where required expertise is available, and the cost is also less.

To stay competitive in this ever-changing environment, managers must be able to know when the right time to outsource is, and when is not a good time to pursue this strategy. Additionally, they need to be able to identify what business functions to outsource, and what not to. Outsourcing, can be an immense source of competitive advantage for a company, if leveraged correctly, accordingly, it can be a weakness, if not deployed correctly.

Review of Literature

Software Development in an Outsourcing Environment

Many definitions exist for the term outsourcing, for the purposes of this article, we will define it as “The internal work being assigned to an external service provider to reduce cost and also get the work done more effectively and efficiently” [2]. The key point here is, organizations pursue outsourcing for two primary reasons: cost savings for the firm, and quicker output of work, which can also lead to cost savings.

Types of Outsourcing

Outsourcing of services can be divided into two primary types: technological services, and business process outsourcing.

- **Technical Services:** Services such as application development, application maintenance, and web hosting.
- **Business Process Outsourcing(BPO):** Services like back office operations, customer relationship management, call centers and telemarketing, payroll maintenance, and more [2].

Benefits of Outsourcing

Outsourcing started as a way to cut costs, and continues to be one of its driving functions, it has now been adopted for other business functions. Some of the benefits that seem to have more impact on outsourcing [2]–[5] are as follows:

- **Reduced Costs:** Labor is cheaper, depending on the geography. This allows businesses to cut staff, and capital expenses.

- **Service:** Outsourcing work, to a 3rd party that has more expertise in the domain, results in better service for the end customer.
- **Access to Technology and skills:** Business has better access to technology, and skills, allowing the business to focus on its core activities
- **Reduced Risk:** Risk is split, between business, and client.

Risks of Outsourcing

When a business outsources internal functions to a third party, there is always risks associated with it. Some of the risks associated with outsourcing [2] are as follows:

- Business loses control on the project, not as a whole, but whatever portion has been outsourced.
- Finding a reliable source to outsource and establish trust.
- Traveling, and coordinating with the service provider.
- Security related risks. Not always possible, if operating within certain domains, such as healthcare.

Software Development Outsourcing

Software Development outsourcing, is the development of software offshore. In this scenario, the provider typically offers support for all software development related activities, such as maintenance, help desk, and technical documentation. Some typical software developments, that are outsourced, are as follows [6]:

- **Application Development:** From the offs-shoring perspective, some of the ways are, to develop an entirely new application for the client, system architecture design, low level coding, quality assurance, and to implement additional features

to the existing application [2]. The first scenario, is typically an easy procedure, being that the application must follow the requirements of the clients, and that its an entirely new application. This procedure is not true, when the modification of existing software is needed, since it has been modified due to the client's business, and customer needs, all changes to that existing application, has been made to meet the clients needs. For this type of development, it is not enough for the off-shore provider to just deliver developed software but provide support and maintenance services. It is often necessary for both the client as well as the service provider to detail the pricing model, the coding rules and also the copyright acts very well in advance before the actual development phase begins [2].

- **Systems Integration:** Systems Integration is the act of connecting existing applications or components in a common architecture, to achieve intended functionality.
- **Database Management:** For many organizations, company data is critical, because of this, companies must use caution when storing its databases. Service providers, simplify this task by implementing a database management system in the client's location, or cloud. Many "packages" being offered give benefits of storing, and retrieving data easily, but with additional services such as data migration and data cleansing [2]

Offshore Software Development

There are six delivery models, through which a company can utilize offshore software development activities. These models are as follows [2]:

- **Onsite Model:** Service provider finishes the outsourced work at the client's location. This model is regarded as the best model when the scope of the project is repetitive, and open-ended.
- **Offsite Model:** Service provider has its office, located near the clients. Offsite model is usually preferred in cases when the client's requirements are not properly defined and are expected to change during the project execution.
- **Offshore Model:** Service provider is located in a different country. This model is preferred when the project is well planned to meet the end products requirements given by the customer.
- **Hybrid Model:** Client has employees working at the site, and an off-shore team, located in a different country.
- **Offsite / Offshore Model:** Clients work is done by the people working at the offsite near the client's premises as well as the team working abroad. Typically, in this model the offsite development team handles 20-30% of the total work, and the offshore team takes care of the rest [2].
- **Global Delivery Model:** Clients task will be completed by a team working at the client's premises as well as the group of offshore teams working from different parts of the world.

The model pursued, is dependent on a wide range of factors, such as work being out-sourced, level of interaction required, and suitability towards the client.

Analysis & Findings

While outsourcing is regarded primarily as a company's strategy to reduce costs, many other factors need to be considered, such as security, cultural mismatch, requirement issues, etc. Utmost care should be taken by companies, when pursuing outsourcing strategies [2]. Outsourcing can be a good approach, if its organized in a meaningful way, and benefits your current software development activities. A company must first focus on its core competencies, and then allow for other things to be done through a third party.

An Exploratory Study on Strategic Software Development Outsourcing

Today's software organizations, are realizing that software development outsourcing (SDO), is an imperative, and strategic step for their continued success. Many organizations have or are in the process of implementing such business transformation [7]. The objective of this study, is to look at the current state of software development outsourcing (SDO) in the software domain, and to understand how software organizations capitalize on SDO as a strategic tool.

SDO is a relationship based on contracts between clients and vendors organizations, when clients outsource part of or whole software development projects to vendors who can provide agreed services for remuneration [8]–[10]. Strategic SDO as a modern software engineering paradigm in the context of global software development has become a very important operating procedure in nearly all industries [11].

A large challenge of SDO is handling complex co-ordination problems regarding culture, and time separation. In addition, although companies adopt SDO to optimize

their software process improvement [11], a major problem is the difficulty to manage the expectations of what can and what cannot be done in a distributed setting.

Research and Methodology

Three research questions posed in this study, are as follows:

- **Question #1:** *What factors need to be considered when making a strategic decision to outsource software development?*
 - A survey is conducted, drawn from a sample group of the IT domain. The survey consists of 17 questions, the survey was published to 761 software professionals, within Sweden.
- **Question #2:** *What are the impacts of strategic SDO on the industrial organizations?*
- **Question #3:** *How to manage strategic SDO to improve organizations performance from a decision makers point of view?*

A multiple-case study is conducted for Questions #2, and #3. 10 face-to-face interviews were conducted, with five companies. In order to gain insights into strategic SDO decision making, interviews were with senior managers, CEO's, senior consultants, IT managers, and strategy analysts.

Research Results

Question #1: Before making a decision to outsource, management should understand the reasons for outsourcing. A strategic SDO decision is based on a strategic vision from the decision-makers when the demand of SDO is coming [12]. An SDO must be driven by the organizations overall vision, role, value, operations and culture. These ingredients are the important assets as well as the prerequisites for decision makers to

realize their organizational visions [7]. *Table 1*, includes determinants of SDO decisions, based on the conducted survey, this survey had 139 respondents in total, with an 18% response rate, among the total respondents, 78 respondents are currently outsourcing, and 61 other respondents are only developing in-house software.

Table 1- Determinants of SDO Decision

Determinants	Freq. (n=139) %	
Cost savings	76	55
Improve business development strategy	37	27
Focus on core competence	58	42
Lack of in-house experience	23	17
Pressure from investor	18	13
Top management	36	26
Improve software product quality	34	26
Culture and communication	35	25
Time savings	26	19
Improved compliance	21	15
Shortage of domestic IT skills & resources	11	8
Free in-house resources	34	24
Technical capability	12	8

Based on these findings, we can ascertain the current main factors that should be considered, when making a decision to outsource software: Cost savings, focus on core competencies, size of organization.

Question #2: Successful SDO can bring many benefits to a software organization, these consist of the following: cost advantage, efficiency advantage, business flexibility, risk share, and access to resources. When the outcome of the increased competition in globalization, along with the communication cost and emergence of specialized service providers, organizations are moving towards outsourcing more critical core processes [9], [13]. This results in a shift from cost discipline to the development of customer value, then the increased value competence even accumulate company’s capabilities to sustainable transform and restructure its value and supply chain [14], [15].

This can be summed up in two findings:

1. The impact of strategic SDO on software industrial organizations processes are cost advantage, efficiency advantage, flexibility in business, risk sharing, and access to skilled resources.
2. The impact of strategic SDO on software organizations performance focused on financial improvement, and business process improvement; the transformation focused on strategic restricting competence [7].

Question #3: When outsourcing software, it is crucial to communicate with all of your stake holders and make sure that they are on the journey with you [16]. To realize the full benefits of outsourcing, a comprehensive communication management and change management program is critical [16], [17]. Based on survey results from *Figure 1*, the top three challenges of SDO are listed [7]:

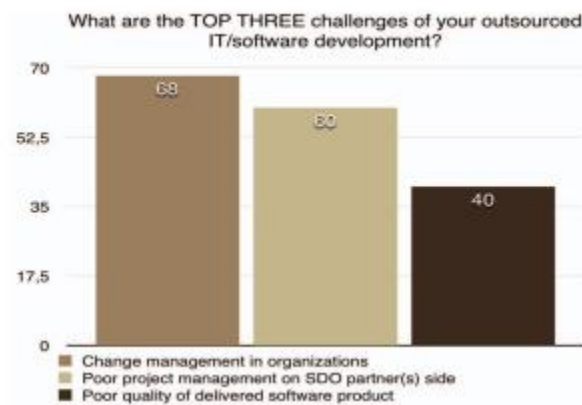


Figure 1- SDO Challenges

This can be summed up in two findings:

1. Two specified case studies and survey results coordinately lead to SDO service management from decision makers.

2. Companies are suggested to emphasize on communication management, strategic SDO service management and change management [7].

Analysis & Findings

Through a survey, and multiple-case studies, this study empirically investigated SDO in the software industry in Sweden. The study has shown that strategic SDO is growing and maturing. In order to reduce risk and solve challenges the software industry is facing, the deep insights into market places and rich hands-on experience in a variety of industries are desired.

Software maintenance outsourcing: Issues and strategies

Software maintenance outsourcing is gaining popularity in the software industry. Companies look to outsourcing maintenance and support activities as an area for competitive advantage [18]. Software product companies of all sizes, have embraced outsourcing in virtually all stages of the software development lifecycle. According to Gartner Group, the total IT outsourcing market totaled over US \$70 billion in 2001 and projected to grow to \$160 billion in 2005.

Software maintenance is well understood to be the most expensive, and perhaps longest phase in the software development lifecycle(SDLC). With software becoming outdated at an ever-increasing rate, companies must invest more resources to keep up with this. Outsourcing now provides companies with an alternative maintenance strategy, allowing the business to focus more on its core business. Outsourcing maintenance functions may include all types of maintenances(preventative, corrective, adaptive, perfective); especially code maintenance, bug fixing, feature enhancement, version

control, software upgrade, software optimization, testing, auditing, porting to different hardware/software platforms, localization, GUI enhancement, help desk, etc. [18].

Maintenance Strategies

Managers must first decide on the type, and scope of maintenance activities needing to be outsourced. An outsourcing strategy for help desk services, would be different than one of say, code maintenance. When software is being developed from outsourced software components, the maintenance plan should answer the following questions [18]:

1. Who will be responsible for the maintenance phase?
2. Have we instilled the required maintenance strategies in the whole project lifecycle?
3. During the maintenance, what to do when the technology changes?

If the software development is heavily outsourced and most of the outsourced software components are developed by a single organization, then the same organization could be a good candidate for the maintenance outsourcing as well [18].

Different criteria may be used, when selecting an outsource organization for maintenance activities, these criteria are as follows:

- Subcontractors familiarity with the product and process.
- Existence of suitable skill set with subcontractor.
- Established business relationships between the parent enterprise

Outsourcing maintenance activities comes with similar risks when software development is outsourced. Some of the maintenance outsourcing risks includes [18]:

- Cost and time over-run for maintenance activities

- Data privacy and security
- IP rights
- Low quality work
- Portability issues between outsourced components
- Outsourcing organization collapse
- Vague contracts

These risks, should be addressed in a project, and maintenance plan. Many of these risks can be minimized through the use of established methodologies and practices [18].

Analysis & Findings

Software maintenance outsourcing presents unique challenges, especially when the product is built from outsourced components. Good maintenance, is only possible if adequate measures are taken well in advance of a projects development and maintenance planning phase and documented in the maintenance contract.

Conclusion

For the purposes of this literature review, I focused on 3 primary sources of literature [2], [7], [18]. As a practitioner in the domain of software engineering, I wanted to gain a better understanding of outsourcing strategies companies employ, why companies do it, and the benefits and risks of employing these strategies. Several trends were observed, through this extensive review and analysis of literature.

There is general consensus that outsourcing strategies in software engineering provide competitive advantages for companies, if employed effectively. Strategy is the lynchpin of business practice, effectively being able to utilize outsourcing strategies to a

company's benefit, can separate your software from that of your competitors. Some of the competitive advantages gained from successfully employing outsourcing strategies on software development activities are: reduced costs, service, access to technology and skills, reduced risk, and 24/7 production processes.

While the literature is far reaching with regards to the significant competitive advantages that can be gained through deploying effective software development outsourcing strategies, there is also general consensus with the risks to pursuing this strategy. Like all technology driven industries, there is benefits, and risks when pursuing certain strategies. Not foreseeing risk, and planning for problems when looking to outsource software development activities, can burn the strategy from the start. Common themes of risk emerged such as IP rights, data privacy and security, low quality work, and compatibility issues are among these risks. Many of these risks, when understood by the practitioner, in advance of the outsourcing activities commencement, can be greatly mitigated, with advance planning and preparation.

Like the majority of technology driven strategies, there is no "one size fits all" approach when outsourcing software development activities, according to the literature, and as a practitioner. When outsourcing software engineering activities, there is types of outsourcing, such as technical services, and business process outsourcing. In addition to this, six primary delivery models for software development outsourcing (onsite, offsite, hybrid, offsite/offshore, and global) are studied.

Managers, and software engineers, need to recognize these different delivery models, outsourcing activity types, and understand the benefits, and risks, when pursuing an outsourcing strategy. Anyone can implement a strategy, but implementing the correct

outsourcing strategy, to grow and evolve your software, in an ever increasingly competitive environment, is what gives your business, and as a manager, the advantage. Naively pursuing an outsourcing strategy, without understanding the ramifications, in addition, can do more harm, then good to your project, if not carried out correctly.

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