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Risk Management in Information Systems Projects:
It Can Be Risky Not To Do It

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ABSTRACT

Information technologies (IT) and information systems (IS) are the backbone of any developed business, and organizations without them cannot compete. In recent decades, many best practices standards, and guides have been made available to project managers and organizations aimed to improve project management. Unfortunately, IS projects continue to show a poor track record, and problems related to project management performance persists. Risk management has a vital role in this context since it can increase the likelihood and impact of positive events, and decrease the likelihood and impact of adverse events in the project. This article presents the results of an international web-based survey, studying if risk management processes are being implemented consistently in IS project management. The obtained results show low levels of risk management processes implementation and reinforce the idea that "it can be risky not to do risk management," demanding more research in this area.

KEYWORDS

Information Systems, Information Technology, Processes, Project Management, Projects, Risk Management

INTRODUCTION

An information system (IS) project is a temporary endeavor undertaken to create a unique product, service, or result (PMI, 2017), as the deployment of a commercial-off-the-shelf application, a consultancy assignment, the transformation of a business process by using IT, the renewing of an information technology (IT) infrastructure, among others. A distinctive feature of IS projects is the fact of being socio-technical undertakings carried out to improve an organization and to achieve business benefits (Varajão, 2018b).

Active IS project management is essential in the context of the development of successful projects. That is particularly evident in large IS projects, where the need for guarantying a competent project management structure becomes crucial due to the complexity involved.

Despite the attention that project management has received in recent years, in many cases, the projects are still not providing the expected outcomes or success rates (Varajão, 2018a). For instance, IS projects should enhance firm performance (Gonzálvez-Gallego et al., 2014), but evaluations frequently reveal that organizations are failing to achieve the intended benefits from their IS investments (Coombs, 2015).

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A common characteristic of failed projects is the lack of effective project management (Langer et al., 2008). Risk management is an important part of project management as it comprises processes such as identification, analysis, response planning, response implementation, and monitoring risk on a project (PMI, 2017). Efficient project risk management is lauded to increase the likelihood and impact of positive events, as well as to decrease the likelihood and impact of adverse events in the project.

Given the recurrent IS project management performance problems and the importance of risk management to project success, the purpose of this article is to address a gap in the literature by studying if risk management is being consistently implemented in IS projects. To do it, we have conducted an international survey with experienced project managers.

This article is organized as follows. The following section presents some fundamental concepts of project risk management. The research design and methodology are described next. Then, the key findings and results are presented and discussed. Finally, we conclude with the main insights as well as with some highlights for further research.

BACKGROUND

All IS projects are risky since they are unique undertakings with varying degrees of complexity that aim to deliver benefits (PMI, 2017). In discussing risk management, it is necessary to consider two main aspects. The first is about understanding and defining the notions of uncertainty and risk. Knight and Frank (2012) make a distinction between measurable uncertainty (which can be considered risk) and non-measurable uncertainty. One can assume that risks are related to events that are either perceived or perceptible and the likelihood of which can be estimated (Hofman and Grela, 2018).

A general dictionary definition states that risk is "the possibility of loss or injury." This definition highlights the negativity ("loss or injury") often associated with risk and points out that uncertainty ("possibility") is involved (Schwalbe, 2018). On the one hand, following PMI (2017) definition, a risk is "an uncertain event or condition that, if it occurs, has a significant positive or negative effect on at least one objective." This means that, in a project, we can have negative risks, but also positive risks (thus having a positive effect on meeting project objectives). IPMA (2015) distinguishes risks (negative effects) from opportunities (positive effects), stating that they should always be viewed considering their relation to and consequences for realizing the objectives of the project.

Risk can exist at two levels within the project (PMI, 2017): 1) individual project risk, which is an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives; 2) overall project risk, which is the effect of uncertainty on the project as a whole, arising from all sources of uncertainty, including individual risks, and representing the exposure of stakeholders to the implications of variations in project outcome (both positive and negative).

When unmanaged, these risks have the potential to cause deviations to the project's plan and fail to achieve the defined project objectives. Consequently, the effectiveness of Project Risk Management is directly related to project success (PMI, 2017). According to PMI (2009, p. 4), "Project Risk Management aims to identify and prioritize risks in advance of their occurrence and provide action-oriented information to project managers. This orientation requires consideration of events that may or may not occur and are therefore described in terms of likelihood or probability of occurrence in addition to other dimensions such as their impact on objectives."

The goal of project risk management can be viewed as minimizing potential adverse risks while maximizing potential positive risks (opportunities) to optimize the chances of project success. Managing negative risks involves several possible actions that project managers can take to avoid, lessen, change, or accept the potential effects of risks on their projects. Positive risk management is like investing in opportunities, aiming to exploit or enhance it (Schwalbe, 2018).

Despite being a frequently overlooked aspect of project management, risk management can result in significant improvements in the ultimate success of projects (Schwalbe, 2018). By implementing risk management processes, it is possible to increase the likelihood of attaining the project's

milestones, improve stakeholder level of satisfaction and confidence, improve operational efficiency and effectiveness, minimize losses, and establish a solid basis for decision making. These benefits leverage the organizations' performance and success, enhancing their overall level of resilience and self-improvement. Therefore, it is of utmost importance to carry out risk management processes, such as planning, identification, analysis, response planning, and controlling risk on any project developed in the organization (PMI, 2017; PMI, 2009).

Risk management standards provide some general guidelines to point out a path towards increasing the awareness of matters related to risk and its impacts (ISO, 2009). Nevertheless, it is not intended to promote uniformity of risk management across all types of organizations. The level of risk management implementation varies a lot depending on the organizational context (Teller et al., 2014), as well as on the level of project's complexity, the degree of project's technical challenge, the maturity/experience of the project manager and his team within the project's scope and context, among other factors that might condition the project's execution and its overall level of success. The design and implementation of risk management require managers to take into account the multiple needs of an organization and consider specific objectives, context, structures, operations, processes, functions, projects, products, services, or assets as well specific practices employed (ISO, 2009; PMI, 2017).

In the case of IS projects, risk management is currently a hot topic in the existing literature. Several studies depict the need for risk management (Varajão et al., 2017). Studies like, for instance, Jun et al. (2011) provide tangible evidence showing the link between risk management and project success. However, in many cases, there is still low adoption of risk management processes and practices. Kutsch and Hall (2009) point out some of the reasons for this. They state that in one-third of the cases that they have studied, no formal project risk management process was applied due to budget limitations. Furthermore, Kutsch et al. (2013), digging deeper into these reasons, have established some of the reasons behind this disengagement: it seems that managers sometimes see risks as fictional pieces of management, and these are consequently ignored. This fact might point out to an underlying level of risk illiteracy among the decision-makers which might limit the adoption of the proper practices towards the development of the required competences, as well as the adoption of techniques and processes towards establishing the adequate management procedures.

METHOD

Our method involved administering a questionnaire-based survey to IS project managers. Based on the available version of PMBOK (PMI, 2013) at the time of data collection and ISO 21500:2012 (ISO, 2012), an online questionnaire was used to measure the implementation of risk management processes in IS projects (among other project management related aspects), as described in the next sections.

Measurement Instrument

The questionnaire contained a list of six processes related to risk management, organized in two groups (planning and monitoring & controlling): Plan Risk management [planning]; Identify risks [planning]; Perform qualitative risk analysis [planning]; Perform quantitative risk analysis [planning]; Plan risk responses [planning]; Control risks [monitoring & controlling].

Besides, there was an open question so that participants could suggest other processes. A Likert scale ("Never," "Occasionally," "Often," "Always"), was used to measure the frequency of process implementation in practice. The survey also included other knowledge areas of management, aiming to compare results. The context validity of the questionnaire was examined before starting the survey. Two IS and project management professors and nine IS project managers pilot-tested the survey. The results indicated a few minor refinements that were made to the final questionnaire.

Data Collection

Our sample of IS project managers was primarily drawn from the worldwide community of LinkedIn users. A discussion topic with a link to the online survey was posted in several groups of project management and IS. Besides, follow-up emails were sent to project managers and chief information officers (with project management duties), with information about the study and a link to the survey. In total, 111 responses were obtained. Since four of the responses were unusable due to being incomplete, a final number of 107 complete questionnaires, representing a total of 472 IS projects (each participant was requested to report on the last three to five complete projects in which they have participated), were used in our analysis.

Table 1 summarizes the demographics of participating project managers. The respondents consisted mainly of project managers (52.3%) and chief information officers (19.7%), all with experience in PM. The majority of respondents are over 40 years old (71.1%). Also, the majority has more than ten years' experience (58%), while 18.7% has more than 20 years' experience. Finally, 93.5% of the respondents indicated that they held graduate or postgraduate degrees, and 65.5% have training or certification in project management.

Table 2 summarizes the characteristics of the respondents' companies. Respondents came from organizations of varying sizes (small, medium, and large). Many of the companies align their PM methodology with PMBOK (37.4%), while only 12.1% use a PM maturity model to improve their PM practices. The sample is split evenly in several of the contextual variables (e.g., total employees and turnover), which renders the analysis more reliable. The majority of companies have headquarters in Europe (62.6%) and North America (23.4%), and international presence (60.7%).

To sum up, the respondents are experienced project managers, representing a variety of company sizes and PM approaches.

RESULTS AND DISCUSSION

According to PMI (2017, p. 397), "All projects are risky since they are unique undertakings with varying degrees of complexity that aim to deliver benefits… When unmanaged, these risks have the potential to cause the project to deviate from the plan and fail to achieve the defined project objectives."

Figures 1 and 2 show the frequency of risk management standard processes in IS projects. Figure 1 shows that risk management occupies the lowest ranked position of the project management knowledge areas, considering the frequency of processes implementation in IS projects. Figure 2 also shows that several risk management processes are "never" or only "occasionally" put into practice.

As shown in Figure 1, the core areas of cost, time, and scope are carried out most often, and that was somewhat expected. Nevertheless, this does not mean that they are done well since risk-neglected practices can hinder the correct consideration of events that may (or may not) occur and have an impact on the project's objectives.

It is also noticeable the low frequency of procurement management process implementation, but this can be explained by the fact that not all projects require subcontracting or acquisitions. Still, to mention that subcontracting is a common risk transfer strategy, especially when the projects' complexity and degree of novelty are high. Furthermore, it can be important to dilute the potential negative impacts associated with the development of some actions or tasks.

What truly stands out in Figure 1 is that risk management processes are the least implemented in practice among all the management areas. We can try to find an explanation for this. On the one hand, we can argue that this may be due to IS project managers opt for an informal approach to risk management or opt for issue/crisis management instead of risk management. On the other hand, the focus of this study was on standard processes, and since the risk management implementation varies according to the project and organizational context (Teller et al., 2014), these processes might not

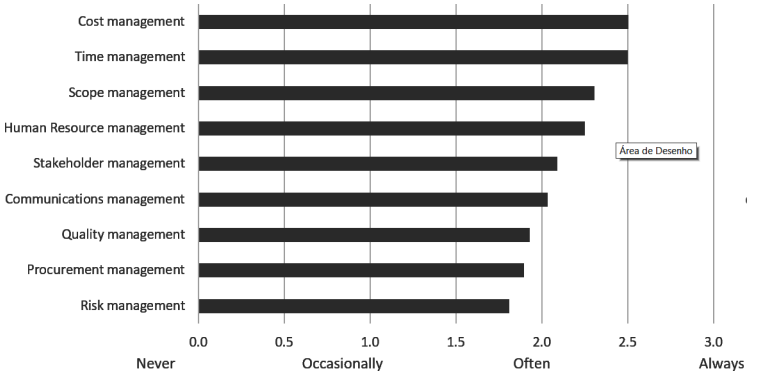
Table 1. Profile of respondent project managers

	Frequency	Percent
Gender		
Male	85	79.4
Female	22	20.6
Age		
27 – 40	32	29.9
41 – 50	48	44.9
> 50	27	25.2
Education		
Undergraduate	7	6.5
Graduate	40	37.4
Postgraduate	60	56.1
Education area		
Informatics	20	18.7
Information Systems	39	36.5
Business Management	27	25.2
Other	21	19.6
Training or certification in project management		
Yes	70	65.4
No	37	34.6
Current position		
Project manager	56	52.3
CIO / IT Director	21	19.7
Director / Manager	15	14.0
Other	15	14.0
Average years in the position		
1 – 10	23	21.5
11 – 20	45	42.1
> 20	39	36.4
Average years in project management		
1 – 5	13	12.1
6 – 10	32	29.9
11 – 20	42	39.3
> 20	20	18.7
Number of projects as the project manager		
< 11	25	23.4
11 – 30	42	39.2
> 30	40	37.4

Table 2. Profile of respondents' companies

	Frequency	Percent
Total employees		
1 – 200	33	30.8
201 – 500	20	18.7
501 – 2000	22	20.6
> 2000	30	28.0
Did not know / Did not answer	2	1.9
Turnover		
< 1.000.000	15	14.0
1.000.000 – 10.000.000	19	17.8
10.000.001 – 250.000.000	24	22.4
> 250.000.000	23	21.5
Did not know / Did not answer	26	24.3
Headquarters		
North America	25	23.4
Europe	67	62.6
Other	15	14.0
Number of countries where is present		
1	42	39.3
2 – 10	36	33.6
> 10	29	27.1
Certifications		
Yes	50	46.7
No	57	53.3
Project management approach/methodology		
PMBOK or Custom (based on PMBOK)	40	37.4
Custom (based on various methodologies)	26	24.3
It is not used a formal methodology	22	20.5
Other	19	17.8
Uses a project management maturity model		
Yes	13	12.1
No	94	87.9
Main software used in project management		
MS Project	55	51.4
MS Excel	20	18.7
Custom	13	12.1
Other	19	17.8

Figure 1. Ranking of project management processes in IS projects, grouped by knowledge area



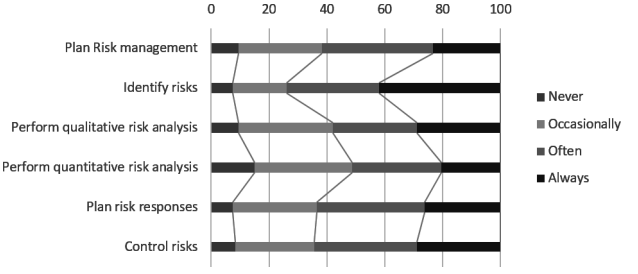
be suitable for IS projects. If so, this points to a significant gap that needs to be addressed towards supporting IS project managers in the adoption of the right practices to manage projects effectively.

On the other hand, results show that the majority of our sample implemented standard processes at least occasionally, and the participants identified no additional processes or actions related to risk management. By observing Figure 2, we can conclude that the percentage of cases in which the processes "are never implemented" or are "occasionally implemented" is too high. In our opinion, this reality should raise the attention of managers and researchers since it illustrates a poor culture of effective risk management in IS projects and might, somehow, explain the low levels of success frequently reported.

Since project risk management involves understanding potential problems that might occur on the project and how they might hinder project success (Schwalbe, 2018), not doing it can endanger (put at risk) the overall project. Project control is a critical function of project management (Perrier et al., 2019), and without adequate risk management cannot be done in full.

However, the adoption of risk management into organizational practices, can bring together a certain level of mistrust and apprehension, coupled with a sense of "analysis paralysis." Top managers fear that too much time might be spent on examining concerns and possible problems rather than on trying to solve them (Pritchard, 2014). For that reason, the International Standard Organization (ISO), through its risk management standard, recommends that organizations integrate the process for managing risks into the organization's overall governance, strategy and planning, management, reporting process, policies, values and culture (ISO, 2009). The level of awareness on these matters should increase the likelihood of adopting practices and thus promote higher levels of success.

Figure 2. Risk management processes in information systems projects



CONCLUSION

Several studies depict the need for risk management in IS projects (Varajão et al., 2017) as, for instance, Jun et al. (2011) that provide evidence for the relationship between risk management and project success.

Our study shows that standard processes related to time management, cost management, and scope management, are frequently implemented in IS projects. However, the processes related to risk management are relegated to a secondary place. In our opinion, this is a matter of concern, since the absence of a consistent approach for managing risks in IS projects can lead to several undesirable results: it can reduce the likelihood of attaining the projects' objectives; compromise the level of confidence and reduce the level of satisfaction of stakeholders; decrease the operational efficiency and effectiveness; to mention a few. According to PMI (2017), "organizations should choose to take project risk in a controlled and intentional manner in order to create value while balancing risk and reward."

Project Risk Management aims to identify and prioritize risks in advance of their occurrence and provide action-oriented information to project managers. It becomes even more critical when the scope, complexity, dimension, and level of innovation required is higher. These are strong reasons that ground the need for implementing risk management processes consistently in IS project management.

Before discussing directions for future research, it is necessary to point out the limitations of this study. It represents an advance on earlier work; however, it still has some limitations. Like other studies, one limitation is that it relies on self-reported evidence of recent experiences of project managers. This means that each project that is included in this study relies on the memory of one project manager with responsibility for the project. Regarding the sample, to note that the majority of participants are from Europe (62.6%) and North America (23.4%), and further research is advisable in other geographies to expand results.

Some avenues for future research would be: 1) to examine why IS project managers are not implementing processes from project management risk standards, as well as to discover more about the consequences of this behavior; 2) being Agile development methods currently widely used among business enterprises (Nuottila et al., 2016), explore the implications for risk management practices and tools; 4) the management of project portfolio risks has gained more attention increasingly from researchers (Hofman and Grela, 2018) but it is still a gap in the literature concerning IS projects.

To conclude, just to say that something is sure about Risk Management… it can be *risky* not to do it!

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REFERENCES

Coombs, C. R. (2015). When planned IS/IT project benefits are not realized: A study of inhibitors and facilitators to benefits realization. *International Journal of Project Management*, *33*(2), 363–379. doi:10.1016/j.ijproman.2014.06.012

Gonzálvez-Gallego, N., Molina-Castillo, F. J., Soto-Acosta, P., Varajão, J., & Trigo, A. (2014). Using integrated information systems in supply chain management. *Enterprise Information Systems*, *9*(2), 210–232. doi:10.1080/17517575.2013.879209

Hofman, M., & Grela, G. (2018). Project portfolio risk categorisation – factor analysis results. *International Journal of Information Systems and Project Management*, *6*(4), 39–58.

Hofman, M., & Grela, G. (2018). Project portfolio risk categorisation - factor analysis results. *International Journal of Information Systems and Project Management*, *6*(4), 39–58.

IPMA. (2015). Individual Competence Baseline (v. 4.0). International Project Management Association.

ISO. (2009). *ISO 31000:2009 Risk management - Principles and guidelines*. International Organization for Standardization.

ISO. (2012). *ISO 21500:2012 Guidance on project management*. International Organization for Standardization.

Jun, L., Qiuzhen, W., & Qingguo, M. (2011). The effects of project uncertainty and risk management on IS development project performance: A vendor perspective. *International Journal of Project Management*, *29*(7), 923–933. doi:10.1016/j.ijproman.2010.11.002

Knight, E., & Frank, H. (2012). *Risk, uncertainty and profit*. Courier Corporation.

Langer, N., Slaughter, S. A., & Mukhopadhyay, T. (2008). Project Managers' Skills and Project Success in IT Outsourcing. In *Proceedings of ICIS 2008 - International Conference on Information Systems*. Association for Information Systems.

Nuottila, J., Aaltonen, K., & Kujala, J. (2016). Pr Challenges of adopting agile methods in a public organization. *International Journal of Information Systems and Project Management*, *4*(3), 65–85.

Perrier, N., Benbrahim, S.-E., & Pellerin, R. (2019). A comparison of project control standards based on network analysis. *International Journal of Information Systems and Project Management*, *7*(3), 37–62.

PMI. (2013). *A Guide to the Project Management Body of Knowledge (PMBOK Guide)* (5th ed.). Project Management Institute.

PMI. (2017). *A Guide to the Project Management Body of Knowledge (PMBOK Guide)* (6th ed.). Project Management Institute.

Pritchard, C. L. (2014). *Risk Management: Concepts and Guidance* (5th ed.). Auerbach Publications.

Schwalbe, K. (2018). *Information Technology Project Management* (9th ed.). Cengage Learning.

Teller, J., Alexander, K., & Gemünden, H. G. (2014). Risk Management in project portfolios is more than managing project risks: A contingency perspective on Risk Management. *Project Management Journal*, *45*(4), 67–80. doi:10.1002/pmj.21431

Varajão, J. (2018a). A new process for success management – bringing order to a typically ad-hoc area. *Journal of Modern Project Management*, *5*(3), 92–99.

Varajão, J. (2018b). The many facets of information systems (+projects) success. *International Journal of Information Systems and Project Management*, *6*(4), 5–13.

Varajão, J., Colomo-Palacios, R., & Silva, H. (2017). ISO 21500:2012 and PMBOK 5 processes in information systems project management. *Computer Standards & Interfaces*, *50*, 216–222. doi:10.1016/j.csi.2016.09.007

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