

Software Production in Developing and Emerging Countries through International Outsourcing¹

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Abstract

This study examines and analyses how the software production through international outsourcing process is executed. This research was carried out by reviewing literature, interviewing of and consulting with researchers and practitioners and analyzing case companies which have executed the various phases of outsourcing process. This study contributes both in terms of theory and practice. At the theoretical level, it provides a framework of international software production through outsourcing that can be used as a basis for further research. The study identifies various factors that are creating barriers to international outsourcing and mechanisms for controlling the risks of outsourcing projects. It describes in detail one case company as an example of the software production through international outsourcing. At the practical level, the framework can guide managers in international software production through outsourcing process, effectively and efficiently.

1. Introduction

Nordic software companies are facing a great shortage of appropriately trained software professionals and intense global competition (Nahar, Käkölä and Huda, 2001a). Increasingly, these software producing companies are attempting to produce some of their software through international outsourcing in order to overcome these difficulties. An international outsourcing relationship is referred to as a commercial arrangement through which an OSU (outsourcing service user) entrusts a foreign OSP (outsourcing service provider; a foreign software house) with a commission to produce software products/sub-products; the OSP produces the products/sub-products and delivers them to the OSU and receives the payments from the OSU.

Many researchers have also pointed out that Western software producing companies are facing intense competition, and are under a great pressure to introduce complex products in a short period of time, and also facing a very high shortage of appropriately trained software professionals (Barr and Tessler, 1996; Battin et al., 2001; Carmel, 1999; Carmel and Agarwal, 2001; Ebert and Neve, 2001; Herbsleb and Moitra, 2001). Therefore, Western software producing companies are trying to produce some of their software through international outsourcing in order to overcome these current difficulties (Heeks et al., 2001).

Various researchers (Gurbaxani, 1996; Harindranath and Dhillon, 1997; Sabherwal, 1999) have indicated an increasing importance of international outsourcing as it can provide high benefits to both the outsourcing user and outsourcing provider. If it is successful, it can

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facilitate access to innovative solutions, foster innovations, increase speed to markets, reduce costs, focus the core of the business, improve quality, etc.

A great amount of literature exists on international outsourcing (Kumar et al., 1996; Smith et al., 1996). Unfortunately, very limited literature exists that describes in detail the tasks involved in each phase of an international outsourcing process. Commonly, Western companies spend a high amount of time and money only to explore and figure out how to execute many tasks of various phases of an international outsourcing process, mainly due to a great lack of a systematic framework of international outsourcing process with the phases described in a great detail. In fact, there is no literature to guide companies about how to execute a great number of tasks in each phase of an international outsourcing process. Therefore, an in-depth research is needed on international software production through outsourcing.

Our empirical research indicates (Nahar, Käkölä and Huda, 2001a) that it is common that either an OSU utilizes an OSP from a nearby low cost country or from a country which has reputation as a software producing nation. Those who attempt to use the OSPs from a nearby country, encounter many unexpected difficulties such as lack of various categories of software and business skills from the OSPs and an unfavorable business environment. Those who try to use the OSPs from a country that has reputation as a software producing nation, encounter the problems of rapidly rising costs and departure of talented and experienced software developers to the United States and Europe.

Companies also encounter various other problems in establishing and maintaining the outsourcing relations (Radosevich, 1996; Smith et al., 1996) that include screening and evaluating of suitable outsourcing partners from around the world and high expenses for managing the relationships. The software outsourcing projects in developing and emerging countries become influenced by a variety of factors. Due to these, it is very challenging to manage the outsourcing process and project. Therefore, a systematic approach is needed to select the appropriate software producing countries and OSPs.

However, developments in information technology (IT) such as online databases of prospective countries for software production and potential partners, collaborative online tools and other IT tools that can provide some help in searching appropriate countries for software production and suitable outsourcing service providers, establishing outsourcing relationships and maintaining these relationships.

This research has been undertaken due to the growing importance of international outsourcing, complexities in the international outsourcing process, rapid increase in the capacity of ITs as well because no systematic research has been undertaken on IT-supported international outsourcing process.

The basic research question addressed in this research is: how is the software production through international outsourcing process executed?

This paper proceeds as follows. A literature review is carried out in Section 2. The research method applied in this study is described in Section 3. Section 4 analyses and describes the cases. Section 5 presents the research results. In this section, a framework of international outsourcing process is described which consists of eight phases. The factors that create barriers to international outsourcing process and mechanisms for controlling the risks of

outsourcing projects are also highlighted in this section. Finally, conclusions are discussed in Section 6.

2. Literature Review

2.1. Major types of outsourcing

Outsourcing has been categorized in a variety of ways. Some researchers have divided it into three different levels: body shopping, project management and total outsourcing (Hirschheim and Lacity, 1995). Body shopping commonly refers to the use of contract programmers managed by the company employees. In the project management case, the management outsources for a specific project or portion of work. In these cases the vendor is responsible for managing and completing the work. In total outsourcing case, the vendor is in total charge of a significant piece of work. In this study, we do not deal with body shopping but rather deal with other two types of outsourcing in the context of software development.

Outsourcing can also be divided into domestic outsourcing and international outsourcing (Kroshrowpour, 1994). In domestic outsourcing, the OSU employs a domestic software house to produce software products/sub-products/services. In international outsourcing, the OSU produces software in a foreign software house located abroad. International outsourcing provides more advantages than domestic outsourcing if it is successful. However, several factors influence the international outsourcing, it is much more complex and also involves higher risks. In this study, we deal with international outsourcing.

2.2. Major differences of international outsourcing from other international business modes

Software production through pure outsourcing varies significantly from other international business operation modes such as software production through international joint venture (IJV) mode (Nahar, Käkölä and Huda, 2001a). In a pure outsourcing contract business, relation between the OSP and OSU can be terminated just after one contract. Conversion/Migration/Reengineering types of work of end users such as hotel chain are commonly done through one time pure outsourcing contract. International subcontracting or outsourcing can be considered as a one time or a short term production cooperation since one company is using the production capacity of the other company. Many software and IS firms internationally outsource on a continuous basis to different OSPs who can provide high quality and competitive service. Increasingly, software companies are in need of focusing on R&D and outsource the low value added activities to foreign software producing nations.

Whereas, in an IJV relation, the partners established a new legal entity. All the partners make contributions and share risks and benefits (Al-Obaidi, 1993; Al-Obaidi et al., 1999; Harrigan, 1986; Hennart, 1988; Kogut, 1988). In this case, as training is provided extensively, it takes much longer time to produce software products through establishing an IJV and a very strict control is followed by both partners. In addition, the relations between the partners are very intense and these relations continue for many years. For example, a Western country software firm can set up a joint venture of software production facility in cooperation with a developing country software firm, exercise high control on software development projects and produce software through the IJV entity for many years.

Thus the software production through pure outsourcing contract varies greatly between software production through IJV mode in terms of the process, phases in the process, the success factors, risk factors and so on. This paper deals with software production through international outsourcing process, not through IJV process or software production through other international business operation modes.

2.3. Developing and emerging countries

2.3.1. Developing country

In this study the notion of a “developing country” has been viewed from the perspective of technology development, technology transfer and production of technology-based products.

The World Bank (1997) usually uses this term to refer to low and middle-income countries, assessed with reference to per capita GNP. The United Nations Conference on Trade and Development (UNCTAD 1998) also defines “developing country” on the basis of income level, but has different income thresholds from those of the World Bank.

Both of the above definitions have ignored other important characteristics of developing countries, such as, technological development, technology protection, infrastructure, to name a few.

In this study, “developing country” has been defined on the basis of its characteristics in the context of technology development, technology transfer and production of technology-based products. Major characteristics include (Nahar, 2001):

- Low levels of technology and sophistication,
- If an industrial sector exists, it is quite weak,
- A low level of innovation,
- Technical and management education level is low,
- Underdeveloped infrastructure,
- Underdeveloped IT infrastructure,
- Underdeveloped intellectual protection laws,
- Reliance on imported technology (multinational companies usually transfer technology to these developing countries),
- Lack of advanced R&D facilities (national and university research centers), skilled scientists and engineers, financial resources, management “know-how”, etc.,
- Income level is low,
- Usually unstable political and economical environments, and
- Examples of countries that belong to this set include Belarus, Bhutan, Bolivia, Nigeria, Romania. According to this study, producing software in a country having the aforementioned characteristics, is considered as producing software in a developing country.

2.3.2. Emerging country

“Emerging country or market” has recently become a widely used term amongst technology and equipment suppliers in industrialized countries and the investment community. However, an extensive literature review suggests that little effort has been made to define such a term.

The World Bank (1997) defines an “emerging country” as one with a GNP per capita of less than \$7,910.

In this study, “emerging country” has been defined on the basis of its characteristics in the context of technology transfer. Major characteristics include (Nahar, 2001):

- Demonstration of rapid economic growth in the country/market, the potential to maintain that growth for the next 5-10 years or more and the expectation that the economic growth will exceed that of the developed country,
- Relatively higher per capita GDP than developing countries,
- Usually, privatization and direct foreign investment policies have been implemented,
- Industrialization is advancing or has a long history,
- More technologically advanced than the developing countries,
- Have a better infrastructure than that found in developing countries,
- IT penetration is higher than that of developing countries,
- A growing, competitive and skilled workforce,
- A growing local consumer base,
- Tends to be economically volatile, and
- Examples of countries that belong to this set include Brazil, China, Estonia, Hungary, Mexico, Poland. According to this study, producing software in a country having the aforementioned characteristics, is considered as producing software in an emerging country.

3. Field Study

We have been investigating international production through various international business operation and/or technology transfer modes in the high-tech sector since 1992. We have also been investigating IT-supported international business operation and/or technology transfer modes for many years. The international software production can be performed through a variety of business operation modes and include a variety of issues. *In this paper, we analyze and report the various phases of software production through the IT-supported international outsourcing process.*

Yin (1994) believes that certain topics are suitably examined via a case study method. They include: organizations, processes, programs, institutions, and events. The focus of investigation in this study is “process”. Case study can facilitate in-depth investigation of a phenomenon (Stake, 1995; Yin, 1994). This study attempts to conduct an in-depth investigation on the topic under investigation. The case study method is most appropriate for questions that begin with “how” or “why” (Cavaye, 1996). The research topic under investigation deals with how IT has been used in outsourcing process and why. Since this study examines a process, in order to gain an in-depth understanding of this phenomenon, a qualitative case study method has been utilized to execute the research project.

This research has been conducted by: executing a multi-site case analysis of two case companies’ three IT-supported international outsourcing process events, two of them being successful and one being unsuccessful. The case companies include a Finnish OSU, which has produced energy industry related software in Central Europe and Eastern Europe, and a North American company, which has produced financial software in a South Asian Country. The empirical data was collected from both the OSUs and USPs by using mainly a variety of electronic tools; as well as traditional methods and tools.

The interviews were conducted at several stages. The initial interviews were open-ended and the major questions asked included:

- How long have you been participating in international outsourcing?
- Why do you participate in international outsourcing?
- How do you define international outsourcing? How does software production through outsourcing differ from other software production modes such as software production through international joint venture mode?
- How many countries have been outsourcing your software production?
- What were the sub-processes of international outsourcing process for software production for a particular project?
- Which tasks were performed in each phase?
- How did you select one particular country for software production among hundreds of countries? Which factors were important in selecting the appropriate country for software production?
- How did you select one particular OSP among many prospective OSPs? Which characteristics were important in selecting the appropriate OSP?
- Which IT tools were used in each phase?
- Which barriers were encountered in each phase?
- How did you control the software production through international outsourcing, etc.?

The initial open-ended interviews gave us the necessary data for designing a more focused interview guide in the later stages. Special emphasis was given in interviewing about each of the identified phases of outsourcing process; questions included which decisions were taken, which factors were analyzed and which tasks were performed in each phase.

In addition, we interviewed researchers and practitioners who are knowledgeable about both the OSU and OSP countries.

This study followed the following steps for qualitative data analysis: data reduction, data display, comparison of the case companies and conclusion drawing (Miles and Huberman, 1994).

To ensure the validity and reliability of this research, several measures were applied as suggested by research methodologists (Jick, 1983; Kaplan and Duchon, 1988; Lee, 1991; Patton, 1990; Ragin, 1987; Stake, 1995; Yin, 1994). First, a preliminary interview protocol, and a questionnaire guide were used in order to deal with detailed documentation of the data and minimize errors and biases. The questionnaire guide was verified by the case company, and several other researchers and practitioners. Second, interviewees involved in the international outsourcing process and possessing a high knowledge of the phenomenon under investigation were selected. Third, the concepts of this research were delineated to interviewees before conducting the interviews. Fourth, data verification was attempted by asking the same questions to several employees of each organization, as well as collecting secondary data for the same questions and verifying that. Fifth, multiple data sources have been included in this study in order to increase the validity of the research. Sixth, the case report was sent to the interviewees to check for errors and evaluate the validity of the interpretation. The errors were corrected. Seventh, the same questions were asked to different interviewees and results compared. Multiple data sources were utilized and research results have been compared with prior research in the IT-supported international

outsourcing/subcontracting field. Eighth, the research results were compared with the data that were collected through interviewing of international researchers and practitioners.

4. Case Analysis and Description

This section analyses and describes the processes and sub-processes of international outsourcing in investigated case companies and difficulties encountered in executing the outsourcing processes. Three IT supported outsourcing process events were investigated and analysed, two of them have been successful and one has been unsuccessful. We describe here one successful and another unsuccessful outsourcing events.

4.1. Software production through outsourcing in a Central European country

The first case study describes the international outsourcing process and the tasks performed in each phase, the reasons for success, the factors that caused barriers to the outsourcing project.

4.1.1. The OSU's background

The software firm is a division of an energy engineering company, which is operating in Western Europe, North America and other parts of the World. The software division is producing software for other divisions of this energy company and also for other energy suppliers. Its main software production facility is in Finland. The software division has subsidiaries in different parts of the world for marketing its software products and services.

4.1.2. Reasons for international outsourcing

It makes short-term contracts with foreign OSPs during the peak in the production and produces software through OSPs in foreign countries, mainly because Finnish domestic OSPs are not willing to make short term contracts, like contract for one month. Generally they prefer those contracts which are over six months. If a contract is less than six months Finnish OSPs charge extremely high.

It does not want to recruit permanent software professionals for meeting non-permanent peaks in production. International outsourcing allows hiring the required capacity occasionally and offers flexibility.

4.1.3. The IT- supported international outsourcing process

In 2000, in order to satisfy one peak in the production, instead of body shopping the company decided for international outsourcing. It has the body shopping experience with programmers of various nationalities. However, it is very problematic especially to get approval for the required visas and residence permits for the foreign citizens. In addition, body shopping is not an appropriate solution for meeting the occasional peak in the production. Therefore, it does not prefer body shopping.

It searched for countries and companies, which have expertise in a specific software segment. It found that countries in Central and Eastern Europe, Ireland, Israel and India have skills in that specific area. It identified a suitable county in Central Europe by examining various factors, such as availability of well- educated and trained English speaking software professionals, the standard of education and training, development of software production,

suitability of the legal environment for intellectual property protection and other laws, economic situation, infrastructure, import barriers, political situation, cultural factors and potential risks from regulatory change, economic change and political change. In addition, Finnish companies have long experience in doing business in this country, culture is known, travel distance is short, and telecommunication and other infrastructures are functional. Finland is a politically neutral country, thus has/had good relation with both Western and Eastern European countries. The major software developers speak English as well as labor cost and other software production costs are moderate. By investigating external databases and CD with market data, the company identified this Central European country as an attractive production location. The OSU started e-mail communication with the prospective OSPs of this country as well as started making electronic promotion through mailing lists.

The OSU identified a prospective OSP through a thorough investigation of the following factors: the level of knowledge and skills of software programmers and engineers, quality assurance engineer and software project manager; experience in outsourcing, condition of existing facilities, software production efficiencies and quality control procedures.

It made preliminary negotiations about software production requirements, production costs, delivery time, etc. through e-mail, telephone, fax and face-to-face meeting. Finally, it negotiated a pure outsourcing contract with this OSP in this country and made several agreements including an agreement concerning intellectual property protection. Both parties used adequate efforts and time to prepare and make agreements that are beneficial to both of them. The OSU gave more than the normal prices for the OSP's work that motivated the OSP to work happily.

The OSU's specific competence was transmitted to OSP through intensive training of the key personnel of OSP which also included using the same CASE tools that OSU is using for its own software production. The training was provided in Finland and training duration was about one week. After getting training, these people returned to OSP's country and trained their other employees.

The OSP placed its own technically skilled employee who is also trained in cross-cultural communication inside the OSU in Finland in order to facilitate effective and extensive communication, and avoid misunderstandings. Cross-cultural communication training of this professional included values, thought patterns, and styles of communication across cultures which improved his capability to communicate across cultures. This person knew the capabilities of the OSP, which things will motivate and de-motivate the OSP. The employment of this person helped to establish a very open and active communication channel between the both parties. This person and other persons of the OSU could reach key persons of the OSP immediately through cellular/mobile phones or fixed phones, which allowed taking various decisions in order to overcome various unexpected problems rapidly.

Adequate effort, resource and people from both sides were deployed for the management of the outsourcing relation and execute the software production through outsourcing. The OSU has managers who have extensive know-how and experience of managing the outsourcing relationship. Such a manager was employed to manage this outsourcing relation. OSP also employed very experienced outsourcing project manager, software engineer, quality engineers, programmers, business managers, and other personnel to manage the outsourcing project.

Through the systematic execution of the outsourcing process and its sub-processes, both parties were able to execute the outsourcing project successfully, which allowed to avoid committing costly mistakes.

4.1.4. Factors that created barriers to IT-supported international outsourcing process

Leaving of some skilled developers from the OSP at the middle of the outsourcing project caused problems to outsourcing project. Fax did not work on some occasions, which created problems. High telecommunication expenses from the OSP's side hindered the communication a bit, etc.

4.2. An outsourcing experience in an Eastern European country

The second event of the IT-supported international outsourcing process describes the selection of the outsourcing providing country and company by the OSP, and the various reasons for the failure of the outsourcing project.

The same Finnish company outsourced a software development project to an OSP in one Former Soviet Union state in the beginning of 1990s. This outsourcing providing country is nearby Finland. In one occasion a software producing firm from the Former Soviet Union state contacted this Finnish company and offered a low cost outsourcing service. The Finnish company was in need of outsourcing service at that time, mainly using outsourcing service of very expensive Finnish outsourcing service providers. Being attracted to high cost saving opportunity, the OSU awarded the OSP with a subcontracting job without in-depth investigation of the prospective OSP and outsourcing country. During the execution phase of the international outsourcing projects, a variety of unexpected barriers were encountered. The company encountered various problems both from the OSP and from the macro environment of the country. The OSP had competent programmers, but lacked in quality control; managers were also not able to coordinate and manage the subcontracting project effectively and efficiently.

The OSU also encountered problems due to very high rates of software piracy in the country of OSP. The OSU had to put a great amount of efforts and resources for controlling the outsourcing project. Underdeveloped business communication and transaction infrastructures, changing import and business regulations, created severe problems as well.

The software development project was completed but it missed the deadline. In fact, instead of saving cost and time, it consumed a great amount of time, efforts and money from OSU. Due to this very unpleasant experience the OSU is very hesitant to deal with OSP of this country although the OSPs are geographically and culturally much closer to Finland compared to Central Europe and other leading software nations.

This case exhibits that both country level (e.g. changing business regulations of the country) and company level factors (e.g. resources and capabilities of the OSP) play very important roles in the efficient and effective execution of software subcontracting project. Therefore, a systematic international outsourcing process is essential for the success of outsourcing project.

5. Research Results

This section describes the research results. The research results are based on a cross-case analysis of investigated companies, our earlier research and our long experience in this area. We introduce here a framework of international outsourcing process from OSU's perspective. We also describe various factors that are creating barriers to international outsourcing and mechanisms for controlling the risks of outsourcing projects.

Our research results suggest that effective international outsourcing should be considered as a process of eight interlinked activities. Some of them are executed in chronological order, others occur concurrently. The chronological order and number of phases may vary a bit from outsourcing project to project.

5.1. Major activities of international outsourcing process

5.1.1. International market research for software production through international outsourcing

In this phase, attractive countries for software outsourcing are identified through the analyses of various factors. A comparative case analysis and our earlier empirical research on international market research of high-tech firms (Nahar, Lyytinen and Huda, 1999; Huda, Nahar and Tepandi, 1999; Nahar, 2001) indicate that OSU can select a few suitable countries for software production by considering the following factors of the prospective software producing countries:

- Availability of well- educated, trained (for specific area such as e-business security), experienced and English speaking software programmers and engineers, quality assurance engineer and software project manager,
- Low salary of software professionals and other production costs,
- Availability of functioning infrastructure: telecommunication lines, Internet, electricity, etc.,
- Existence of effective intellectual protection law,
- Favorable government policy and support for software production, low tax, etc.,
- Political stability,
- Economic stability,
- Geographic location, and
- Cultural affinity.

By examining the above factors, an OSU can identify the suitable countries, avoid the troublesome software production locations and reduce the future chances of disaster.

In order to investigate above mentioned factors, companies can investigate CD-ROM based databases, use online databases and various other Internet tools and services. With a low fee, companies from outside the USA can use various useful databases (e.g. Stat-USA <http://www.Stat-usa.gov/>) of US Department of Commerce. Up-to-date and comprehensive information of several countries around the world can be found at these databases of the US Department of Commerce. (Nahar, Lyytinen and Huda, 1999; Huda, Nahar and Tepandi, 1999; Nahar, 2001)

Through further investigation the OSU should select one or a very few countries for software production through outsourcing. Traditional market research tools such as local trade magazines can be used in this phase if all the required information is not available in a

digitized form. Utilization of various IT tools and services make the international market research for software production cost efficient.

5.1.2. International promotion of software production through outsourcing

In this phase, various marketing communication functions targeted to prospective OSPs are performed. Messages are posted in the mailing lists where prospective OSPs are participating. A comparative case analysis and our earlier empirical research on international promotion of high-tech firms (Nahar and Savolainen, 2000) indicate that e-mail, newsgroups, teleconferencing technology and other IT services are used to conduct electronic marketing communication targeted to OSPs. Traditional promotional tools such as direct mailing, advertising in trade and local press are also used to reach the prospective OSPs. Utilization of these tools and services allows delivering the messages of outsourcing requirements, decreases promotional expenses, and increases promotional capacity.

5.1.3. Selection of a suitable OSP

In this phase, a suitable OSP is selected through the analyses of various factors of prospective OSPs. A comparative case analysis and our earlier empirical research on selection of foreign high-tech firms (Nahar, Lyytinen and Huda, 1999; Nahar, Savolainen and Huda, 2000) suggest that OSU can select a suitable OSP for software production by considering the following factors of the prospective OSP:

- Level of knowledge and skills of software programmers and engineers, quality assurance engineer, and software project manager,
- Experience,
- Financial and human resources,
- Management capability, and
- Earlier performance in international outsourcing, etc.

Companies can use modern ITs heavily in the OSP selection process, that include company related databases, research Web sites, search engines, Internet directories, CD-ROMs, e-mail, newsgroups, trade mailing lists, teleconferencing, etc. (Nahar, Lyytinen and Huda, 1999; Nahar, Savolainen and Huda, 2000). Especially the Internet telephony and teleconferencing are used to make in-depth preliminary interviews of the potential OSPs, which is faster and cheaper than face-to-face meetings.

For the final selection of OSP, traditional research methods including external consultants, face-to-face meetings and interviews are used. Utilization of various IT tools and services helps in rapid identification of several OSPs, investigating them and identifying a suitable OSP.

5.1.4. Negotiation and contract

In this phase, software product and/or service requirements (such as features and functions of the software products, expected performance, etc.), delivery time for the completed software products, payment mechanism, etc. are negotiated and contracts are done. (Nahar, Huda, Tepandi and Kamrun, 2001).

Companies use e-mail extensively and transfer files to conduct preliminary negotiations very cost efficiently, which in turn shortens the negotiation period, reduces travelling needs and

reduces negotiation expenses. Traditional methods such as face-to-face negotiations and contracts are done as well.

5.1.5. Implementation of the outsourcing project

A comparative case analysis and our earlier empirical research on international project implementation and management (Nahar, Huda and Tepandi, 1999; Lyytinen, Nahar and Huda, 2001; Nahar, Savolainen and Huda, 2001) of high-tech firms, state that in this phase various tasks are performed, that include:

- Occasionally, a software technology transfer package is supplied from the OSU to the OSP. This package may include software development tools and intensive training of the employees of the OSP,
- The OSP implements the software project,
- The OSU provides supports for technical activities in complex situation,
- The OSP reports to the OSU about the progress on a regular basis,
- Reviewing of the milestones is done together, and
- Rigorous testing and quality assurance are performed.

E-mail, advanced teleconferencing, collaborative online tools, videoconferencing, Intranet, Extranet, Web-based project management tool and reporting tool (Nahar, Huda and Tepandi, 1999; Lyytinen, Nahar and Huda, 2001) allow establishing outsourcing relationships and managing these relationships as well as resolving some of the difficulties associated with this business arrangement. In this phase traditional methods, including face-to-face training and face-to-face meetings are used as well.

5.1.6. Handling of financial issues

A payment mechanism is adopted, like a part of the payment is paid at the inception stage of the project, rests are paid at the completion stage. Tailor-made payment mechanism is used to pay a large sum of money (Nahar, 1998, 1999, 2001). Online credit card transactions are generally unsuitable for large sums of money, therefore this form of payment is not used.

5.1.7. Delivery of the software products/sub-products and documentation

In this phase, ready software products along with the documentation are delivered. Commonly CD-ROM or DVD-ROM and other IT tools and computer networks (Nahar, Käkölä and Huda, 2001b; Nahar, Huda, Tepandi and Kamrun, 2001) are used to deliver the software products and related documents.

5.1.8. Termination of outsourcing relation or continuation

In this phase, either the outsourcing relation is terminated after the delivery of the products and payment is made or relationships grow with new outsourcing software development project (Nahar, Huda, Tepandi and Kamrun, 2001; Nahar, 2001).

Effective implementation of this framework allows identifying suitable countries for software production and suitable OSPs, makes the software production through outsourcing faster, cheaper, easier; reduces resource requirements, complexities and risks.

Table 1 summarizes the IT-supported international outsourcing process.

Table 1: The IT-supported international outsourcing process.

The activities/phases of international outsourcing process	The key tasks involved in the different phases	IT tools and services used in the different phases
1. International market research for software production through international outsourcing	To examine availability of well-educated, trained, experienced and English speaking software and management professionals; low salary and other production costs; availability of functioning infrastructure: telecommunication lines, Internet; intellectual protection law; government policy; low tax; favorable political, economic situation and cultural situation; geographic location.	Company internal and external databases, country related market databases, CD with market data, e-mail, the Web, search engines, Intranet, Teleconferencing, mailing lists and newsgroups. Traditional research tools such as local trade magazines.
2. International promotion of software production through outsourcing	To create awareness of the enterprise and its outsourcing needs to prospective OSPs in identified foreign markets and delivering information.	The Web, e-mail, mailing lists, newsgroups, teleconferencing technology. Traditional media including direct mailing, advertising in trade and local press.
3. Selection of a suitable OSP	To examine level of knowledge, skills and experience of software and management professionals, financial and human resources and earlier performance in international outsourcing.	Company related databases, research Web sites, Internet directories, search engines, CD-ROMs, e-mail, newsgroups, trade mailing lists, teleconferencing. Traditional research methods including external consultants, face-to-face meetings and interviews.
4. Negotiation and contract	Software product and/or service requirements, delivery time, payment mechanism, etc. are negotiated and contracts are done.	E-mail, file transfer and teleconferencing. Traditional negotiation methods including face-to-face meetings.
5. Implementation of the outsourcing project	Occasionally delivering software development tool, providing training, implementing the outsourcing project, providing technical support, reporting, reviewing of milestones, testing and performing quality assurance procedures.	E-mail, advanced teleconferencing, collaborative online tools, videoconferencing, Intranet, Extranet, Web-based project management tool, various IT based training tools, mobile communication systems and reporting tool. Other commonly used methods including face-to-face training and face-to-face meetings.
6. Handling of financial issues	International payment/s are made for the outsourcing service.	Tailor-made payment mechanism is used to pay a large sum of money.
7. Delivery of the software products/sub-products and documentation	Ready software products along with documentation are delivered.	CD-ROM or DVD-ROM, computer networks, etc.
8. Termination of outsourcing relation or continuation	Either the outsourcing relation is terminated after the completion of the outsourcing project or continues with new outsourcing software development project.	E-mail is used for the termination of outsourcing relation. In the case of continuing with a new outsourcing project similar IT tools and services are used as “implementation of the outsourcing project phase”.

5.2. Various factors that are creating barriers to international outsourcing

The same procedures applied in developing the outsourcing framework were followed to analyze the factors that create barriers to international outsourcing. Our research (Nahar, 1998; Nahar, Lyytinen and Huda, 2000; Nahar, Huda, Tepandi and Kamrun, 2001) indicates that various problems have been encountered in international outsourcing. A few of these problems appeared to be more commonly encountered in international outsourcing.

In most countries, the OSPs have lack of experience in international outsourcing although there are exceptions. For example, many Indian companies have extensive outsourcing experience.

Lack of technical expertise of OSPs and also lack of English language proficiency of project coordinators and managers of OSPs although there are exceptions. For example, Indian software professionals are very fluent in English and many Indian companies have high technical expertise.

Cultural differences cause problems in communicating and understanding each other through computer-based media. People who learned English as a second language use many words differently. Even though both the personnel of OSP and OSU speak the same English language, word usage and attitudes vary greatly due to the difference of culture. It is also quite challenging to interact without conflicts with the message recipients' personal beliefs and customs.

Different working methods and organization cultures of OSU and OSP cause difficulties in collaboration.

In order to develop a software product with the co-operation of two cross-national teams, co-ordination is crucial. However, it is difficult due to spatial, cultural and temporal barriers.

Underdeveloped telecommunications infrastructures, poorly developed IT infrastructures, the relatively high price of hardware, software and high communication expenses in developing and emerging countries, cause barriers to international outsourcing.

Security concerns as huge amounts of data are moved via networks.

Changes in national policies and business regulations of OSPs' countries.

5.3. Mechanisms for controlling the risks of outsourcing projects

It is difficult for an OSU to control the outsourcing project. In addition, OSU can face various factors, which impede achieving their objectives and results in unsatisfactory or even negative consequences and results. Legal and contractual means alone are not adequate for controlling the outsourcing project. Our research indicates that in order to achieve expected benefits, to control the outsourcing project and to avoid negative consequences the OSU deploys several mechanisms concurrently, along the various stages of the outsourcing project (Nahar, 1998; Nahar and Lyytinen, 1999). They include:

- Intensive market research and selection of appropriate software production location, which reduce country related risks, improving the chance of success.

- Searching OSPs very effectively, evaluating them thoroughly and selecting a suitable OSP. This reduces the OSP related risk. For details about how to perform these functions see 5.1.3. and Nahar, Savolainen and Huda (2000).
- A very thorough and win-win contract is made.
- Offering higher price to the OSP than the local firms.
- During contract, both legal and contractual methods are used.
- Providing intensive and effective training, commonly covering modern software development methodology, specific area such as wireless telecommunication software development and OSU's specific competence.
- Offering CASE tools to OSP in the situation of large project or long term contract.
- Employment of outsourcing manager with high know-how and experience in OSU's organization who can monitor day-to-day operation.
- Employing on-site manager who is able to handle cultural and administrative issues of outsourcing.
- For a complex outsourcing project, it would also be preferable to have at both sites, somebody from the other site. For example, an OSP's personnel at OSU's site and an OSU's personnel at OSP's site to facilitate the communication between the sites.
- During production stage, strict quality control measures are introduced.
- Reviewing of the job done by the OSP and milestones.
- Personal contacts can be very useful in building relationship with OSP's personnel.
- Monitoring through formal procedures.
- Monitoring through visits to the large and complex outsourcing project, if necessary stationing a member.
- Socializing with the key managers of OSP; things that are not done effectively, can be discussed privately and unofficially.

Especially the positive control mechanisms, motivate OSPs to work hard and exhibit high performance. It is very difficult to foresee all the possible problems and risks and devise mechanisms for them as sudden changes can occur. For example, key developers of the OSP can be ill suddenly. The mechanisms described above, are from OSU's perspective. Research is also needed to develop mechanisms from OSP's perspective.

6. Conclusions

Increasingly, Western software producing companies are forced to produce software through international outsourcing due to a high shortage of software professionals, increased competition, advent of various low cost software producing nations, etc. Western companies encounter various difficulties in executing the outsourcing process by using an ad-hoc approach. Therefore, this research was undertaken. The research was conducted by using theoretical and empirical investigations and analyses.

The research has been novel in that, it has introduced an IT-supported international outsourcing process, mechanisms for controlling risks and uncertainties (from the perspective of OSU), which have not been the focus of international outsourcing research before.

The research results indicate systematic execution of the phases and the activities of each phase of the IT-supported international outsourcing process and employing various mechanisms to control risks and uncertainties (i.e. the process and the control mechanisms) are essential for the effective and efficient execution of the outsourcing project.

This study contributes to the scientific understanding of the international outsourcing process by describing in detail the international outsourcing process of one case company.

This research introduces a framework for software production through international outsourcing process. The framework is composed of the following activities: a) international market research for software production through international outsourcing, b) international promotion of software production through outsourcing, c) selection of a suitable OSP, d) negotiation and contract, e) implementation of the outsourcing project, f) handling of financial issues, g) delivery of the software products/sub-products and documentation, and h) termination of outsourcing relation or continuation.

The research result can be used both in conducting research and in industrial settings. The outsourcing process framework can be used in further research. OSUs can use the international outsourcing process framework and execute outsourcing process more effectively and efficiently. Effective implementation of this framework can reduce resource requirements, complexities, and risks as well.

Further research is needed to examine in-depth each of the outsourcing sub-process. In-depth research is also needed to identify various risk factors and how to control the risks that are involved in an outsourcing project management. The international outsourcing framework presented here is developed from the OSU's perspective. However, an in-depth examination from the OSP's perspective is necessary to complement the findings here.

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