

# GLOBALIZATION AND GLOBAL SOFTWARE DEVELOPMENT

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## ABSTRACT

*In this paper, the author discusses key elements that expedite the globalization, and how the globalization impacts the information systems development. In addition, this paper presents the motivations of global software development and issues associated global software development. Finally, some possible solutions for issues are provided.*

**Keywords:** Globalization, Information Systems (IS), outsourcing, offshoring, global software development

## INTRODUCTION

One of noticeable characteristics in information technology (IT) at the beginning of twenty-first century is globalization. Friedman declared in 2005 “The World is flat” and illustrated ten flatteners (see Table 1) which forced the world to be flat [1]. Starting from the fall of Berlin wall which represents the break down of political barriers, Friedman’s ten flatteners expedited the globalization.

Globalization has increased the connectivity and integration in the political, cultural, social, economic, and technological systems between nations, corporations, households, and individuals [9].

**Table 1.** Ten flatteners

Number	Description
#1	The fall of Berlin wall on 11/9/89
#2	Netscape went public on 8/9/95
#3	Work Flow Software (Virtual applications working together over a networking)
#4	Open-Sourcing
#5	Outsourcing
#6	Offshoring
#7	Supply-Chaining
#8	Insourcing
#9	In-forming (Search engines)
#10	The Steroids

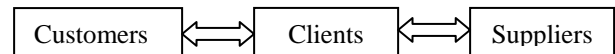
Globalization has also several aspects which affect the world in different ways including emergence of worldwide production/consumer markets, emergence of worldwide financial markets, spread of political

sphere of interests, increase in information flows, and emergence of new way of developing information systems [9]. In particular, globalization has tremendously impacted the style of information systems development. Due to the influence of globalization, many information systems developed by geographically co-located developers are delegated to other companies in different locations. This new trends coined the word “outsourcing” which delegates non-core operations to an external company, and the word “offshoring” which shifts core operations to an offshore company. The term offshoring is referred as global software development (GSD) to reflect the nature of globalization which reduces temporal, geographic, social, and cultural distance across countries.

The remainder of the paper discusses the motivations of GSD and then presents the common issues arising in GSD milieu. Finally, the paper suggests the solutions for the issues and directions for GSD.

## GLOBAL SOFTWARE DEVELOPMENT

In traditional information systems development process, there are two main players, customers who buy information systems and suppliers who develop and sell the systems to customers. However, in GSD setting, there are three key players, customers, clients, and suppliers (see Fig 1). For example, a customer in the US asked a company in the US to develop the system. The company can develop the system by themselves (traditional way) or ask a company in the US (outsourcing) or in other countries to develop it (offshoring or GSD). If the company chooses the GSD, the company becomes clients and the clients may ask the suppliers to develop the portion of the system or the whole systems.



**Figure 1.** Three main players in GSD

As shown in Figure 1, the clients sit in the middle between customers and suppliers, and collect necessary information from customers and deliver it to suppliers. Also, the clients as an upper level manager manage the whole process and deliver the final information systems to the customers.

## Motivations of Global Software Development

The primary motivation of using GSD is lower labor cost. The per capita labor cost in most Asian countries is substantially low whereas, the cost of information systems development in the US, Canada, and most European countries is significantly higher than most Asian countries [2] such as Chindia (China and India). However, countries such as Ireland and Israel have developed a significant presence in the supplier market due to the quality of their developer pool [3].

The second motivation is the possibility to hire skillful and knowledgeable developers. The number of graduates in IS field in the US has been decreasing dramatically since 2001 [4] and many schools are worrying about falling enrollment in IS field [5]. However, many countries such as India and China have many high quality developers and generate many graduates in IT field. Among many Asian countries, India has received a lot of attention from many companies in the US. The part of the reasons for that is India is a largest English speaking country outside the US and India has hundreds of thousand well-educated developers in IT field.

The third motivation is the ability to create a virtual corporation and virtual teams in a short length of time to utilize market opportunities [7]. As mentioned in the second motivation, there are plenty of well-trained potential employees outside the US. It is an easy task to form virtual teams from the qualified developer pool.

The fourth motivation is the ability to use the time zone difference to achieve “follow-the-sun” development. This can provide literally 24 hours a day development which can lead to improved performance. However, the tasks at the various stages of the software life cycle should be well divided and assigned to different geographic locations [6].

The fifth motivation is the business advantages of having proximity to the market and the supply investment on merger and acquisition opportunities [7]. These kinds of opportunities do not exist if the company insists to use the traditional way of IS development.

## Issues of Global Software Development

Adopting GSD seems to provide global organizations with very promising benefits. However, there are many barriers that organizations have to overcome. One of the most significant obstacles in GSD is

communication. It is common knowledge that lack of communication among developers is the root of failure in most IS projects [11] and large chunk of developers’ time is spent for communication [13]. It is difficult to establish good communication norm and it becomes worse in GSD milieu. There are many technologies suggested to mitigate the communication issues including email, remote desktop, web-interfaced web-demo, instant messaging (IM), file transfer protocol (ftp), remote login through secure socket session (SSH), virtual private network (VPN), phone conferencing, and video conferencing. It is obvious to have high speed internet between two sites to utilize suggested technologies. Time difference between two sites is another barrier to have a quick communication because when the time is 9 am in eastern coast of the US, it is around 7:30 pm in New Delhi, India.

Coordination and control issues arise when dividing and assigning the work. If both sites try to control the projects and process of the projects, there will be conflicts in project management. One suggestion is to set up an ambassador in supplier site and a coordinator in client site [2] and let them act as representative of each site to reduce the coordination and control issues. Also, the ambassador in supplier site should be a local person and be educated person in client site for long-time.

Trust and Confidence issues arise if developers in supplier site do not complete the tasks in a certain period of time or misunderstand the requirements from client site and finish the task in different way. If this happens often, developers in client site have difficulties to establish a feeling of trust with developers in supplier site and the lack of trust between two sites reduces the confidence.

Social and Cultural difference make GSD difficult. There are many social and cultural differences between workers in the US and Asians in attitudes towards authority, work ethic, sense of time, and the styles of communication. For example, U.S. client companies normally prefer to specify every single detail items on the document and use informal telephone and email contact. In contrast, Japanese clients tend to prefer to use electronic media more formally and less frequently and also have preference on verbal communication rather than written documents [8]. It is also well known that most Asian employees usually do not say “No” and do not raise the voice of criticism in public meetings. Instead, Asian people usually say “I will see what I can do” or “I will look at it later”. Because of Asian people’s

deference to authority, many western companies have difficulties with this “polite” behavior [10].

Virtual team management issues should be considered seriously before using GSD. The projects can be delayed or completed in a desired way depending on how to manage virtual team. Delayed projects often lead to an extension of product delivery date and cause the financial loss. Further, failure of delivering software products on time to customers can damage the reputation of the client.

### **Solutions for Issues in GSD**

Issues in using GSD can be categorized largely as temporal, geographical, social, and cultural barriers. In this section, the author discusses the possible solutions for these barriers.

*Use common process:* If both clients and suppliers use the common process, they can communicate better and reduce unnecessary problems arising in coordination and control of projects. For that reason, common process should be established in a systematic way in many aspects of software development process. From the planning process of projects to reporting and delivering process, both sites should understand fully the process and follow the process they establish. To facilitate the use of common process, both sites can use the commercial software project like VersionOne [14] for project planning and managing, JIRA [15] for bug tracking and managing, or Wiki [16] for sharing core knowledge and information. The use of common system is also one way the relationship between two sites can be facilitated [13].

*Choose and divide project strategically:* Choosing and dividing the work between two sites is a difficult process. There should be strategic mechanism in determining which site takes which projects. Clients usually take charge of customer interfacing, installation, system integration, and acceptance testing while suppliers are in charge of developing all the main functions of the project and unit testing. In doing so, clients should choose the tasks that are culturally neutral and require less cultural understanding before assigning tasks to suppliers [8]. Also, clients should consider the level of expertise, available resources, technology, and infrastructure in supplier site [7]. This strategic selection of the work and consideration of suppliers’ development environment will mitigate the problems arising from social and cultural difference between two sites.

*Enhance the diversity:* The diversity in many areas of software development process can bring many benefits to GSD. Recent paper demonstrated that utilizing diversity in gender, management, and opinion increased the productivity in GSD [17]. For example, women tend to work based on sharing power, consultation, consensus, and collaboration, and work interactively and swap information more freely than men do [18]. Also, utilizing a variety of people to work together in interlinking ways [19] and using various opinions from different levels of employees on both sites can reduce the geographic distance in GSD.

*Educate employees:* Many global companies spend good portion of employees’ time for training and education. To utilize the full benefits of GSD, companies should offer employees cultural education as well as technical training. These education and training program must be conducted at regular bases at both sites. If clients understand the suppliers’ culture and vice versa, social and cultural barriers will be lowered and the level of trust and confidence will be raised.

### **CONCLUSIONS**

Globalization has influence on many aspects of our society including political, cultural, social, economic, and technological system. In particular, globalization have tremendously impacted IT industry and changed the IS development style dramatically. Traditional co-located development teams are scattered to countries like Chindia where many global companies can hire well-trained and high-educated employees with lower labor cost. The new term global software development is wildly used to reflect the nature of globalization. The paper discussed the motivations and issues arising in GSD milieu. Finally, four solutions were suggested: use common process, choose and divide project strategically, enhance the diversity, and educate employees.

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