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Risks Response Strategies for Supporting Practitioners Decision-Making in Software Projects

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Abstract

Enterprises make great efforts to adopt up-to-the-minute technologies and completely new systems. Despite these efforts, software projects outcomes are not successful. Indeed, poor risk management of software projects often leads to failure, which can impact the project outcomes. For this reason, practitioners should follow a risks strategy that drives their software project toward success. To address this need, this paper presents a risks checklist of software projects. This gathers together the risks affecting the performance of software projects. Moreover, the authors use the importance-performance approach to assess the risks factors identified. The findings allowed us to define the most suitable strategy for managing each risk in more effective way.

Keywords: software projects; risks checklist; IP approach; risks response strategies

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1. Introduction

In recent decades, companies across the world have adopted enterprise information systems by means of IS/IT (Information Systems/Information Technologies) projects. These applications allow the modeling and automation of firms' activities, providing relevant information for decision making. However, success of enterprise information systems adoption is never guaranteed. The outcomes obtained in IS/IT projects determinates it.

However, as is indicated in [1], the nature of IS/IT projects creates many risks that must be managed diligently. A study carried out by Standish Group International consultancy shows that only 32% of the IS/IT projects in 2009 can be considered successful [2]. This means that they finished on time, within budget and the final result satisfied the needed requirements [3].

To avoid unexpected results, the professionals have to manage their risks effectively and efficiently [4, 5]. This means they have to identify, evaluate and plan the actions to be undertaken, and continuously monitor the risks of their projects [6]. In fact, during the last few years, the IS/IT projects successful ratio has been improved [7], but this continue being low.

IS/IT projects risks research is not scarce in the literature. In order to support project managers' activity, several studies have proposed tools and methods for assessing risks in this kind of projects [8]. However, frequently, practitioners have difficulties to understand the use of these tools. In contrast, we have not identified research, which state the most effective strategies for managing IS/IT project risks.

According to this, our aim is to study IS/IT project risks. To do this, we have used an Importance-Performance approach. Prior to that, we have identified the risk that threatens IS/IT projects. Subsequently, we have applied the importance-performance analysis (IPA) technique. This allows to assess the risks from two dimensions: probability of occurrence and negative impact on the IS/IT projects outcomes [9]. The results indicate practitioners, what response strategy must select for managing each risks in more effective way.

2. Risk management in IS/IT projects

An IS/IT project is a large-scale, unstructured and highly complex undertaking. In some cases, this even requires the use of unfamiliar technologies and tools. Hence many controllable and uncontrollable risks can affect its outcome [10].

A risk is an event characterized by uncertainty because it may or may not occur. If this risk turns into a real problem, this may impact the project success. Hence, to avoid undesired outcomes, practitioners have to continuously manage in a proactive way the risks existing in their IS/IT projects [11]. The most used criteria to determine the importance of factors is the risk of exposure [8].

Risk management shows us the real situation in which our project is, being able to manage the threats in a proactive way. If the project team identifies, assesses, treats and monitors existing risks in such projects, the probability of failure decreases. Hence, it has given rise to a proliferation of studies about software projects risks. But research in the literature focus on the identification and assessment phases established in risks management methodologies [6, 9, 12, 13, 14, 15, 16, 17].

More specifically, in last years, evaluation models based on grey correlation [18], probabilistic terms [19], fuzzy theory [20, 21], bayesian networks [22] have been developed to assess software project risks. Other studies identify and prioritize the existing risk factors in IT/IS projects from more to less problematic [23, 24]. Even, a risk management application has also been created for the modeling, optimal adaptation and implementation of an enterprise system [25]. In contrast, scarce studies evaluate and identify the most effective strategies for managing IS/IT project risks.

From an IS/IT project begins, practitioners should follow specific strategies in order to effectively manage existing risks [26]. Despite, studies about strategies to deal with IT/IS projects risks is scarce in the literature. One study states mitigations strategies for mitigating risks from economic perspective [27]. However, other factors like the importance of risks also should be considered in this issue. In fact, information about the probability of occurrence and impact of risks on IS/IT project can support the practitioner to select a better risk management strategy [28].

Actually, the selection of the risks strategy followed depends on the manager's subjective judgments. To support the project managers' work, we have realized a formal study about risks which impact the IS/IT projects success. To do this, we have used an IPA approach. In this way, we identified the risk that affects IS/IT projects development. Subsequently, experts assessed the importance of each risk identified. The findings allowed us constructing an IP matrix. This indicate practitioners which strategy should follow to deal with each IT/IS projects risks in more effective way.

3. Research method

The main purpose of this study is to state the most effective response strategy for managing each IS/IT project risk. With this in mind, firstly, we identified the risks that affect the development of IS/IT projects. To do this, we carried out a critical literature review of software risk management. The risks identified were checked removing duplicates eliminating those factors which do not affect IS/IT projects.

In order to validate the factors identified, we consulted 12 experts in IS/IT projects. The optimal number of experts depends on the characteristics of the study itself. We can, however, say that the greater the heterogeneity of the group, the fewer is the number of experts recommended, 12 being a good size [29, 30]. All experts' opinions were considered to be of the same importance. Respondents were not chosen just because they were easily accessible. Thus, we obtained the list of IS/IT projects risks.

Later, we evaluated the risks identified using the IPA method. This technique was introduced by [31] to selecting marketing strategies. IPA has also been applied in such different fields as tourism [32], banking [33], quality of service [34], e-Business [35], and education [36], among others. Its wide acceptance can be explained by its ease of application, simplicity and utility [34].

IPA combines measures of importance of each factor (i.e., a risk) and its performance into a two-dimensional grid or matrix. In our study, performance dimension refers to the risks' impact on the development of IS/IT projects, meanwhile importance refers to the probability of occurrence of each factor.

In order to estimate the probability of occurrence and impact of each risk, we again consulted the above-mentioned experts. In this way, we sent a survey to the participants via email. Both probability of occurrence and impact dimensions were measured on a 5-point likert scale, as is suggested in [31]. Basing on the replies received, we calculated the mean and the standard deviation for each risk, in each dimension [31, 35]. Finally, we plotted each risk according its level of importance (mean value) and probability (mean value), on the IP grid. Each quadrant refers to a different group of risks. Hence, practitioners have to follow different strategies for managing each group (quadrant) in more effective way. In the next section, we present the results obtained in this study.

4. Findings

The goals in our research were to analyze existing risks in IS/IT projects and identify the most effective strategies for treating those. In this way, 12 experts in this kind of projects activate participated in our study. They started checked the risks identified in a critical literature review. The result was the checklist of IS/IT project risks depicted in Table 1.

Table 1. IS/IT project risks checklist.

ID	Risk	Source
R1	Users are reluctant/reticent to the changes.	[25, 38, 39, 40, 42]
R2	Lack of end-users commitment to the project.	[25, 37, 38, 40, 41, 44]
R3	Lack of end-users support.	[25, 37, 39, 40, 41, 42, 44]
R4	Users constantly request further changes.	[25, 40]
R5	Target users are unfamiliar with the technology and require additional training.	[25, 39, 42]
R6	Inadequate composition of project team	[9, 25, 37, 38]
R7	Excessive/insufficient personnel in the project team	[25, 37, 42, 43, 44]
R8	Inexperienced project manager.	[25, 38, 39, 40, 41, 42]
R9	Project manager lacks required skills.	[25, 38, 44]
R10	High turnover within project team.	[38, 39, 41, 42]
R11	Team members are unmotivated.	[25, 41]
R12	Poor internal communication	[25, 40, 41]
R13	Team members are unfamiliar with the technology	[39, 40, 41, 42]
R14	Team members lack required skills.	[39, 40, 41, 42, 43, 44]
R15	Conflict and no cooperation between the team members.	[39, 41, 38, 4]
R16	Improper definition of roles and responsibilities.	[44]
R17	Lack of top management commitment to the project	[39, 41, 25, 37, 38, 42, 44]
R18	Changes in organizational priorities.	[39, 41, 44]
R19	Continuous changes in the organizational environment.	[39, 40, 41, 42, 44]
R20	Top managers make important IT decisions without consulting the others.	[25, 42]
R21	Conflicts between users departments.	[25, 37, 38, 39, 40, 41, 44]
R22	Requirement specifications are ill-defined	[25, 37, 39, 40, 41, 44]
R23	Continually changing system requirements	[9, 39, 40, 41, 42, 43, 44]
R24	Unclear or incomplete requirements.	[25, 39, 40, 41, 42]
R25	Failure to manage end-user expectations.	[25, 37, 41, 42]
R26	Lack of frozen requirements.	[9, 43]
R27	Time too short/too long.	[9, 39, 43]
R28	Inadequate estimation of required resources.	[9, 25, 38, 41, 43, 44]
R29	Unrealistic schedule.	[9, 39, 41, 43, 44]
R30	Unrealistic projects outcomes.	[41, 42]
R31	Project milestones cannot be defined.	[25, 39, 40, 42]
R32	Poor establishment of standard process/procedures/methodology.	[25, 39, 40, 44]
R33	Poor project planning.	[25, 39, 40, 42, 44]
R34	Ineffective project control,	[25, 39, 40, 41, 44].
R35	Critical activities are not identified.	[44]
R36	Lack of proper tests.	[25]
R37	Project progress is not monitored closely enough.	[25, 42, 44]
R38	Technology has not been understood by the project team.	[25, 40, 41 44]
R39	Immature technology.	[25, 38, 39, 40]
R40	Excessive project size.	[39]
R41	High level of technical complexity.	[39, 40, 38]
R42	Highly complex task being automated.	[39, 41]
R43	Complex excessively procedures.	[38]
R44	Highly synchronized systems.	[39, 41, 42]
R45	Inadequate system documentation; incomplete or non-existent.	[42]
R46	Lack of integration between systems.	[41]

Subsequently, we assessed the risks identified in the checklist using the IPA approach. In this way, experts individually estimate the probability and impact of each factor. Table 2 shows the impact and probability of occurrence ratings of the 46 risks.

Table 2. Mean impact and probability ratings.

ID	Impact	Probability	Quadrant
R1	2,75	3,83	1
R2	3,67	3,58	1
R4	4,33	3,83	1
R6	3,83	2,92	1
R8	4,75	3,58	1
R9	3,92	4,58	1
R17	3,58	4,08	1
R20	4,58	2,83	1
R21	3	3,75	1
R23	4	3,08	1
R24	3,25	4	1
R25	4,5	3,83	1
R30	3,17	3,08	1
R36	4,58	2,83	1
R42	2,75	3,08	1
R44	3	3,92	1
R45	3,67	4,83	1
R46	2,67	2,92	1
R3	4,83	2	2
R12	2,83	1,33	2
R13	3,75	2,08	2
R16	3,91	1,2	2
R22	2,67	2,25	2
R29	2,83	2,17	2
R34	3,92	1	2
R35	4	2,25	2
R7	2,33	2,42	3
R14	2,08	2,25	3
R15	1,33	2	3
R19	1	2,08	3
R27	2,25	2,17	3
R28	2,25	2	3
R31	1,08	1	3
R32	1,42	2,25	3
R33	2,17	2,25	3
R37	1,42	1,47	3
R38	1,5	2,17	3
R40	1,83	2	3
R41	2,17	2,17	3
R43	1,25	1,17	3
R5	1,08	4,92	4
R10	1,08	4,67	4
R11	2,08	3,67	4
R18	1,91	2,67	4
R26	1	4,58	4
R39	2,33	2,75	4

Impact and probability ratings determine the coordinates for each risk on the map and thus determine their placements. Specifically, the ratings were used to split the axes. We thus carried out the four-quadrant matrix showed in Fig. 1. The quadrant, in which a risk is placed, determines the most effective strategy to treating it. So, the IP map yields the following strategic suggestions for managing risks in IT/IS projects:

- Quadrant 1 (high impact, high probability). These risks are the most critical. In fact, experts considered that those strongly impact on project development. In addition, participant revealed that the probability of occurrence of these risks is high. Indeed, practitioners should follow the strategy "elimination of root-

cause" [18]. That is, they should identify and eliminate those elements, which can provoke its appearance in the IS/IT project.

- Quadrant 2 (high impact, low probability). These risks do not usually appear in IS/IT projects. However, when they convert into a real project problem, factors impact strongly on IS/IT projects development. In order to manage them, practitioners should follow a prevention strategy [18]. This consists in defining and applying a plan to control the occurrence of these risks in the project.
- Quadrant 3 (low impact, low probability). These risks do not usually appear in IS/IT projects, as well as slightly impact on IS/IT project development. Therefore, in order to manage them, practitioners should follow a fix each error strategy [18]. This consists in treating risks when they convert into real problems.
- Quadrant 4 (low impact, high probability). These risks usually appear in IS/IT projects, although normally, they slightly affect IS/IT projects development. Therefore, in order to manage them, practitioners should follow a mitigation strategy [18]. This consists in estimating the time required to minimize these risks, if they would become real project problems.

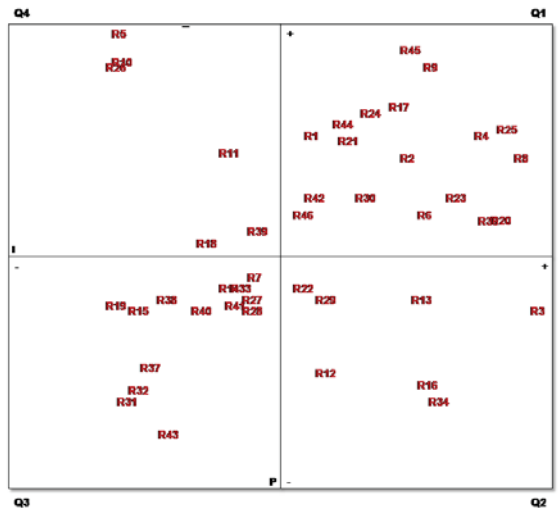

Fig. 1. IPA matrix

5. Conclusions

A successful management of IS/IT projects requires practitioners to follow effective strategies for managing risks. The focus of IS/IT project management studies is the risk assessment. This is explained why information about the importance of project risks supports the practitioners to select a better risk management strategy. With this in mind, this paper proposes the use of IP approach to select the most suitable risks response strategy in IS/IT projects. In this way, we carried out a checklist of risks. Later, the factors identified were evaluated according to the definition of risk exposure, and placed in an IP matrix. The findings allow us to identify the most suitable strategy for managing each risk in a more effective way.

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Nomenclature

IS/IT	Information Systems/Information Technologies
IPA	importance-performance analysis