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Risk assessment in IT outsourcing using fuzzy decision-making approach: An Indian perspective

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ABSTRACT

Outsourcing of Information Technology (IT) is a common practice in global business today. IT Outsourcing (ITO) refers to the contracting out of IT services (or functions) with the objective of achieving strategic advantages as well as cost benefits. Recently, many IT industries are facing daunting challenges in terms of healthy alliances on their ITO strategy due to existence of inherent risks. These risks must be recognized and properly managed towards successful establishment of effective ITO strategy. Therefore, risk assessment appears to be an important contributor to the success of an ITO venture. In this paper, a hierarchical ITO risk structure representation has been explored to develop a formal model for qualitative risk assessment. The basic parameters for defining risks have been presented including the metrics for measuring likelihood and impact that aid to achieve consistent assessment. An improved decision making method using fuzzy set theory has been attempted for converting linguistic data into numeric risk ratings. In this study, the concept of 'Incentre of centroids method' for generalized trapezoidal fuzzy numbers has been used to quantify the 'degree of risk' in terms of crisp ratings. Finally, a framework for categorizing different risk factors has been proposed on the basis of distinguished ranges of risk ratings (crisp). Consequently, an action requirement plan has been suggested for providing guidelines for the managers to successfully manage the risk in the context of ITO exercise.

1. Introduction

In today's IT sector, the tremendous change in technology results in increasing competition towards achieving competitive advantage over lower costs and the ability to deliver improved IT supports. It is really difficult for the organizations to run the business using latest technologies which seem to be very expensive towards fulfilling customers' expectations from economic point of view. To cope up this unpredictable business situation, organizations must look at IT vendors to gain access to the best technology in a cost effective way. Therefore, the decision to outsource IT functions has been proved beneficial towards gaining increasing advantage in the global business today (Abdullah & Verner, 2012). IT outsourcing is the use of a third party to successfully deliver IT enabled business process, application service and infrastructure solutions for a cost effective business outcome. Moreover, IT outsourcing is defined as a decision taken by an organization to contract out or sell some or all the organizations' IT assets, people and/ or activities to a third party vendor, who in turn provides and manages these activities/services as set forth in the contractual agreement and monetary fee (Dhar, Gangurde, & Sridar, 2004; Lacity & Hirschheim, 1993; Loh & Venkatraman, 1992). According to the latest outlook by Gartner Inc., worldwide spending for IT outsourcing (ITO) services is on pace to reach $251.7 billion in 2012, a 2.1% increase from 2011 spending of $246.6 billion (Source: http://www.gartner.com/newsroom). The objectives of IT outsourcing are to reduce costs, accelerate time to market, and take advantage of external expertise, assets and/or intellectual property. Despite the numerous advantages and cost benefits that offer IT outsourcing, many organizations are facing daunting challenges to manage the inherent risks associated with it. The possibility of risks that are introduced when IT functions associated with outsourcing activities results in negative consequences to the business outcome. For example, NASSCOM (National Association of Software and Services Companies), a trade association of Indian Information Technology (IT) and Business Process Outsourcing (BPO) industry is too lowered its growth forecast for 2012–2013 towards IT-BPO exports to 11–14% from prior fiscals' target of 16–18%. This is because of current global volatile economic conditions and the European Sovereign Debt crisis. Similarly, this challenging economic scenario also affects in many key European countries resulting in a forecast for Western Europe ITO growth decline of 1.9% in U.S. dollars during 2012 (Source: http://www.gartner.com/newsroom).

Apart from global economic crisis, some of hidden costs and unexpected outcomes can also be viewed as risks in ITO exercise. Therefore, risk assessment appears to be the important contributor

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to successfully manage the possibility of ITO risks. Generally, risk is defined as a potential future loss or undesirable outcome that may arise from some present action. Risk factors are defined as a source that can pose a serious threat to the outcome. On the contrary, risk assessment is the determination of quantitative/qualitative value of risk related to a concrete situation and a well recognized threat. Although some of the individual risk factors may be more significant than the others, the outsourcing success usually depends on effective management of all types of risks, response strategies used to assess risks and an organizations ability to overcome them. Therefore, it is indeed necessary to develop a unified risk understanding model containing perceived risks in relation to ITO exercise and factors that affect the manageability of these risks.

Exhaustive literature review reveals that limited studies have been reported so far highlighting important sources of risks and associated risk influencing factors in IT outsourcing. Moreover, it has been found out that limited attempts have been made to establish a comprehensive approach in analysing various issues like risk assessment, mitigation, and devolvement of best practices in the perspective of IT outsourcing. Kou and Lu (2013) have pointed out that individual knowledge, experience and intuitive judgement provide better assessment of risk than probabilistic approach. Hence, the authors have highlighted the applicability of fuzzy set theory for risk assessment for capturing the individual intuitive assessment. The aim of this paper is to develop a unified hierarchical risk model that can effectively be used to estimate the degree of risk extent and propose a risk assessment procedure using fuzzy knowledge representation theory to support qualitative risk analysis. Furthermore, all perceived risks have been classified into different categories based on their quantifying value of risk ratings and also an action requirement plan has been recommended which could provide a guideline towards effective management of ITO risk.

2. Literature review

Karami and Guo (2012) have proposed an integrated multi-criteria decision making (MCDM) framework for selecting IT service provider in information system outsourcing. The authors selected an appropriate IT vendor by approximately trading off the perceived risks as well as the benefits. Abdullah and Verner (2012) have developed a literature based conceptual risk framework for strategic IT system development outsourcing from the clients perspective. The critical risk factors such as complexity, contract, execution, financial, legal, organizational environment and user are identified as influencing factors on the outcome of strategic IT system development outsourcing projects. Rusu and Hudosi (2011) have presented a design of an information technology outsourcing (ITO) tool that includes a procedure based on transaction cost theory (TCT) for examining as well as assessing the risk exposure in ITO. Susarla (2012) have examined renegotiation design in contracts for outsourced information technology (IT) services using a sample of 141 IT outsourcing contracts. Pareto improving amendments is proposed to assess renegotiation outcomes which enhance the value from outsourcing by hazard equilibration and incorporating learning. Contractual flexibility and rent seeking are also analysed in order to measure the effectiveness of IT outsourcing contracts. Zhang and Huang (2012) have presented a fuzzy risk evaluation method for information technology service outsourcing in which the risk factors are assessed by fuzzy value and the risk grades of each risk factor are calculated by fuzzy linguistic values. The risk rate of IT service outsourcing is determined through the probability of occurrence of each risk factor. Cheng (2012) have developed an information security risk assessment model of IT outsourcing managed service. The qualitative process of quantifying degree of risk is performed by Borda sequencing and analytic hierarchy process (AHP) method. Al-Hamadany and Kanapathy (2012) have examined the effect of perceived risks and benefits on the intention to increase level of Information Technology (IT) outsourcing amongst 83 companies in Malaysia. A questionnaire survey is conducted resulting in the financial risk factor as the most significant factor amongst all perceived risks whereas technical resources and time are found as the most influencing factors for perceived benefits. Thouin, Hoffman, and Ford (2009) have used transaction cost economics (TCE) of IT Outsourcing examining the effect of level of low asset specificity on firm level financial performance. TCE constructs corresponded closely to optimal allocation of firm-resources so that firms that outsourced low asset specificity resources experienced superior financial performance providing valuable support for normative value of TCE.

Alaghehband, Rivard, Wu, and Goyette (2011) have assessed transaction cost theory (TCT) based ITO models in terms of faithfulness and concluded that the models hardly capture all the essential elements of TCT. Chou and Chou (2009) have developed an information system outsourcing life cycle model considering various risks factors encountered during different contracting phases (pre-contract, contract, and post-contract phases). In another paper, Chou and Chou (2011) have described various issues related to innovation outsourcing including uncertainty, risks, productivity and quality perspectives. Shi, Tsuji, and Zhang (2011) have proposed a linear mixed model (LMM) approach for outsourcing decisions considering heterogeneity among the experts in risk perception. Fan, Suo, and Feng (2012) have proposed a methodology to identify IT outsourcing risk factors as well as their importance in decision making process.

Han, Lee, Chun, and Seo (2013) have investigated direct and complementarity effects of client and vendor IT capabilities on the success of IT outsourcing projects. Yuan and Xu (2013) have proposed a rough set approach for risk analysis of IT outsourcing. Kim, Lee, Koo, and Nam (2013) have proposed a model for IT outsourcing management considering governance effectiveness facilitated as key indicator for success. Bachlechner, Thalmann, and Maier (2014) have highlighted various important aspects of security and compliance challenges in complex IT outsourcing from the perspective of multi-stakeholders based on the series of interviews and online survey. They have realized that factors like auditing clouds, heterogeneity of services, coordination between parties, relationships between clients and vendors, and lack of data security awareness can be viewed as risks if these are not properly managed. Tjader, May, Shang, Vargas, and Gao (2014) have developed a balanced scorecard (BSC) based analytic network process (ANP) model for determining IT outsourcing strategy. Verner, Brereton, Kitchenham, Turner, and Niazi (2014) have studied various sources of risks and their risk mitigation strategy for global software development. The study identifies 85 risks and 77 risk mitigation advice items from the extensive literature review and categorized them under four major captions such as outsourcing rationale, software development, human resources, and project management. The work aimed at furnishing appropriate risk and risk mitigation advice to provide guidelines to the organizations involved with global software development. However, they did not attempt to quantify the degree of risk extent that should be considered as a limitation of their study.

3. Risk assessment

In this paper, risk has been described as a function of two main parameters – (a) the likelihood, which is the possibility of an undesirable occurrence, and (b) the impact, which is the degree