

Risk Analysis for it Projects Using System Dynamics

Nastaran Hajiheydari *

Assistant Professor, Management faculty, University of Tehran, Iran, nhheidari@ut.ac.ir

Fatemeh Rahmati

MA of IT management, Alzahra University, Iran, rahmaty_fatemeh@yahoo.com

Abstract: In today's complex world when we talk about IT projects, risk appears such as an inseparable part. The purpose of this study is to identify risks in IT project management and their effect on the overall risk of the project. In order to achieve this objective, we study a wide range of researches in the field of IT project risk analysis. We classify risk factors and the factors are simulated in a dynamic model. Then, some equations are extracted using examining relationship between structures and factors, and the risks are studied in a period of 12 month. The results of this study show that human resource risk is the most important risk that is repeated, after that project management risk is the second risk. Strategic risk is a risk that is appeared in some periods. So, we suggest IT project managers to pay more attention to these risks in the politics and strategies.

Keywords: IT projects, System Dynamics, Risk Analysis.

Introduction: This research can be classified as applied researches because the researchers attempt to provide a solution for recognition and management of IT projects, considering the need for the current community to pay particular attention to risk and analyzing it in active organizations in the field of information technology, and by conducting fundamental research in this field. The achievement of this endeavor is to provide a dynamic simulation model for risk analysis of IT projects, which can be used to determine the priority of significant risks over a given time period.

Since this study is based on existing projects in IT organizations, the scope of research can be defined by all projects that are carried out in companies and organizations with background in the field of information technology.

The general purpose of this research is to provide a dynamic model of risk analysis in IT projects. Dedicated objectives are included:

- Identification of risk factors in IT projects
- Identification of Structures (Major Groups) Risk of IT Projects
- Prioritizing the risk structures of IT projects
- Examining the extent of explaining each of the risk structures by the relevant components in IT projects
- Investigating the relationship among risk factors in IT projects
- Investigating the impact of changes in the overall risks of IT projects for changes in each of the risk structures

Row	Researcher's name	Year of research	The topic of the research
1	Ssemaluulu, Paul and Williams Ddembe	2007	Complexity and Risk in IS Projects: A System Dynamics Approach
2	Trček, Denis	2008	Using System Dynamics for Managing Risks in Information Systems
3	Trček, Denis	2009	System Dynamics Based Risk Management for Distributed Information Systems
4	Sen, Wang Gui and yang, Li Xiang	2010	The Risk Analysis on IT Service Outsourcing of Enterprise with System Dynamics
5	Dash Wu, Desheng, et al.	2010	Modeling technological innovation risks of an entrepreneurial team using system dynamics: An agent-based perspective

Materials and Methods: This study, first of all, reviews the background of the subject and identifies the factors involved in the risk of IT projects. The current study, investigates the researches that are done in this field and after extracting them and performing a survey by experts and managers for determining the importance of risks, they are categorized into 9 main factors. The PLS method is used to obtain confirmatory factor analysis. In order to identify the relationships among the main structures, the analysis of regression between them has been used.

In the next step, the relationships among the variables are defined, their equations are tuned, and their dynamic simulation model is depicted. Finally, by analyzing the susceptibility to the model, the sensitivity of each risk and its impact on overall company's risk is assessed, and significant risks that require more attention in IT projects have been identified.

* Corresponding author

Results and Discussion: Linear regression technique is used to analyze the relationship among research structures (risk indicators). The significance level for relationships to be meaningful is less than 0.05 ($\text{Sig} < 0.05$). Additionally, the Beta Indicator indicates the effect (positive or negative). Finally, ARS specifies the modified coefficient of determination of the model. The purpose of presenting this coefficient is to show the percentage of dependent variable variations that occur for one unit change in an independent variable. The conceptual model of research can be presented as Fig1 for the study of causal relationships based on the dynamics of the system. Based on the relationships studied in the previous stages of the research, the dynamic diagram of the model, which is designed in VENSIM PLE software, can be presented as Fig. 2.

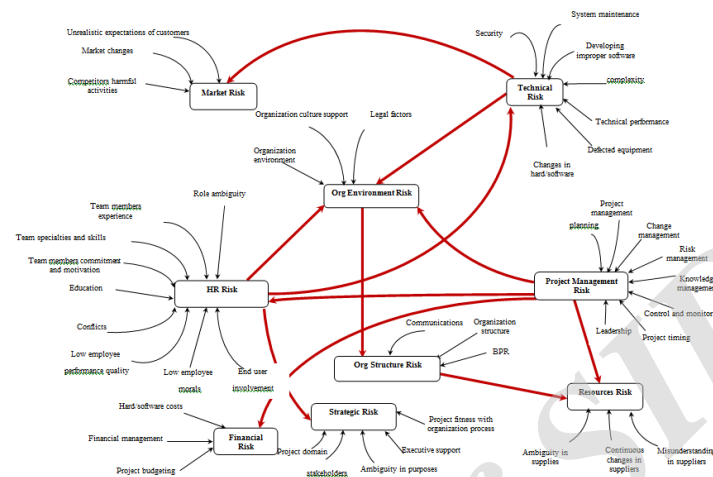


Fig 1: Conceptual model of research structures

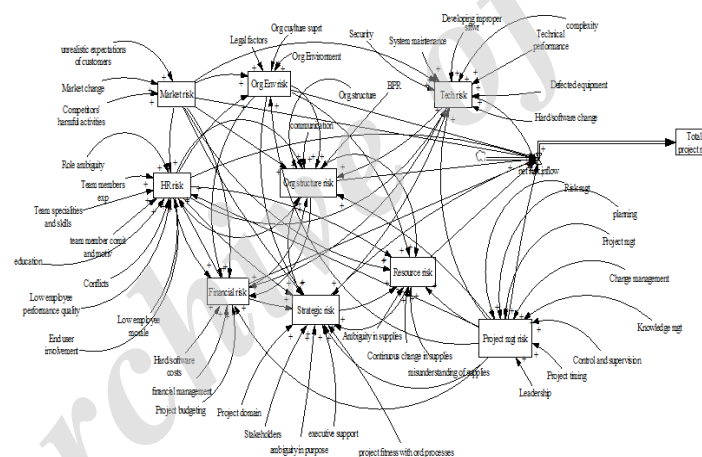


Fig 2: Dynamic Simulation Model

Conclusion: In this study, the risk factors in IT projects were identified and a wide range of studies conducted in previous years were reviewed. Risk factors were classified into 9 main groups according to the literature review. In the next step, by designing a questionnaire, the importance of these risks was determined by experts and the priority of each of them was determined. The explanation of each of the risk structures by the relevant components was also determined by using PLS and their relationship was determined. The conceptual model was drawn and finally, the model was implemented in Vensim via extracting the equations of the model by the obtained analyzes. After designing and simulating the model, we analyzed the susceptibility analysis of the model. At this stage, the results indicated that the most important risk that occurs during repeated periods of time is the risk of human resources. Risks that fall into the top priority include strategic risk, project management risk, and organizational structure risk.

References

- Abdel-Hamid, T. K. (1989). The dynamics of software project staffing: a system dynamics based simulation approach. *IEEE Transactions on Software Engineering*, 15(2), 109- 119.
- Agarwal, N., & Rathod, U. (2006). Defining 'success' for software projects: An exploratory revelation. *International journal of project management*, 24(4), 358- 370.
- Akkermans, H., & van Helden, K. (2002). Vicious and virtuous cycles in ERP implementation: a case study of interrelations between critical success factors. *European journal of information systems*, 11(1), 35- 46.