

Journal of International Technology and Information Management

Volume 15 | Issue 4

Article 4

2006

Development of a Risk Assessment Model for Global Information Technology Outsourcing

June Wei
University of West Florida

Brian Peach
University of West Florida

Follow this and additional works at: <http://scholarworks.lib.csusb.edu/jitim>

 Part of the [Management Information Systems Commons](#)

Recommended Citation

Wei, June and Peach, Brian (2006) "Development of a Risk Assessment Model for Global Information Technology Outsourcing," *Journal of International Technology and Information Management*: Vol. 15: Iss. 4, Article 4.
Available at: <http://scholarworks.lib.csusb.edu/jitim/vol15/iss4/4>

This Article is brought to you for free and open access by CSUSB ScholarWorks. It has been accepted for inclusion in Journal of International Technology and Information Management by an authorized administrator of CSUSB ScholarWorks. For more information, please contact scholarworks@csusb.edu.

Development of a Risk Assessment Model for Global Information Technology Outsourcing

June Wei

Brian Peach

University of West Florida

ABSTRACT

Global Information Technology (IT) outsourcing has been recognized to have important potential benefits. However, researchers and practitioners also recognize potential risks involved in global IT outsourcing, which sometimes lead to undesirable consequences. This paper develops a model to assess risks in global IT outsourcing. Specifically, this paper begins by identifying global IT outsourcing risk factors by considering the national infrastructure, organizational infrastructure, and project environment. Second, a Global IT Outsourcing (GITO) engagement model for risk assessment is developed to logically link all these risk factors together. Third, one quantifiable approach based on a relative-weighted assessment model is presented to demonstrate how the risks in the GITO engagement model can actually be measured and assessed. Such an overall measurement of global IT outsourcing risks establishes a reference point for assessing global IT project outsourcing risks, and will assist managers to enhance global IT outsourcing's effectiveness and realize its vast potential. This paper will also benefit high-level decision makers including executives, policy planners, and managers working on decisions regarding global IT outsourcing, such as decisions on selecting an outsourcee country with a lower level of risk.

INTRODUCTION

During the past decade, companies have increasingly relied on outsourcing for their information technology (IT) services (Ang & Slaughter, 2001; Lacity & Willcocks, 2000, 2001). Improvements in telecommunications infrastructures in many developing countries coupled with lower cost, have led many firms to globally source their IT functions to centers outside their home country. For the last five years, global IT and IT enabled services have been growing steadily (Palvia, 2004).

In order to remain competitive in today's global marketplace, organizations are turning their IT project focus towards their core competencies, and outsourcing those IT functions offshore for which they lack the expertise to maintain effective cost structures. The major reasons for global Information Systems (IS) outsourcing include cost savings associated with cheaper labor and infrastructure, improved quality of services, the reduced burden on the organization managing and developing a viable IS function, and accessing specialized vendors and expertise globally (Desouza, Awazu & Mehling, 2005).

There are two waves involved in global IT outsourcing. The first wave is hardware, and global outsourcing of hardware production reduced the price of IT hardware 20% below what it would have been without global outsourcing (Mann, 2004). The second wave is software and IT services. As software and IT services are produced more cheaply abroad, several cost saving factors have been integrated into the international value chain of software and services production. For example, the Internet with lower prices for telecommunications and IT hardware creates less expensive linkages between outsourcee and outsourcer countries. Global outsourcing to lower labor cost countries reduces software costs since coding and maintenance do not require working closely with customers and can be done across borders (Sahay, Nicholson & Krishna, 2003).

Despite the considerable growth of IS outsourcing in recent years, this trend is the object of strong criticism (Gonzales, Gasco & Llopis, 2005). Total outsourcing can turn out to be a very dangerous strategy, mainly due to the dependence it creates. Although outsourcing any IT function presents risks, the focus of this paper is on assessing the additional risks of global outsourcing. IS managers need to consider the risks involved in the global outsourcing

environment versus other alternatives such as having multiple providers or resorting to selective outsourcing (Gonzales et al., 2005). The positive effects of global IT outsourcing are substantial but also depend on an environment of strong and continuing public, business, and worker relationships (Mann, 2004).

Problems with Global IT Outsourcing

Although global IT outsourcing provides a number of benefits, managing outsourcing across borders presents a number of significant pitfalls not common to domestic IT outsourcing. Global IT outsourcing involves more risks because it deals with environments in other countries and the outsourcing organization may have little if any control over the IS vendor (Chen, Tu & Lin 2002). Although risks are inherent regardless of where IS are created or maintained (domestic or global), the risks for global IT outsourcing are greater as systems become increasingly beyond the organization's control, both physically and psychologically (Desouza, et al., 2005). The unique quality of global IT/IS outsourcing is that it typically involves foreign vendors at remote geographic locations under largely different cultural, political, economic and legal settings. Therefore, the added risks increase the level of difficulty in finding a truly competent and reliable foreign contractor (Chen et al., 2002). Global outsourcing firms must identify all of the risks in any potential relationship when selecting which firm to be the outsourcee, establishing realistic performance expectations, and maintaining a long-term relationship with vendors.

Although global IT outsourcing is expected to achieve significant benefits, the uncertainties and risks associated with it cannot be underestimated (Chen et al., 2002). In viewing the possible undesirable consequences from IT outsourcing, several authors have argued for adopting a risk management approach to studying and managing IT outsourcing (Willcocks, Lacity & Kern, 1999; Auber, Patry & Rivard, 1998; Kern, Willcocks & Lacity, 2002). Although a number of studies have been done that adopt such a perspective and provide insight on risk management (Willcocks et al., 1999; Auber, et al., 1998; Auber, Patry, Rivard & Dussault, 1999; Auber, Patry, Rivard & Smith, 2001), there have been calls recently for systematic studies on the conceptualization and measurement of IT outsourcing risks (Bahli & Rivard, 2005). Recent research on global IT outsourcing has provided conceptual frameworks and descriptive analyses of risk factors (Tafti, 2005; Bahli & Rivard, 2005; Rao, 2004; Palvia, 2004; Chen et al., 2002; and Pfannenstein & Tsai, 2004), but failed to provide methods for quantitative assessment. In response to the call for both conceptualization and measurement, this paper develops a conceptual model and provides a method for quantitative assessment.

Objectives

To fully realize the benefits of global IT outsourcing, proper global outsourcing strategy and outsourcing partners have to be carefully considered based on risk assessment. This paper aims at providing a holistic view of risk factors involved in global IT outsourcing. Each risk factor is either identified in the literature or developed for the purpose of the current research. A global IT outsourcing (GITO) engagement model is developed as a theoretical basis for risk assessment. The relative-weight method is combined with the engagement model to provide a computational assessment model to measure global IT outsourcing risks quantitatively. Specifically, the paper

- provides a holistic view of risk factors impacting the success of global IT outsourcing;
- creates a model to conceptually analyze these risk factors and logically link them together;
- provides a quantitative method to measure these risk factors in the model; and
- provides a risk assessment mechanism for IT managers selecting a foreign firm to be an outsourcee.

LITERATURE REVIEW

Global IT Outsourcing Definitions

IT functions include IS analysis, IS design, IS development, IS implementation, and management of entire data centers. IT enabled services (i.e. business processes) include functions like call centers, accounting, payroll, employee benefits, tax preparation, radiology analysis, films and cartoon production, and research and development (Palvia, 2004). However, some organizations have outsourced the entire IT function which includes acquisition and maintenance of IT infrastructure (hardware, software, telecommunications networks) (Palvia, 2004).

Global IT outsourcing is the practice of turning over part or all of an organization's IT functions to external service providers in a foreign country (Chen et al., 2002). For Rao, global IT outsourcing adds the dimension of contracting part or all of a company's IT functions to either third-party vendors or in-house development centers that are based abroad (Rao, 2004). Pfannenstein and Tsai (2004) defined global (offshore) IT outsourcing as turning over a firm's computer operations, network operations, software development and maintenance, or other IT functions to a provider in another country for a specified time. Bahli and Rivard (2005) define offshore IT outsourcing as the transferring of IT activities to suppliers outside the country to reap various benefits, including cost saving, increased flexibility, improved quality of service, and better access to state-of-the-art technology. In the current paper, global IT outsourcing refers to a firm's turning over one or more IT functions to a provider in another country.

Benefits of Global IT Outsourcing

There are several benefits resulting from global IT outsourcing. The primary reason for global IT outsourcing is cost reduction, mainly reducing operating costs due to lower salaries in other countries. For example, the hourly rates for workers in Asia and other emerging markets in developing countries are anywhere from 30% to 75% lower than they are in the US (Pfannenstein & Tsai, 2004). Producing IT products and services with lower costs has a direct effect on the ability to offer reduced prices to consumers.

Second, global IT outsourcing can improve flexibility. For example, global IT outsourcing using multiple time zones can more easily provide consumers 24-hour-a-day call centers, compared with national outsourcing. Benefits can also be derived by having continuous support through integrated in-house and offshore-based staff in other time zones (Chen et al., 2002).

Third, global IT outsourcing is becoming a tool for improving service delivery and a source of providing high quality products and services. The extensive use of quality methodologies (e.g., Software Capability Maturity Model (CMM), People CMM, CMMI, and ISO 9000) among offshore vendors provides a higher level of assurance than many in-house projects. A 2005 process maturity profile from Carnegie Mellon Software Engineering Institute (2005) found that 47 U.S. and 104 non-U.S. firms have reached a maturity level of 5 for CMMI; thus about 70% of the best firms are outside the US. CMM and CMMI are models for judging the maturity of software processes and identifying the key practices required to increase the maturity of software processes (Pfannenstein & Tsai, 2004).

Fourth, demand for IT knowledge and skills are increasing (Galup, Dattero & Quan, 2004). Global IT outsourcing helps firms deal with local shortages of skilled people in IT products and services. Such shortages make outsourcing to the thousands of well-trained IT professionals available in Asia and East Europe very attractive (Chen et al., 2002).

Fifth, global IT outsourcing is a means for maintaining competitiveness in a global economy-by accessing new business opportunities and talent in other countries (Sullivan, 2003; Chen et al., 2002). Through frequent communication with vendors in different countries, organizations will have a better understanding about global business, and be aware of and able to explore new business opportunities in these countries.

Sixth, global IT outsourcing helps improve the local economy. Global IT outsourcing reduces a firm's total costs, thereby allowing it to offer lower prices to its customers. A 2003 study concluded that at least two thirds of the economic benefit from sending IT jobs outside the US flows back to the US economy in the form of lower prices, expanding overseas markets for US products, and providing additional profit that US companies can reinvest into more innovative businesses (Schroeder & Aeppel, 2003).

Global IT Outsourcing Models and Framework

Even though global IT outsourcing has important potential benefits, the potential risks involved in global IT outsourcing sometimes lead to undesirable consequences. For all business practices, there is always a need for a holistic framework or model, along with evaluation methods for assessing performance such as system effectiveness and efficiency. Several researchers have developed frameworks and examined the critical factors affecting global IT outsourcing. Some of the recent studies and their contributions include:

- Soliman (2003) developed a framework that identified the critical factors affecting Application Service Provider (ASP) decision making for global IT outsourcing. These factors are product development costs, IT talent, product quality, communication technology, tax incentives, and cultural differences.
- Tafti (2005) provided a framework for risk assessment of offshore IT outsourcing, and provided a check-list of the major risk factors related to offshore IT outsourcing. Although Tafti provided a synthesis and analysis of the viewpoints as reflected in the literature on various dimensions of the risks associated with offshore IT outsourcing, this assessment was qualitative, and did not consider risks involved in the outsourced project itself.
- Bahli and Rivard (2005) identified IT outsourcing risk factors based on transaction costs theory (TCT). Using TCT as a theoretical basis, they identified IT outsourcing risk factors associated with three broad categories: transaction, supplier, and client. TCT provides a reference point for identifying the main risk factors; however, this theory is more applicable for vertical integration of organizations, and the emphasis of TCT is on the context of the relationship between organizations.
- Rao (2004) identified issues unique to operating in a heterogeneous international environment that global sourcing (including insourcing or outsourcing) requires IT project managers to deal with. The influences of country-level and individual-level factors on the effective management of offshore IT sourcing relationships were also examined. The country-level factors include telecommunication infrastructure, legal and security issues, and time zone differences and the friction of distances. Individual factors include culture issues and language issues.
- Palvia (2004) developed a conceptual framework for choosing an outsourcing destination country. This framework focuses on factors of political system, ICT infrastructure, regulatory regime, workforce (quality and quantity), judicial/legal system, and language/culture at a macro level. These factors also distill into issues of cost, quality, and speed. The framework recommended that for any company in the U.S. considering offshore outsourcing, it ought to decide on the country first, followed by choosing an outsourcee company in that country based on a sound analysis of a fit between the needs of the outsourcer company and outsourcee company.
- Pfannenstien and Tsai (2004) synthesized recent published reports to provide an overview of the status of offshore IT outsourcing and some current and projected effects on the IT industry in the U.S. They presented offshoring risks that involve legal and security risks, and political issues.
- Chen et al., (2002) developed a framework for both the global outsourcees and outsourcers to fully understand and evaluate the expectations, considerations, and implications of global IT/IS outsourcing necessary to form a successful long-term strategic alliance. This framework was based on four interrelated aspects: forming an appropriate global IT strategy, using proper global IT platforms, managing international data sharing, and surviving the cultural environment.
- Carmel and Agarwal (2002) presented a four-stage maturation model of offshore outsourcing, including offshore bystanders, offshore experimenters, proactive cost focus, and proactive strategic focus. Stage 3 focuses on cost by outsourcing offshore non-core functions such as maintaining current systems or testing new systems to reduce costs. This is where most US companies are currently. In Stage 4, management no longer sees offshore outsourcing as simply a source of low-cost labor. Management sees it as a strategy to spur innovation, develop new projects, and explore new markets. Stage 4 is becoming more of a reality every day as the business world becomes increasingly global and companies are able to manage global operations.

In summary, the literature provides different definitions of global IT outsourcing, presents major benefits for global IT outsourcing, and discusses current global IT outsourcing frameworks used to analyze critical factors affecting the success of global IT outsourcing. Based on the literature review, recent research focuses primarily on descriptive analyses of global IT outsourcing risks. While it can be agreed the many noteworthy frameworks and analyses identified in the research efforts indicated above have indeed been useful, studies that can address a holistic model for overall risk assessment are still lacking. In addition, systematic studies of the conceptualization and measurement of IT outsourcing risks have been called for. There is a need for proven quantifiable approaches that IT decision makers can actually utilize to assess overall risk involved in outsourcing an IT project to different outsourcee countries. This paper is a pioneer effort aimed at addressing both those areas of need in the global IT outsourcing risk literature.

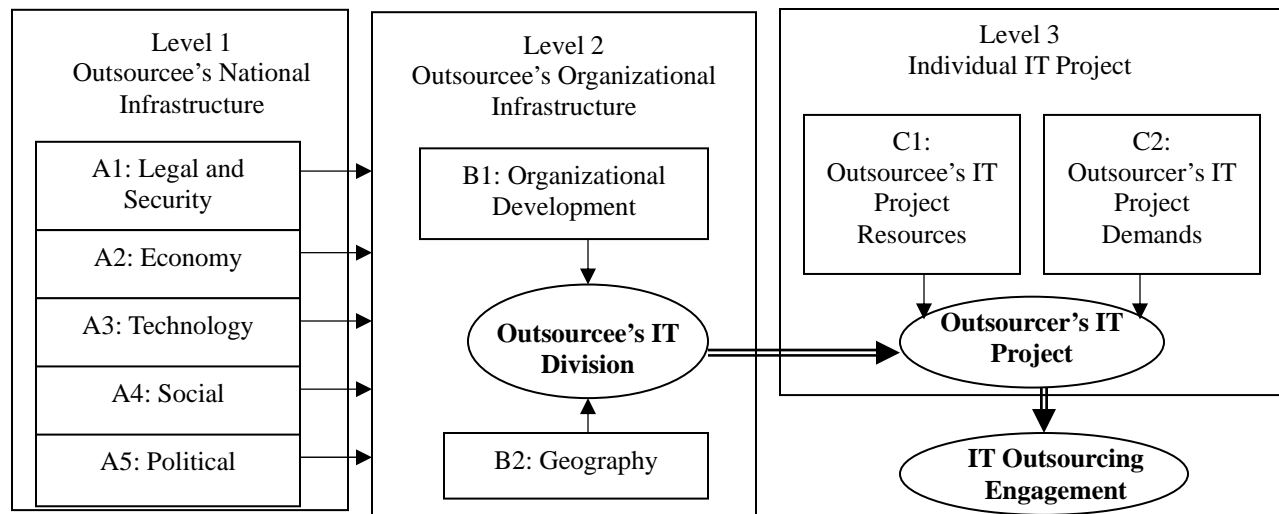
GLOBAL IT OUTSOURCING (GITO) ENGAGEMENT MODEL

In order to help understand the major challenges from the rapid development of ICT, the limitations of cross-country comparative evidence, and the need for a multi-method research design, Norris (2000) presented a comparative multilevel research framework covering a wide range of political systems. Wei (2004) developed a three nested level e-government engagement model based on Norris's (2000) conceptual framework, to fit into e-government development infrastructures in order to investigate more detailed contents of global e-government environments. To analyze and look into details on various risks inside global IT outsourcing, a comparative multilevel research conceptual model covering a wide range of risks is presented in this paper by modifying Wei's (2004) model.

This new global IT outsourcing (GITO) engagement model was developed with three levels and nine risk categories to describe the global IT outsourcing environmental infrastructures and facilitate the investigation of more detailed aspects of global IT outsourcing risks (Figure 1).

In Figure 1, the first level is the national infrastructure of the outsourcee's macro-level global IT outsourcing decision-making environment. This includes legal and security (A1), economic (A2), technological (A3), social (A4), and political (A5) risk categories that encompass the risk factors of global IT outsourcing for a particular country. The five risk categories (A1-A5) in the first level influence the development of the outsourcee's organizational infrastructure in the second level and the IT outsourcing project in the third level. The second level is the organizational infrastructure of the potential IT outsourcee which includes organizational development (B1) and geographical environment (B2) risk categories. Level 2 provides the systematic context within which the outsourcee's IT division identifies opportunities to participate in global IT outsourcing projects. The third level is the individual project level with two risk categories: the micro-level of the outsourcee's IT resources (C1) and the outsourcer's IT project outsourcing demand (C2). The two second level risk categories (B1 and B2) mediate structural differences between the outsourcee's IT division's resources (C1) and the IT outsourcer's potential IT outsourcing project demands (C2). The two third level risk categories together determine which IT projects can be outsourced to the outsourcee's IT division in the selected country.

Figure 1. Three-Level Global IT Outsourcing (GITO) Engagement Model for Risk Assessment.



The nine risk categories for the three levels can be further broken down into individual risk factors. Table 1 presents the individual risk factors identified with each of the nine risk categories in the GITO engagement model.

Table 1. Global IT Outsourcing Risk Factors Hierarchy.

Global IT Outsourcing Risks Decompositions								
<i>Level 1 – National Infrastructure (A)</i>					<i>Level 2 – Organizational Infrastructure (B)</i>		<i>Level 3 – Individual Project (C)</i>	
legal & security (A1)	economic (A2)	technology (A3)	social (A4)	political (A5)	organization (B1)	geography (B2)	resource (C1)	demand (C2)
sensitive to industry requirements (a1.1)	financial currency stability, financial payback (a2.1)	quality and reliability of ICT infrastructure (a3.1)	interact with supervisors (a4.1)	government restriction (a5.1)	functional knowledge (b1.1)	require working at odd hours (b2.1)	hardware (c1.1)	quality level (c2.1)
comply with government regulations (a1.2)	exchange rate (a2.2)	stability of ICT infrastructure (a3.2)	group harmony (a4.2)	nationalistic aspirations (a5.2)	technological knowledge (b1.2)	scheduling meetings (b2.2)	software (c1.2)	flexibility level (c2.2)
provide sufficient transparency (a1.3)	interest rate (a2.3)	infrastructure different between outsourcer and outsourcee (a3.3)	gender issues (a4.3)	type of government (a5.3)	managerial knowledge (b1.3)	simultaneous collaborative work and communication (b2.3)	network and telecomm (c1.3)	service level (c2.3)
knowledge and technology transfer (a1.4)	trading cost (a2.4)	technology replacement (a3.4)	language barrier (a4.4)	political instability (a5.4)		distance and stability (b2.4)	database (c1.4)	low cost (c2.4)
intellectual property and copyrights (a1.5)	recession and inflation (a2.5)	outdated technology (a3.5)	underpaid (a4.5)	effect of reducing jobs (a5.5)		transportation (b2.5)	people (c1.5)	response time (c2.5)
privacy laws (a1.6)	economic structure (a2.6)		hostility towards the home country (a4.6)	train workers (a5.6)		utility (water, electricity) (b2.6)		variability level (c2.6)
transborder data flows (a1.7)	union and strike (a2.7)		job evaluation and assignment (a4.7)	war (a5.7)				
dispute settlement (a1.8)	un-employment status (a2.8)							
controls by foreign countries (a1.9)	training cost (a2.9)							
access control security (a1.10)	tax (a2.10)							
security protocols and policies (a1.11)								
security protection rights & legal status (a1.12)								
brand protection (a1.13)								
contractual bindings (a1.14)								
protect data from disasters (a1.15)								
background check (a1.16)								

Outsourcee's National Infrastructure Risk Factors

(A1) Legal and security risk factors:

The legal risk of global IT outsourcing involves a number of legal aspects: (a1.1) the ability of the IT outsourcer to ensure that the offshore vendor is sensitive to industry-specific requirements, (a1.2) the offshore vendor's ability to comply with the outsourcer's government regulations, and (a1.3) the offshore vendor's ability to provide sufficient transparency to demonstrate that it does comply with the outsourcer's government regulations during audit. The offshore vendor's governmental regulations on (a1.4) technology transfers, (a1.5) intellectual property and copyrights, (a1.6) privacy laws, (a1.7) transborder data flows (TDF), (a1.8) dispute settlements, and (a1.9) ownership and control limitations by vendor countries, also create additional risks impacting the success of IT global outsourcing.

Industry specific requirements (a1.1) create possible risks because the vendor may not be aware of the industry's intricacies. One example of IT industrial requirements is CMM, CMMI, and ISO 9000 compliance for quality (Dhar & Balakrishnan, 2005). Another is industry-specific policies. HSBC - North America is one of the top 10 financial services companies in the United States with assets approaching \$300 billion. When HSBC outsourced an insurance product to its large software development center in Pune, India, the vendor had the technical skills but not the industry expertise and industry knowledge. This required that experts within HSBC sit alongside the outsourcee's technical experts in India during project development (BusinessWeek, 2006).

Regulations governing IT operations (a1.2) vary from nation to nation. For example, the Chinese Ministry of Posts and Telecommunication (MPT) will not allow foreign firms to operate local telecommunications networks in China (Zixiang, 2000).

Rules governing disclosure (a1.3) also vary from nation to nation. Thus there is a potential risk the offshore vendor would not feel compelled to provide proof it was complying with the outsourcer's requirements.

The offshore vendor's governmental regulations on (a1.4) technology transfers may add risk in that they are either insufficiently strict or they are not enforced. Some countries such as Taiwan and China have very lax enforcement.

Similarly, intellectual property and copyright laws (a1.5) vary dramatically between nations. IT outsourcers must often share sensitive system design or source code for testing and debugging, thereby creating the risk of industrial espionage by competitors and the added risk of losing control of intellectual property.

Data privacy laws (a1.6) vary widely around the world. There is no current U.S. law that prohibits data processing across borders, but the European Union has very stringent privacy standards such as the European Union's Data Protection Directive that controls companies exporting data about EU citizens, and India is working on national legislation to provide legal safeguards to protect privacy (Vijayan, 2003).

Transborder data flows (TDF) (a1.7) are often subject to local laws and legislation in the outsourcee country. Some of the common risks in TDF include lack of well-defined and highly compatible international data standards to ensure global data sharing; extended privacy laws to prevent TDF from creating problems for global human resource planning and control; weak fundamental intellectual property rights; and the lack of transparency and instability for local regulations. Foreign investors and contractors are often frustrated by unpredictable and frequent changes of regulations by the local government (Chen et al., 2002).

Security has been a major risk factor for IT related fields such as e-commerce (Bidgoli, 2003). GITO also involves a number of security related risks. Physical control over security regarding systems and facilities is limited when work is done at offshore sites. Risks involved in global IT outsourcing security aspects include (a1.10) access control security, authentication, and encryption, (a1.11) security protocols and policies adopted by the outsourcer; (a1.12) risk of security breaks or intellectual property protection rights and their legal status in the country, (a1.13) brand protection, (a1.14) contractual bindings and arbitration policies of the outsourcer; (a1.15) ability to protect data and software code, replication level, and back-up and recovery policies due to disasters (Dhar & Balakrishnan, 2005); and (a1.16) weaker employee background check requirements create fraud risks associated with turning sensitive data over to third-party vendors (Pfannenstein & Tsai, 2004).

(A2) Economic risk:

Economic risks include (a2.1) financial risks arising out of IT project accounting standards, cash flows, asset bases, and financial payback. For example, outsourcing an IT project to a different country with different accounting standards might create financial losses due to standards conflicts.

The stability of exchange rates (a2.2) and interest rates (a2.3) create risk as a shift in exchange rates or the vendor's interest rates can create an increase in real costs. Unstable trading costs (a2.4) also create possible risks of adverse changes in predicted cost structures.

Some other economic risks include (a2.5) economic recession or inflation, (a2.6) economic structure (such as capitalism or centralized planning), (a2.7) unions and their ability to strike, and (a2.8) unemployment rates. These risk factors are all related to the outsourcee's national economic infrastructure. The presence of a stable economic infrastructure for global IT outsourcing is very important to a vendor's ability to honor foreign contracts by accurately predicting outsourcing costs.

Global IT outsourcing may also increase employee (a2.9) training costs due to such factors as unanticipated skill deficiencies or communication problems. Taxes (a2.10), including import and export taxes, are another risk factor. An unexpected change in import/export or tax policy by the outsourcee's country could increase costs or otherwise interfere with the project.

(A3) Technology risk:

IT contains a large amount of technological uncertainty (McLellan & Marcolin, 1994). Adding the technological risks inherent in global IT outsourcing increases the uncertainty and thus potential risk. Management of the global IT outsourcing relationship depends heavily on the quality and reliability of a country's ICT infrastructure (a3.1), the stability of a country's ICT infrastructure (a3.2), and the risks of using different ICT infrastructures in outsourcee and outsourcer countries (a3.3). The ICT infrastructure is even more critical when outsourcing customer services such as a call center. To reduce ICT risk, some developing countries are creating special regions with state-of-the-art telecommunication infrastructures. Other risks include (a3.4) technology replacement and (a3.5) using outdated technology. For example, the replacement of older telecommunication and network technologies (a3.4) with technologies such as Asynchronous Transfer Mode (ATM) networks, Integrated Services Digital networks (ISDN), and Asynchronous Digital Subscriber Line (ADSL) might also create risks (UNCTAD, 2003) due to lack of stability in communications between outsourcers and outsourcees.

(A4) Social risk:

Social risk in global IT outsourcing arises mainly out of cultural risk. Knowledge of foreign culture is valued highly in global IT outsourcing. Culture reflects learned behavior patterns that are characteristic of members of a society. The behavior pattern used by employees of outsourcers may seem so natural and ingrained that the behavior of employees of outsourcees may appear alien and incomprehensible; therefore, managers in charge of global IT outsourcing projects must be able to adjust their managerial style through understanding and valuing cultural variations and risks.

Cultural differences are numerous, including customs, attitudes, communication skills, language, and even the pace of daily life. Specifically, culture risks involved in global IT outsourcing include the way individuals (a4.1) interact with supervisors, (a4.2) perceive the importance of group harmony (complicated employer-employee relationships create risks), and (a4.3) respond to gender issues (Rao, 2004). For example, open discussions in producing IT products and services are critical, including open discussions in determining requirements, potential problems, and project deadlines. However, in high power distance countries (such as Mexico, India, and Russia), employees may not be willing (or believe it is not their responsibility) to have open discussions with superiors. Gender differences and discrimination in some countries might create obstacles preventing employee communication with senior managers of the opposite sex (Rao, 2004). Language (a4.4) is a major cultural factor. For example, many African countries are attractive outsourcing locations for most European countries due to their fluency in speaking French. One of the most important advantages for outsourcing to India by U.S. firms has been the availability of a highly educated and English-speaking IT workforce, as opposed to China's more limited English skills (Rao, 2004). Chinese IT/IS outsourcees are far behind their neighbor India which attracts more IT/IS contracts every year. One of the reasons is that many foreign entrepreneurs see more cultural and language obstacles in IT

outsourcing in China than in India. However, even though English is one of the official languages in India, pronunciation and accents can vary tremendously, creating risk depending on the nature of the outsourcing project. Employees working on IT projects in some countries are underpaid (a4.5), creating performance risks. In some cases, (a4.6) employees have hostilities towards the home countries of their clients. These hostilities can manifest themselves in performance or quality risks. Cultural differences can also present problems in (a4.7) job evaluation and assignment in some countries. For example, employees may not be evaluated and assigned tasks based on their job skills. Some other factors such as seniority, personal relationship to authority, and socialist principles may also play an important role in job assignment in many developing countries (Zixiang, 2000).

(A5) Political risk:

Global IT outsourcing is a politically sensitive issue, which pits populist protectionism against free trade expansionism, local trade against world trade, and management against workers. Political systems vary across the 200 plus countries of the world from democratic capitalism (U.S.) to democratic socialism (India) to autocratic (Singapore) to monarchy (Saudi Arabia and Jordan) to communist (China and Cuba) (Palvia, 2004).

Providing a stable political environment for global IT outsourcing is very important to keeping foreign contracts continually flowing into a developing country. Political risks arise out of (a5.1) changes in governmental trade policy resulting in outsourcing restrictions, (a5.2) nationalistic aspirations which create the risk of restrictions on foreign trade, (a5.3) type of government as centralized governments may be less receptive to trade and may change policies based on political rather than economic reasons, and (a5.4) political instability (Dhar & Balakrishnan, 2005).

Global IT outsourcing might result in (a5.5) the long-term effect of reducing domestic jobs, which affects labor unions and members of the affected domestic industries when IT professionals are losing their jobs.

If vendors need training (a5.6) by domestic workers due to outsourcing IT offshore, the IT professionals who are asked to train workers to replace them may become economically insecure resulting in a drop in employee morale and general dissatisfaction among remaining staff (Pfannenstein & Tsai, 2004). Other unexpected events such as (a5.7) civil unrest or war also create political risks.

Outsourcee's Organizational Infrastructure Risk Factors

(B1) Organizational development risk:

Organizational development risk involves three organizational knowledge aspects: (b1.1) functional, (b1.2) technological, and (b1.3) managerial knowledge. Functional knowledge risk (b1.1) includes the expertise, understanding, and experiences in IT and related functions in the organization. Technological knowledge risk (b1.2) refers to the risks associated with expertise in the IT related technology architecture and system development life cycles (selection, analysis, design, implementation, testing, integration, and maintenance support). Managerial knowledge risk (b1.3) associates with risks in project management, resource management, and developing and administering management-related IT functions (Dhar & Balakrishnan, 2005). Support from the top management team has been suggested as an important factor for the success of IT projects (Jitpaiboon & Kalaian, 2005).

(B2) Geography risk:

The outsourcee's geographic location poses some risks mainly due to time zone differences, travel distances, and facilities around the location. The outsourcee's and outsourcer's countries, provinces, and cities may be in different time zones, which (b2.1) require working at odd hours for the outsourcee or outsourcer. Scheduling meetings (b2.2) between outsourcer and outsourcee to assess project status and (b2.3) simultaneous collaborative work and communications can be difficult when there are no overlapping work-hours. The U.S. near-shore outsourcing alternative countries such as Canada and Mexico are attractive to the U.S. due to their close location. Countries such as the Bahamas, Brazil, and Peru have attracted some countries for near-shore geography outsourcing as opposed to the usual offshore countries such as India, China, and Russia. Other risks include (b2.4) travel distance and stability in the region, and availability of supporting infrastructure such as (b2.5) transportation and (b2.6) utilities (Dhar & Balakrishnan, 2005).

Individual IT Project

(C1) IT resource risks:

There are five IT/IS resource elements including (c1.1) hardware, (c1.2) software, (c1.3) telecommunications and networks, (c1.4) data resource management, and (c1.5) people (O'Brien, 2005). Some risks might arise with high hardware (c1.1) and software (c1.2) prices at foreign subsidiary locations due to a local monopoly. For example, U.S. firms in Japan usually pay twice the U.S. price to local distributors to purchase hardware and software. The (c1.5) experience and skill levels of people and training are also risk factors (Dhar & Balakrishnan, 2005). For example, different experience and skill levels of employees at both outsourcee and outsourcer organizations might create risks in misinterpretations and mis-communications. Employees working on the outsourcing IT project at the vendor also might need some training by the outsourcer, creating risks of (a2.10) cost increases, and employee morale issues (a5.7).

(C2) Project demand risks: The drivers of demand for global IT outsourcing can be derived from basic customer demand for products and services (Knod & Schonberg, 2001). Knod and Schonberg presented the six basic customer wants as: (c2.1) high levels of quality, (c2.2) a high degree of flexibility, (c2.3) high levels of service, (c2.4) low costs, (c2.5) quick response, and (c2.6) little or no variability.

There is a cost risk (c2.4) in the level of expectations the internal organization has about how much the savings from global IT outsourcing will be (Davison, 2003). Global IT outsourcing can lower some costs including IT wages. It also creates new up-front expenses including outsourcee selection costs (documenting requirements, sending out Request For Proposals, evaluating responses, and negotiating a contract), legal costs (travel costs if vendor due diligence requires on-site inspections), contract costs, and costs to transition work to the outsourcee. The contract costs include invoicing, auditing, making sure cost centers are being charged correctly and times are recorded properly. Transition costs include knowledge transfer costs such as bringing developers from outside the country for training, and lay-off costs for trainers after training has been completed (Overby, 2003). These costs may not be fully anticipated up-front resulting in underestimated costs.

The ability to correctly estimate delivery times poses a risk (c2.5) (Dhar & Balakrishnan, 2005). Late delivery or even failure to deliver does occur, although such failures are exceptions. The quality delivered by vendors may also not meet quality expectations. Some quality measures have been developed for information systems (Whitten, 2004). In the IT industry, CMM, CMMI and ISO 9000 compliance are examples of quality standards. Performance measurement standards, benchmarking, and performance assurance are the major elements to evaluate quality risks (Dhar & Balakrishnan, 2005).

VALIDATION OF THE GITO ENGAGEMENT MODEL

The development of the GITO engagement model was based on current noteworthy research. Of particular importance to the development of the current model was research by Bahli & Rivard (2005), Chen et al., (2002), Davison (2003), Furniss (2003), Dhar & Balakrishnan (2005), Knod & Schonberger (2001), O'Brien (2005), Overby (2003), Palvia (2004), Pfannenstien & Tsai (2004), Rao (2004), Tafti (2005), Vijayan (2003), Wei (2004), and Zixiang (2000). These research efforts provided the technical perspectives, conceptual views, and process-oriented structures that are critical for validating the current GITO engagement model construct.

Second, the GITO engagement model was developed by combining the risk factors identified in frameworks from the literature review (Bahli & Rivard, 2005; Chen et al., 2002; Palvia, 2004; Pfannenstien & Tsai, 2004; Rao, 2004; Tafti, 2005), and adding in risk factors such as IT project level risk factors due to IT resources and project demands. Therefore, the GITO engagement model covers more risk factors than those in the current literature.

THE RELATIVE-WEIGHTED ASSESSMENT METHOD

In order to demonstrate how the GITO model can actually be measured, an assessment method is presented based on a systematic rating method. This method is a relative-weighted method that has been successfully used in the areas of location evaluation in facility design (Knod & Schonberger, 2001) and evaluation of m-commerce system security (Wei et al., 2005). This method can also be used to evaluate and assess global IT outsourcing risks. This systematic rating method of global IT outsourcing risks includes four steps: (1) rating the comparative importance of each risk factor to find total raw scores for

each risk factor; (2) developing a country specific weight for each risk factor for each alternative outsourcee country; (3) calculating a category risk score by computing the weighted risk factor score for each risk factor in a category by multiplying the risk factor total raw score (Step 1) by risk factor country weights (Step 2) for each risk factor and summing the weighted risk factor scores in each column to obtain a category risk score for each country; and (4) identifying the lowest risk candidate outsourcee country by summing all nine category risk scores to obtain a total outsourcing risk score for each country.

In Steps 1 and 2, identifying the relative importance of each risk factor (Step 1) and establishing the country weights of the risk factors (Step 2) can be obtained from a variety of sources such as records in corporate archives or surveys of subject matter experts using a Delphi technique.

Comparative Rating of Importance for Each Risk Category

The first step is to rate the comparative importance for all pairs of risk factors within a risk category, i.e., each risk factor in a risk category is compared one at a time with all the other risk factors in that risk category. The relative importance of risk factors will likely be unique to a firm, depending on its personal preferences and requirements. Thus a firm must establish its scale of relative importance using knowledgeable employees or subject matter experts.

For example, the relative importance of risk factors a1.1 and a1.4 can be assessed by asking the subject matter experts to answer measurement questions such as:

Question: To what extent is risk factor a1.1 more important than risk factor a1.4 when outsourcing this IT project outside the country?

where the importance of the risk factors can be rated using a four-point scale: a rating of 4 indicates most important (a major preference); 3 indicates medium importance (a medium preference); 2 indicates minor importance (a minor preference); and 1 indicates equal importance (1 = no preference).

Each paired comparison score is then inserted into a risk factor relative preference matrix (Figure 2). In Figure 2, preferences have been arbitrarily assigned to various pairings. These preferences should not be taken to reflect real world preferences which are likely unique to each firm as the relative preferences depend on the type of IT project. For example, the intersection of a4.1 and a4.2 was assigned a major preference (4) for interaction over harmony; i.e., we see 4a4.1 in the resulting diamond. Similarly, a4.3 is moderately preferred over a4.2 and we see 3a4.3. However there is no preference between a4.1 and a4.3 so we see 1a4.1/1a4.3 as a result. The bottom row contains the total raw scores for each risk factor by summing the preference level for each time a factor appears in the matrix.

Figure 2. Risk Factor Relative Preference Matrix for Social Factor A4.

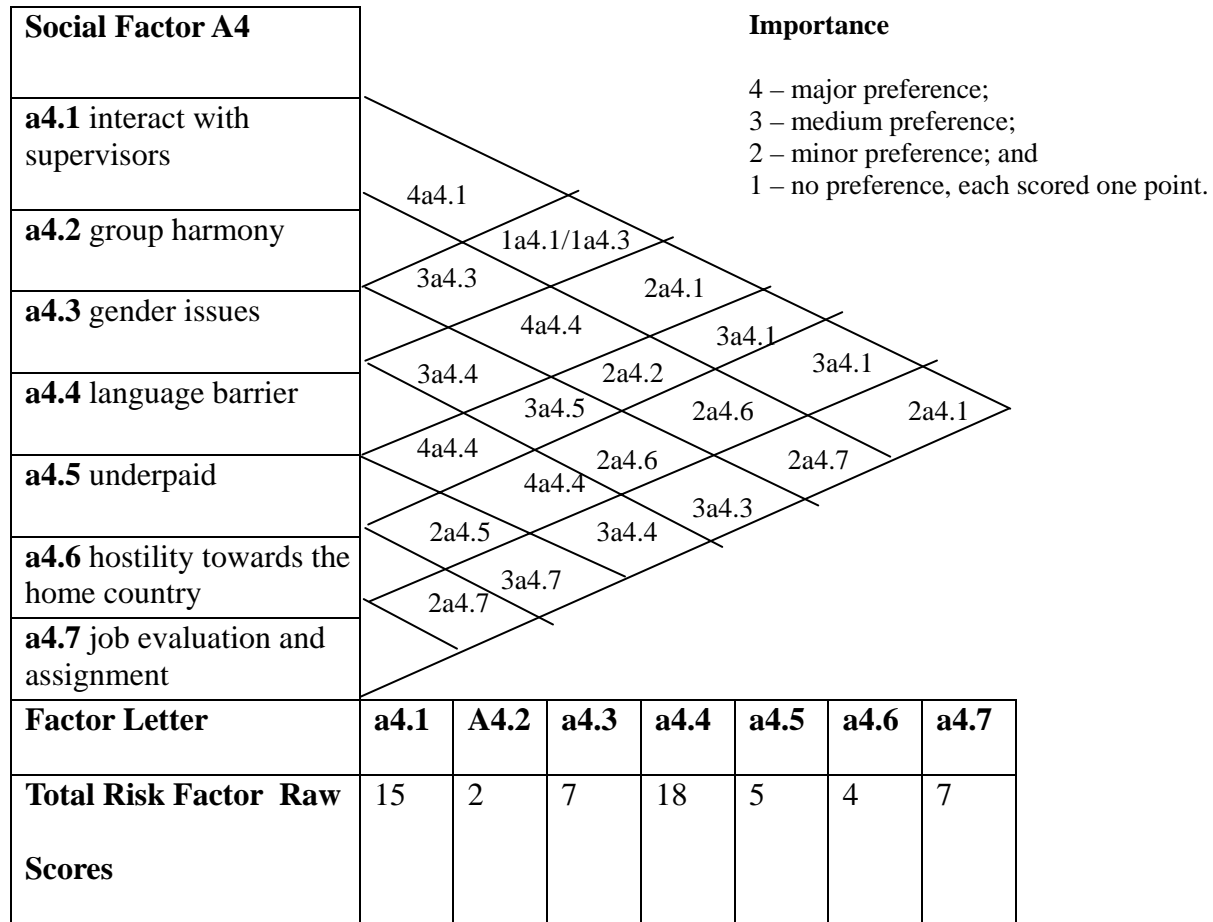


Figure 2 presents the example of calculating total risk factor raw scores for every risk factor in risk category A4. The same process is applied to all the other risk categories until the total risk factor raw scores for all nine risk categories A1-A5, B1-B2, and C1-C2 are obtained.

Developing Risk Factor Country Weights for Outsourcee Countries

Step 2 is to develop risk factor country weights for each possible outsourcee country for each of the risk factors. Again, the relative weights of risk factors will likely be unique to a firm, depending on its personal preferences and requirements. Thus a firm must develop country specific risk factor weights using knowledgeable employees or subject matter experts.

Table 2 is an example matrix for a U.S. firm considering outsourcing an IT project to one of four alternative outsourcee countries, with possible ratings on a 10-point scale for Social Factor A4. Higher weights imply higher risk. Again, country weights were arbitrarily assigned, and these weights should not be taken as reflecting real world weights for a specific firm. In this example, Mexico was assigned a country weight of 8 on the risk factor a4.1 ‘Interact With Supervisor’. Other example country weights assigned to the respective risk factors for each of the four countries are presented in Table 2 for Social Factor A4.

The country weight for individual risk factors can be established by asking the subject matter experts to answer some measurement questions such as:

Question: To what extent is this risk factor involved in outsourcing an IT project to this country?

With a ten point scale 1 means very little or no risk factor involvement and 10 means the risk factor is highly involved.

Table 2. Country Specific Risk Factor Weights: Social Factor A4.

Social Factor A4	Risk Weights for a U.S. firm outsourcing an IT project to four alternative foreign countries			
	China	Canada	Mexico	India
a4.1 interact with supervisors	6	3	8	5
a4.2 group harmony	6	3	8	2
a4.3 gender issues	3	1	8	9
a4.4 language barrier	8	1	6	2
a4.5 underpaid	6	2	8	4
a4.6 hostility towards the home country	6	6	7	7
a4.7 job evaluation and assignment	6	4	8	5

The same process used for the risk category Social A4 is applied to all the other risk categories, until country specific weights are obtained for each risk factor in all nine risk categories A1-A5, B1-B2, and C1-C2.

Weighted Risk Factor Scores for Each Risk Category

The third matrix combines the total raw scores for each risk factor from Step 1 and the country specific risk factor weights from Step 2 to get weighted risk factor scores by country for each risk category's risk factors. In Table 3, continuing with Social Factor A4, the weighted risk factor scores are obtained by multiplying risk factor total raw scores (from Figure 2) by risk factor country weights for each risk factor (from Table 2). For example, for China and risk factor a4.1 - Interact With Supervisors, from Table 2 the risk factor country weight for China is 6, and from Figure 2 the risk factor total raw score for a4.1 is 15, and thus China's a4.1 weighted risk factor score is 90 (6*15). The rest of Table 3 is computed based on the same process. The column total (total risk category score for category A4) for each country is the category risk for A4 for that country.

Table 3. Total Category Risk Scores: Social Factor A4.

Social Factor A4	Weighted Risk Factor Scores			
	China	Canada	Mexico	India
a4.1 interact with supervisors (15)*	90	45	120	75
a4.2 group harmony (2)	12	6	16	4
a4.3 gender issues (7)	32	7	56	63
a4.4 language barrier (18)	144	18	108	36
a4.5 underpaid (5)	30	10	40	20
a4.6 hostility towards the home country (4)	24	24	28	28
a4.7 job evaluation and assignment (7)	42	28	56	35
Total Risk Category Score for Category A4 by country	374	138	424	261

(*) numbers are the risk factor total raw scores from Figure 2.

The results from Table 3 show that Canada has the lowest level of category risk in terms of social factor A4, with a risk score of 138. The same process is also applied to all the other risk categories, until the category risk scores for each country for all factors A1-A5, B1-B2, and C1-C2 are computed.

Find an Outsourcee Country with the Lowest Level of Risk

The fourth and last step is to find the outsourcee country with the lowest overall risk. By summing the category risk scores for all nine factors (A1-A5, B1-B2 and C1-C2) for each of the four countries, the overall outsourcing risk score for each of the alternative outsourcee countries is obtained. The country with the lowest overall risk score has the lowest level of risk.

DISCUSSION, CONCLUSIONS, AND IMPLICATIONS FOR FUTURE RESEARCH

Global IT outsourcing provides benefits including reducing costs, improving flexibility, improving quality, providing access to highly skilled labor outside the local country, improving the economy in the outsourcer country, maintaining competitiveness in a global economy, and accessing new business opportunities and talents in other countries. However, it also creates different types of risks which affect the success of global IT outsourcing projects. This paper developed a quantitative measurement method for assessing various risks involved in global IT outsourcing. The GITO relative weighted assessment method provides guidance to IT executives on how to include risk considerations in their decision making process when selecting an outsourcee firm outside their country. Specifically, there are three major areas covered in this paper.

First, this paper presented a three logical layers model providing risk analysis in global IT outsourcing. The three layers include national infrastructure, organizational infrastructure, and IT project level risk factors. It then identified nine associated risk categories that can be used for the development of a GITO engagement model. The primary objective of this new engagement model is to help investigate more detailed insights into global IT outsourcing risks. It also helps to understand the causes and effects of global IT outsourcing environmental risk factors, and provides cross-country comparative assessment on global IT outsourcing risk factors. This model is based on a variety of noteworthy research, but adds to this research by logically linking factors affecting global IT outsourcing success together. The model developed in this paper represents a foundation for more rigorous empirical research to identify the significance of each influencing factor. The results can provide managers with a road map that addresses issues of concern in global IT outsourcing.

Second, the nine risk categories in the GITO model were further broken down into individual risk factors. The breakdown and identification of these risk factors were based on noteworthy literature on analysis of global IT outsourcing risk factors. These risk factors provide a holistic view of risks involved in global IT outsourcing, thereby assisting IT outsourcing decision makers to better analyze risks involved by estimating all aspects of risks affecting the success of global IT outsourcing for a specific IT project.

Third, a relative-weighted assessment method was used in this paper to demonstrate how risks in the GITO model can actually be measured and assessed. The relative-weighted method is a systematic analysis method, which is valuable to decision makers since it reduces data that could be used to influence the final decision. In addition, this measurement is scalable since more risk factors could be added if needed, and one factor can also be split into more sub-factors. This resulting method can be used to assess the risks involved in global IT outsourcing for a particular IT project, and assist in selecting an outsourcee country with the desired level of risk.

The model developed in this paper provides a number of possible bases for future research. First, it may be that risk factor scores and/or risk factor country weights are not firm-specific. Future research may develop a generalized prescriptive set of tables could be used by any firm contemplating outsourcing. It also may be that some risk factors which are firm specific and some are general. In addition, the model provides a foundation for more rigorous empirical research to identify the significance of each influencing factor. Finally, future study could be conducted comparing risks in global and national IT outsourcing, offshore and nearshore IT outsourcing, and outsourcing and insourcing IT projects.

In conclusion, this paper presents a GITO engagement model to help IT global outsourcing firms and foreign outsourcing providers understand and evaluate the risks of the global IT outsourcing process, so that “they can form a successful long-term strategic alliance, as well as signing short-term or progressive contracts that are desirable for both sides by offering maximum flexibility and minimum risks” (Chen et al., 2002, pp. 112). This method can be used by a global IT outsourcing firm in any country to assess overall risks for any global IT outsourcing projects, including any IT products and services.

REFERENCES

- Ang, S., & Slaughter, A. (2001). Work outcomes and job design for contract versus permanent information systems professionals on software development teams. *MIS Quarterly*, 25(3), 321-350.
- Auber, B. A., Patry, M. & Rivard, S. (1998). Assessing IT outsourcing risk. *Proceedings of the 31st Hawaii International Conference on System Sciences*, Kohala Coast, HI.
- Auber, B. A., Patry, M., Rivard, S. & Dussault, S. (1999). Managing the risks of IT outsourcing risk. *Proceedings of the 32nd Hawaii International Conference on System Sciences*. Maui, HI.
- Auber, B. A., Patry, M., Rivard, S. & Smith, H. (2001). IT outsourcing risk management at British Petroleum. *Proceedings of the 34th Hawaii International Conference on System Sciences*. Maui, HI.
- Bahli, B. & Rivard, S. (2005). Validating measures of information technology outsourcing risk factors. *Omega – The International Journal of Management Science*, 33(2), 175-187.
- Bidgoli, H. (2003). An integrated model for improving security management in the e-commerce environment. *Journal of International Technology and Information Management*, 12(2), 119-132
- Business Week (January 30, 2006). *Special report – outsourcing/online-extra*. The McGraw Hill Companies. Retrieved from <http://www.businessweek.com/index.html> on February, 6, 2006
- Carmel, E. & Agarwal, R. (2002). The maturation of offshore sourcing of information technology work. *MIS Quarterly Executive*, 12 (summer).
- Carnegie Mellon Software Engineering Institute (2005). Process Maturity Profile. CMMI® v1.1 – SCAMPI v1.1 Class A Appraisal Results. Carnegie Mellon University. Retrieved from <http://www.sei.cmu.edu/appraisal-program/profile/pdf/CMMI/2005sepCMMI.pdf> on February 14, 2006
- Chen, Q., Tu, Q. & Lin, B. (2002). Global IT/IS outsourcing: expectations, considerations and implications. *Advances in Competitive Research*, 10(1), 100-112
- Davison, D. (2003). Top 10 risks of offshore outsourcing. *META Delta* 2618. METAGroup, Inc., CT
- Desouza, K., Awazu, Y. & Mehling, J. (2005). The risks of outsourcing: How to secure the outsourcing beast. *Business and Company Resource Center*, i60, 32-38.
- Dhar, S. & Balakrishnan, B. (2005). Issues and challenges in global IT outsourcing. *Proceeding of 16th Information Resource Management Associations (IRMA) International Conference*. San Diego.
- Furniss, T. (2003). China, the next big wave in offshore outsourcing. *BPO Outsourcing Journal*, December.
- Galup, S. D., Dattero, R. & Quan, J. J. (2004). The demand for information technology knowledge and skills: an exploratory investigation. *Journal of International Technology and Information Management*, 13(4), 253-262.
- Gonzales, R., Gasco, J. & Llopis, J. (2005). Information systems outsourcing risks: A study of large firms. *Industrial Management and Data Systems*, 105(1), 45-62.
- Jitpaiboon, T. & Kalaian, S. A. (2005). Analyzing the effect of top management support on information systems performance. *Journal of International Technology and Information Management*, 14(2), 131-144.
- Kern, T., Willcocks, L. & Lacity, M. C. (2002). Application service provision: Risk assessment and mitigation. *MIS Quarterly Executive*, 1(2), 47-69.
- Knod, E.M. & Schonberger, R.J. (2001). Operations management: Meeting customer needs. (7thed.). New York: McGraw-Hill.
- Lacity, M.C. & Willcocks, L. P. (2000). Inside IT outsourcing: A state-of-art report. *Oxford Institute of Information Management*, 56. UK: Oxford.
- Lacity, M. C. & Willcocks, L. (2001). Global information technology outsourcing: In search of business advantage. New York: Wiley.

- Mann, C. L. (2004). What global sourcing means for U.S. IT workers and for the U.S. economy. *Communications of the ACM*. 47(7), 33-35.
- McLellan, K. & Marcolin, B. (1994). Outsourcing information technology. *Business Quarterly*, 59(1), 95-103.
- Norris, P. (2000). Digital divide? civic engagement, information poverty & the Internet in democratic societies. New York: Cambridge University Press.
- O'Brien, J. (2005). Introduction to information systems: Essentials for the e-business enterprise, (12th ed). New York: McGraw-Hill/Irwin.
- Overby, S. (2003, September 1). The hidden costs of offshore outsourcing. *CIO Magazine*,.
- Palvia, S. (2004). Global outsourcing of IT and IT enabled services: A framework for choosing an (outsourcer) country. *Journal of Information Technology Cases and Applications*. 6(3), 1-20. ABI/INFORM Global.
- Pfannenstien, L. & Tsai, R. (2004). Offshore outsourcing: Current and future effects on American IT industry. *Information Systems Management*. 21(4), 72-80. ABI/INFORM Global
- Rao, M. (2004). Key issues for global IT sourcing: Country and individual factors. *Information Systems Management*, 21(3), 16-21.
- Reid, W. S. (2003). Outsourcing: the 20 steps to success. *WSR Consulting Group, LLC*. 1-8.
- Sahay, S., Nicholson, B. & Krishna, S. (2003). Global IT outsourcing: Software development across borders. New York: Cambridge University Press.
- Schroeder, M. & Aeppel, T. (2003, October 10). Skilled workers mount opposition to free trade, swaying politicians, A.1, Wall Street Journal (Eastern Edition).
- Soliman, K. S. (2003). A framework for global IS outsourcing by application service providers. *Business process management journal*. 9(6), 735-744.
- Sullivan, T. (2003, October 22). Tech CEOs defend offshore outsourcing. InfoWorld.com.
- Tafti, M. (2005). Risk factors associated with offshore IT outsourcing. *Industrial Management and Data Systems*. 105(5), 549-560.
- UNCTAD (2003). E-Commerce and Development Report. United Nations Conference on Trade and Development (UNCTAD), Switzerland.
- Vijayan, J. (2003, June 2). Offshore Ops to get stronger privacy lock. Computerworld.
- Wei, J. (2004). Global comparisons of e-government environments. *Electronic Government*. 1(3), 229-252.
- Wei, J., Liu, L. & Koong, K. (2006). An onion ring framework for developing and assessing mobile commerce security. *International Journal of Mobile Communications*. 4(2), 128-142.
- Whitten, D. (2004). Information systems service quality measurement: the evolution of the SERVQUAL instrument. *Journal of International Technology and Information Management*. 13(3), 181-192
- Willcocks, L., Lacity, M. & Kern, T. (1999). Risk mitigation in IT outsourcing strategy revisited: Longitudinal case research at LISA. *Journal of Strategic Information Systems*. 8, 285-314.
- Zixiang, T. (2000). China's new Internet regulations: Two steps forward, one step back. *Communications of the ACM*. 40(12), 28-36.