FINANCIAL RISK ANALYSIS OF INFORMATION TECHNOLOGY PROJECTS OF SOFTWARE COMPANIES IN KERALA

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Abstract

The modernisation and globalisation in the field of information technology generate changes in the software industry. Software companies in general and project managers in particular do not perform risk analysis. The long-term success of information technology projects depends on efficient financial risk analysis. Majority of the software companies are unaware of the impact of financial risk analysis techniques and project success. Improper risk analysis is the reason for project failures. Collective knowledge and experience of project managers help for efficient risk analysis. Software companies are largely impacted by many risk analysis factors that create unusual changes in projects and lead to failures. Software companies measure different risks using various risk analysis techniques. Normally, risk delays the progress of software projects. Development in risk analysis techniques allows software companies to implement and strengthen risk management. The use of financial risk analysis techniques helps to minimise the effect of failure and prevents them. Risk analysis needs to be organised proactively to communicate potential risks and contribute to risk management. Risk mitigation strategies are followed to prevent failures with the help of qualitative and quantitative risk analysis techniques.

Keywords: Financial risk, Risk analysis techniques, Success.

Introduction

Financial risk occurs in every software project and management of those risks varies according to the risk level. Software companies depend on other financial institutions for adequate financial resources to complete projects. Financial risk analysis is essential to mitigate the severe impact and earn benefits from the projects. Information technology projects are influenced by many risk analysis factors. Software companies suffered huge losses from projects due to improper risk analysis. Project managers are helpless to provide appropriate techniques to manage the risk. Many financial risk analysis techniques are used to analyse the risk but they fail. Software companies fail to deliver the projects according to customer requirements. Higher-level complications and ambiguity made everything behind schedule. The efficacy of estimates becomes increasingly difficult for project managers. Most of the failures and issues in software projects are the result of improper use of risk analysis techniques. Uncertainties in software projects enhanced and created complexity in the initial stages of software development. All projects are unique and the complexities are concerned about the associated risks and how they can be effectively managed. Many projects fail because the software companies assume that all the projects will succeed and they therefore do not identify, analyse and provide mitigation strategies for the risk elements involved in the project. Many factors determine the criteria for success of the software projects. The presence of these factors may not always guarantee success but their absence may contribute to failures. To increase the success of a project, software companies had to understand the potential risks systematically and quantitatively and assess these risks to anticipate possible causes of failure. Risk analysis techniques are proven as a way of identifying and assessing the factors that could negatively affect the success of information technology projects. Risk analysis techniques are beneficial only if they are used appropriately in software projects. The study tries to analyse the financial risk analysis of information technology projects and mitigation strategies to resolve financial risk analysis issues in software companies.

Significance of the Study

Information technology projects face uncertainties regarding cost and time. Financial risks are a major issue in information technology projects. Software companies strive hard to manage these risks. Identification of risk was an initial task vested with project managers. Identification of risk becomes fruitful only if it is properly analysed. Software project varies according to different software companies depending upon their nature, size and complexity. The risk analysis provides the likelihood, severity, and timing, together with the risk dependency, which is used to determine the effects of the risks on the project and the tasks within the project. Efficient financial risk analysis helps software companies ensure the successful completion of projects. The challenges facing software companies lead to the use of different risk analysis techniques to remove uncertainties. The experience gained in project risk analysis helps for the successful implementation of project schedules and budgets. Quantitative and qualitative risk analyses are the hardest part of risk management with various techniques which increase the project outcomes. Qualitative risk analyses assess the probability and consequences of the risk. Quantitative risk analysis techniques categorise the cost and risk associated with software projects. The proper use of sophisticated risk analysis techniques reduces software project delays. All software companies are using different techniques to analyse the risk efficiently for the success of projects. The

project manager should acquire knowledge regarding each technique. Proper use of financial risk analysis techniques reduces the threats to software companies. Consequences of risk are reduced and result productively. Software companies analyse the risk and help monitor the errors in each phase of the software development process. A practical approach to quantitative risk analysis highlights the correlation between time, cost and resource limitation in information technology projects. Risk management complexities are well understood with the use of quantitative and qualitative risk analysis and reduce the cost involved in the implementation of software projects. Proper adoption of financial risk analysis provides huge gains to software companies and practical application within risk management. Both qualitative and quantitative techniques are useful to analyse the risk and increase the efficiency in managing the risk.

Objectives of the Study

The major objectives of the study are,

1. To identify the factors influencing the financial risk analysis of information technology projects.

2. To analyse the impact of quantitative and qualitative techniques on the successful completion of information technology projects.

3. To evaluate the risk mitigation strategies based on the nature of software companies.

4. To analyse the relationship between financial risk analysis techniques and the success of information technology projects.

Hypotheses of the Study

The following hypotheses are used to study the financial risk analysis of information technology projects of software companies.

HO_1: There is no significant difference between the impact of financial risk analysis techniques and the success of information technology projects.

HO_2: There is no significant association between risk mitigation strategies and the nature of software companies.

HO_3: There is no significant relationship between financial risk factors and the success of information technology projects.

Review of Literature

Risk analysis plays a critical role in the successful management and execution of software projects. Various studies have emphasized the importance of identifying, analyzing, and mitigating risks to ensure projects are completed within scope, time, and budget. This review consolidates findings from several sources discussing different risk analysis techniques, tools, and their effectiveness in managing uncertainties in software projects.

Bowers (1994) highlighted the dependence of project risk analyses on the project team's expertise and the quality of information available. Project risks can be categorized and addressed through both qualitative and quantitative risk analysis techniques. The study suggests that risk cannot be completely avoided, but through proper learning from past projects, its impact can be minimized. While many practitioners in project management seldom perform quantitative analyses, it is crucial for the proper execution of software projects. According to Baker et al. (1998), risk management has become a cornerstone of software project success. By

implementing effective risk analysis techniques, project managers can estimate potential losses from unforeseen risks. This enables proactive management of both technical and project complexity risks. Baker's study further suggests that a combination of quantitative and qualitative methods is used by most software companies for risk analysis. This multi-faceted approach helps identify the most appropriate strategies to mitigate project risks. Rainer and Hall (2003) investigated 26 factors influencing software development and process improvement through qualitative and quantitative risk analysis. They found that while reward schemes and estimation tools were often irrelevant, common factors such as quality and schedule were critical to success across all software companies. Their study also revealed that a multi-strategy approach is beneficial in mitigating complex factors, leading to enhanced software process improvements. Moreover, they identified three pervasive factors such as people, change, and problems that are interrelated and crucial to software process improvement. Shahzad and Said (2014) emphasized the importance of a balanced combination of resources and technical expertise for successful software project delivery. The study used quantitative analysis, including sensitivity analysis and symbolic models, to identify project success factors. These techniques helped develop models to reduce project failure rates, ensuring that projects are completed successfully within the allocated time and resources. Hojjati and Noudehi (2015) focused on the use of Monte Carlo Simulation for risk management in information technology projects. The study demonstrated that Monte Carlo Simulation could accurately estimate project time and cost by considering various risk factors. This enables project managers to assess the potential risks more effectively and implement strategies to mitigate them. The findings indicate that Monte Carlo Simulation can provide initial estimates for time and cost, allowing managers to make informed decisions throughout the project lifecycle.

The literature reviewed reveals that effective risk analysis, whether qualitative or quantitative, is indispensable for the successful execution of software projects. Risk management helps project managers identify potential risks, estimate their impact, and develop strategies for mitigation. Techniques such as Monte Carlo Simulation, sensitivity analysis, and symbolic modelling have proven effective in assessing and reducing project failure rates. Furthermore, a multi-strategy approach and an understanding of critical factors like people, change, and quality are essential for software process improvement. Despite some challenges in adopting quantitative techniques, the importance of risk analysis cannot be overstated in achieving project success.

Research Methodology

The study uses descriptive and analytical research design. Primary and secondary data are used for data collection. The primary data are collected from project managers of software companies with the help of a structured questionnaire and secondary data are collected from books, journals, websites and research theses. The technique of multi-stage random sampling was adopted for the selection of 250 project managers. For analyzing the data different mathematical and statistical tools like Mean, Standard deviation, Chi-square, Correlation, ANOVA and Confirmatory Factor Analysis are used.

Results and Discussions

The analysis result of financial risk analysis of information technology projects of software companies.

1. Financial Risk Analysis Techniques of Software Companies

The research mainly concentrates on financial risk analysis techniques such as probability and impact grids, influence diagrams, analytical techniques and Monte Carlo analysis to check for significant differences.

Table 1. Financial Risk Analysis Techniques of Software Companies

Financial Risk Analysis Techniques	Mean	Standard Deviation
Probability And Impact Grid	3.62	0.898
Influence Diagram	4.09	0.786
Analytical Techniques	4.98	0.963
Monte Carlo Analysis	3.76	0.772

Source: Primary Data

Based on the mean score, it can be observed that the influence of analytical techniques (4.98) is very high for the successful completion of projects, and the probability and impact grid (3.62) have a low influence on project success. The mean value of the financial risk analysis techniques of software companies shows some difference. To test whether this difference is statistically significant or not, an ANOVA test was carried out.

2. Financial Risk Analysis Techniques Based on Project Success

HO_1: There is no significant difference between the impact of financial risk analysis techniques and the success of information technology projects.

Table 2. Financial Risk Analysis Techniques Based on Project Success

Risk Analysis Techniques	F Value	P Value	Action
Data Gathering	0.430	0.426	Accept
Simulation	0.413	0.398	Accept
Assumption Testing	0.276	0.192	Accept
Decision Tree Analysis	0.376	0.227	Accept
Sensitivity Analysis	0.224	0.163	Accept

Source: Primary Data

Table 2 shows the F and P values of financial risk analysis techniques based on the success of information technology projects. The null hypothesis is accepted since the P value is greater than 0.05. The null hypothesis suggests that there is no significant difference in the financial risk analysis techniques when applied to the success of IT projects. The different financial risk analysis techniques are ineffective in contributing to the overall success of IT projects. As a result, project managers may not need to favour one technique over another solely based on financial risk analysis outcomes, as the statistical analysis shows no significant impact on project success.

3. Risk Mitigation Strategies Based on the Nature of Software Companies

The research focuses on risk mitigation strategies such as risk reduction, risk transfer, risk acceptance and risk avoidance. The nature of software companies is classified into small, medium, and large.

HO_2: There is no significant association between risk mitigation strategies and the nature of software companies.

Table 3. Risk Mitigation Strategies Based on the Nature of Software Companies

	Perform Test
Chi-Square	20.82
Degree Of Freedom	4
P Value	0.000

Source: Primary Data

Level of Significance 0.05

The nature-based analysis of risk mitigation strategies of software companies states that the p-value as per the chi-square test is zero, which is less than 0.05, hence the null hypothesis is rejected at a 5% level of significance. There is a significant association between the nature of software companies and the risk mitigation strategies they adopt. This implies that software companies with different characteristics or operational focuses may adopt different approaches to managing risks in their projects.

4. Relationship between Financial Risk Factors Based on Project Success

HO_3: There is no significant relationship between financial risk factors and the success of information technology projects.

		Financial Risk Factors	Project Success
Financial Risk Factors	Pearson Correlation		0.0452
	Sign (2 Tailed)		0.017
	N	250	250
Project Success	Pearson Correlation	0.0452	
	Sign (2 Tailed)	0.017	
	N	250	250
Correlation Co-efficient at the 0.05 Level (2-Tailed)			

Source: Primary Data

The correlation table of financial risk factors and the success of information technology projects shows that the Pearson correlation coefficient (r) is 0.0452 which shows a moderate correlation between financial risk factors and success of information technology projects. The p-value is statistically significant ($p<0.05$). Since the p-value is lower than 0.05, the null hypothesis that there is no significant relationship between financial risk

factors and the success of information technology projects is rejected. So, there exists a significant relationship between financial risk factors and the success of information technology projects.

5. Confirmatory Factor Analysis of Financial Risk Factors and Financial Risk Analysis Techniques

Confirmatory factor analysis is used to understand the relationship between factors and the impact of financial risk analysis techniques. Each measurement model parameter offers estimates. 32 observable variables, 32 error elements (e1 to e32), and 8 unobserved variables made up the measurement model. The following variables are unobserved.

1. **Technology**: In the IT sector, technology refers to the tools, systems, and software used to solve problems and enhance efficiency. It enables automation, innovation, and supports the development of new products and services.

2. **Requirement**: Requirements in the IT sector are the detailed specifications that define what a system, software, or product must achieve. They guide the development and ensure the end product meets the business or user needs.

3. **Organisation**: An organisation in the IT sector involves the structure, processes, and people that work together to deliver technology solutions. It includes teams focused on development, operations, and support to ensure the effective deployment of IT services.

4. **Resource**: Resources in the IT sector refer to the assets, such as hardware, software, human skills, and time, needed to deliver IT projects. Proper management of resources ensures projects are completed on time, within budget, and to the required quality.

5. **Analytical Techniques**: Analytical techniques in the IT sector are methods used to interpret data and gain insights for decision-making. These include statistical methods, data mining, and machine learning algorithms to optimize performance and solve complex problems.

6. **Influence Diagram**: An influence diagram in IT is a graphical representation used to visualize the relationships and dependencies between variables within a system. It helps in decision-making by showing how different factors influence each other in complex IT systems or projects.

7. **Probability and Impact Grid**: The probability and impact grid in IT is a risk management tool used to assess the likelihood and severity of risks. It helps prioritize issues, ensuring resources are allocated to the most critical risks that could affect project success.

8. **Monte Carlo Analysis**: Monte Carlo analysis in the IT sector is a computational technique used to understand the impact of uncertainty in project outcomes. By simulating different scenarios, it provides a range of possible results to aid in risk management and decision-making.

Table 5

Model Fit Indices for Financial Risk Factors and Financial Risk Analysis Techniques

Model Fit Indices	Model Values	Threshold	Interpretation
CMIN/DF	1.58	Between 1 And 3	Excellent
CFI	0.986	> 0.95	Excellent
GFI	0.927	> 0.9	Excellent
AGFI	0.914	> 0.9	Excellent
RMSEA	0.032	< 0.08	Excellent

Source: Primary Data

The Chi-Square to degrees of freedom ratio needs to be less than 3 for a model to be declared viable. In this case, the result is 1.55, which is significantly below the suggested upper limit. The RMSEA value is 032, which is much below the 0.08 acceptable threshold score. The GFI, AGFI, and CFI values are all higher than 0.9 as well. As a result, the model fits perfectly.

Figure 1.1

Confirmatory Factor Analysis of Financial Risk Factors and Financial Risk Analysis Techniques
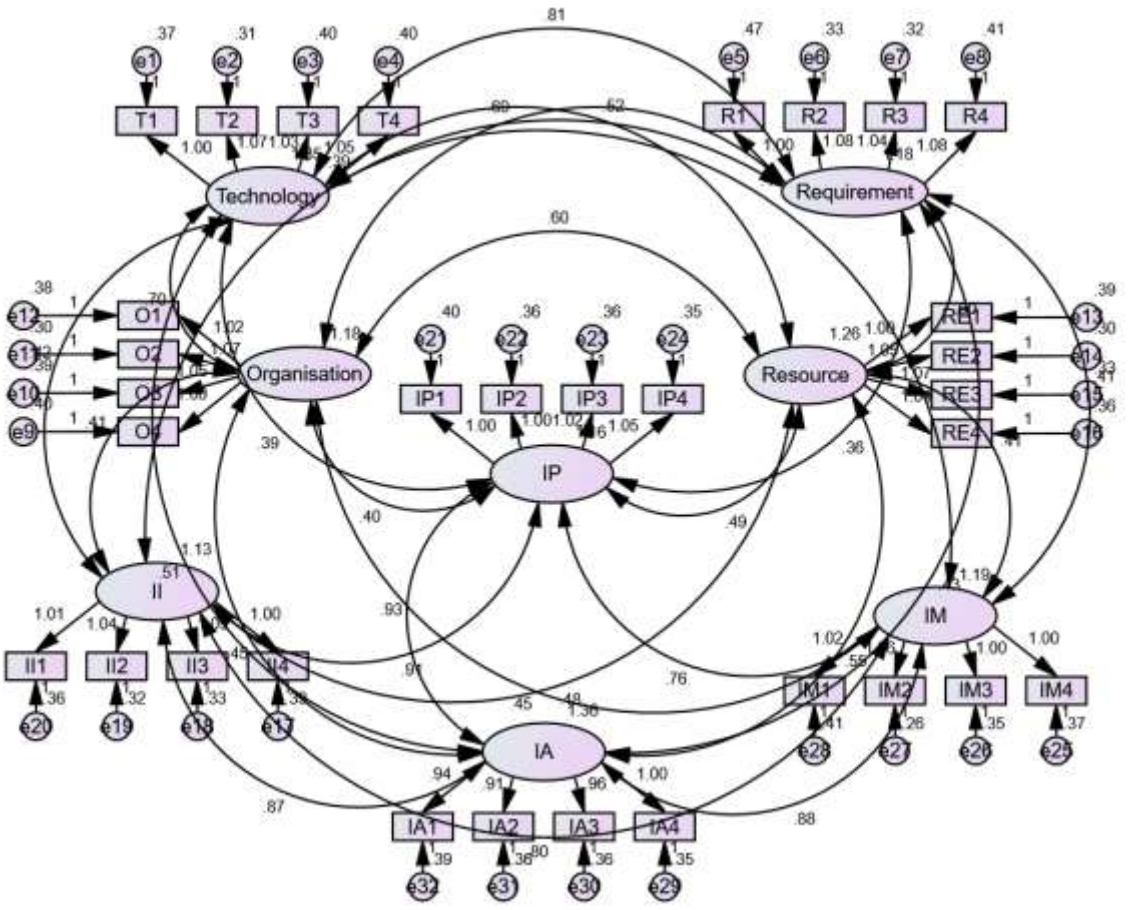
Figure 1.1 explains the confirmatory factor analysis of financial risk factors and financial risk analysis techniques. It offers estimates along with observed and error estimates for each measurement parameter. The results of the beta coefficients for each factor are also shown. The figure makes clear that there are significant factor loadings between the components of each factor. It is indicated as an ideal fit for the model with eight constructs and related variables.

Conclusion

Financial risk is the major problem that arises in every software company. There are many financial risk analysis techniques to reduce the severe impact of information technology projects. Software companies mainly depend on both qualitative and quantitative risk analysis techniques according to the requirements of their projects. Most software projects fail due to the inappropriate use of risk analysis techniques. There are many risk mitigation strategies, and they have a significant relationship with the nature of software companies. It was shown that there is no significant difference between the impact of financial risk analysis techniques and project success. It was also evident that there is a relationship between financial risk factors and the success of information technology projects. Efficient financial risk analysis techniques increase the success rate of information technology projects.

Implications for Future Research:

Future research could explore further integration of advanced risk analysis techniques, especially in emerging technologies. Moreover, studies on the barriers to implementing comprehensive risk management strategies in software development could provide insights into overcoming challenges and improving project outcomes.

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