CHAPTER 1

INTRODUCTION

Section 1.1 presents a short review of the Indian Software industry. Section 1.2 describes the growing concern over software development project failures. The concept of software development project risk and the importance of risk management techniques are introduced in Section 1.3 and 1.4 respectively. Section 1.5 presents the content and organization of the thesis.

Growth and development of Indian software industry has gained worldwide attention and India has established her position among the market leaders in global software development. The Indian IT industry has achieved an iconic status in the Indian economy and is considered a highly significant economic growth engine in India’s success. Today software development in the country is a nearly $50 billion strong industry, with a domestic market of $16 billion, contributing around 5.4 % of the GDP and employing over 1.5 million people. The industry has registered a CAGR of around 40 % over the last 6 years. (Source: NASSCOM).

TCS, Wipro, Infosys, Satyam and HCL are the top 5 Indian software companies both in terms of revenue and number of employees. Accenture, HP, Microsoft, IBM and EDC are some of the foreign MNCs who have a big presence in India. Even though the top players continue to lead growth, several high-performing SMEs have also come into the limelight. There are over 5000 registered software companies operating in India.

Service and software exports continue to be the mainstay of the sector contributing as much as USD 31.3 billion. The average size of contracts awarded to Indian firms is going up. Indian Service Providers have grown their share of contracts with values in excess of USD 50 million dollars from 1% in 2002 to 7% in 2006. Major components of IT Services exports include Custom Application Development and Maintenance, System Integration and IT Consulting, Application Management and IS Outsourcing/Infrastructure Management Services. Onsite assignments, where the software professionals with particular technical skills work at the premises of the foreign client, continue to be major revenue earners for Indian companies. However, India is projecting itself as an ideal offshore
destination from the cost and execution point of view. The rapid growth in physical infrastructure and communication facilities has aided this process.

Majority of the software companies in India operate in a project mode. A major challenge for companies engaged in software development projects has been successful completion of the projects.

1.1 SOFTWARE PROJECT FAILURES

Project Management Institute (PMI) defines a project as “One shot, time limited goal directed major undertaking requiring the commitment of various skills and resources”. A project, by definition, is a temporary activity with a starting date, an end date, defined goals and responsibilities, a budget, a plan and involvement of multiple parties. Software development projects can be looked at as a category of projects executed with the objective of developing and delivering software products (Pressman, 1997). Software development projects may include new development, modification, re-use, re-engineering, maintenance, or any other activities that result in software products.

A project is usually deemed as successful if it meets the desired requirements, is completed on time and is delivered within budget (Powell and Klein, 1996).

There have been frequent reports of high profile cases of mismanaged software development projects (Charette, 1996). Reports indicate that large numbers of IS development efforts result in systems that do not function as intended, are not used, or are never delivered (Gibbs, 1994; Jones, 1995; Lyttinen and Hirschheim, 1987). The Standish Group research (1999) shows a staggering 31.1% of projects are cancelled before they get completed. Further results indicate that 52.7% of projects cost over 189% of their original estimates. Only 16.2% of software projects are completed on-time and on-budget. Even when these projects do get completed, many are no more than a mere shadow of their original specification requirements (Standish survey, 1999). A study conducted by Ewusi-Mensah and Przasnyski (1991) showed that 35% of abandoned projects are not abandoned until the implementation stage of the project’s life cycle. Gordon (1999) found that, on the average, a company will complete only 37% of its major IS projects on time and only 42% will be completed within budget.
The effects of software project failure are not limited to monetary aspects alone. If the project is intended to provide a company with a strategic advantage over its competitors, its failure could have devastating results on the company’s market position, as well as its ability to survive. As software companies continue to invest time and resources into the development of software, a primary area of concern revolves around how software development problems and failures can be minimized.

### 1.2 SOFTWARE DEVELOPMENT PROJECT RISK

Barki et al. (1993) define software development project risk as the product of the uncertainty surrounding a software development project and the magnitude of potential loss associated with project failure. The uncertainty surrounding a software development project arises from factors that threaten its success (Barki et al., 1993). These factors have been labeled “risk factors” which threaten the successful completion of a software development project.

Most of the researchers on software project risk and risk management broadly agree on a two-step approach to software development project risk management: risk assessment and risk control (Boehm, 1991; Charette, 1996; Lyytinen, 1988; McFarlan, 1981). Risk assessment involves identifying, analyzing and prioritizing the risk factors that are likely to compromise a project’s success, and risk control involves acting on each risk factor in order to eliminate or control it (Boehm, 1991). It is apparent that the second step cannot proceed without the first being completed successfully. Managers may be pursuing IS development projects which ultimately result in failure because they are not sufficiently aware of the risk involved. If managers have faulty perceptions of the risk associated, their management efforts are likely to be misdirected and they may unknowingly make risky decisions (Slovic, Fischhoff, and Lichtenstein, 1981).

One of the most common methods for risk identification has been the use of risk factor checklists (Boehm, 1991; Barki et. al. 1993; Schmidt et. al. 1996; Keil et al, 1998). These checklists present a list of all potential risks to the project manager and force him to check and decide which risk factors are applicable in that particular project.
A comprehensive list of software project risk may be obtained by combining the risk factors identified previously in the literature (e.g. Barki et al., 1993) with those factors identified by practicing project managers (e.g. Schmidt et al., 1996).

1.3 IMPORTANCE OF RISK MANAGEMENT TECHNIQUES

Once the risk factors are successfully identified and assessed, the next logical step is to manage the risk (Boehm, 1991). Software project risk management is one mechanism for minimizing project failure (Barki et al., 1993; Boehm, 1991; Boehm and Ross, 1989; Keider, 1974; McFarlan, 1981).

Research on software risk management has primarily focused on crafting guidelines for specific tasks (Alter et al., 1978; McFarlan 1982; Boehm 1989; Charette 1996). Some of these researchers advocate a continuous view of risk management throughout the development cycle (Boehm, 1991; Alter et al., 1978). Boehm argues that risk management strategies must be integrated into the software life cycle and has proposed the spiral model as an explicit means of doing so. Some studies recommend a discrete view where specific measures are adopted at selected stages of the development cycle (Davis, 1982; McFarlan, 1982). Because no single risk management framework is all-encompassing, scholars encourage a broad view that incorporates multiple perspectives of risk (Willcocks and Margetts, 1994; Keil et al., 1998; Lyytinen, Mathiassen, Ropponen, 1998).

1.4 CONTENT AND ORGANIZATION OF THE THESIS

Software development project risk and risk management are constructs which cannot be measured as single dimensions. The current research attempts to identify the different components of software development project risk and risk management and check for their impact on project outcome. Following the accepted procedures, validated instruments are developed for measuring risk and risk management. Comprehensive models linking risk, risk management and project outcome are proposed and statistically tested.

The work is presented in the thesis in nine chapters. The remaining eight chapters are organized as follows:

In Chapter 2, a review of literature on risk, risk management and project outcome is presented. Existing research models linking these constructs are
analyzed. Observations from the literature review and motivation for the present study are also discussed here.

Chapter 3 presents the various aspects of the research methodology. The initial part of the chapter presents the rationale for the study, objectives of the research, concept models, hypothesis to be tested, variables in the study, scope of the study and sampling design. The second part explains the steps leading to the instrument development including the exploratory factor analysis on the pilot study data.

Chapter 4 builds on the discussion in chapter 3 on instrument development and its empirical validation. It gives the profile of the final sample collected. The results of the dimensionality analysis with Confirmatory Factor Analysis are also presented in this chapter.

Chapter 5 explores risk and risk management constructs further. The hypothesis stated in chapter 3 are tested and the results are presented here.

Chapter 6 explores the link between risk dimensions and risk management dimensions. Regression models connecting each risk component to risk management components and project / organizational characteristics are presented here.

Chapter 7 presents a basic model showing relationship among project outcome and risk. The model has each of the project outcome measures taken as the dependent variable and the risk dimensions as the independent variables.

In Chapter 8, the researcher discusses the use of Structural Equation Modeling (SEM) technique to validate the hypothesized models. It compares various models linking risk, risk management and project outcome and identifies the best fitting model based on SEM analysis. Second order models developed for risk and risk management are tested against their first order models and results are presented here.

Chapter 9 presents a summary of the results and findings of the research. The relevance of the research for practice is discussed. The limitations of this research work and scope for future research are also presented here.

****