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Project Management Processes – Impact on the Success of Information Systems Projects

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Abstract. Purpose: Few studies in the literature address the success of enterprise Information Systems (IS) projects, namely focusing on how success is influenced by project management practices. This research studied the impact of ISO 21500/PMBOK processes on the success of IS projects, aiming to contribute to a better understanding of management practices importance in the context of this type of projects. Design/methodology/approach: An international survey was used to collect data, which was analysed using descriptive and inferential statistics. Findings: The results show higher levels of success than usually reported in the literature. Furthermore, this research shows that overall success is strongly influenced by ISO/PMBOK project management processes, thus reinforcing the relevance of competent project management to improve the results of IS projects. Originality: Focusing on the specific case of IS projects, this study shows that higher levels of success are achieved by organizations with higher project management maturity.

Key words: Information Systems, projects, project management, processes, practice, success, project success, ISO 21500, ISO 21502, PMBOK, survey.

1. Introduction

Given the current importance of Information Systems (IS) in organizations due to their role in improving productivity and leveraging investments (Hu and Quan, 2005; Özturan *et al.*, 2019), it is crucial that IS projects succeed. However, it has been frequently reported that IS projects show low levels of success (Iriarte and Bayona, 2020; Bilir and Yafez, 2021).

The complexity involved (Morcov *et al.*, 2020), project underestimation of resources and time, inadequate requirements, changes in scope, unassessed, uncontrolled or unmanaged risks throughout project implementation, unrealistic expectations, and inappropriate methodology are some of the reasons pointed out for the failure of IS projects (Cerpa and

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Verner, 2009). Poor project management practices seem to be a significant cause of many issues verified in these projects.

Some well-known studies – e.g. the Standish Group's Chaos Reports (Standish Group, 1994, 2015, 2018, 2020) – clearly state low levels of success over the years. However, these results have been somewhat contested, because studies are not always described in detail. Furthermore, they are typically focused on software development projects and not specifically on enterprise IS (socio-technical) projects (involving Information Technology (IT) implantation in organizations) (Varajão and Carvalho, 2018).

Even though many studies in the literature show results of software development projects, few of them address the success of IS projects and aim to explain how such success is influenced by project management practices (Varajão *et al.*, 2017). Defining, understanding, and achieving success in a project is not easy nor straightforward since it depends on many aspects, such as stakeholders' perceptions, project characteristics (e.g. complexity), circumstantial aspects (e.g. context), evaluation details (e.g. criteria and measurement models), and many other aspects that need to be considered (Varajão *et al.*, 2022). For the purpose of our study, considering the efficiency and efficacy of a project, project success is defined as project management success combined with output success (Baccarini, 1999).

Our study complements existing research by addressing the following research question: "Is the success of Information Systems projects influenced by project management processes implementation?". An international survey was conducted with experienced IS project managers in order to answer this research question, asking them to report both the success level achieved in the last three to five (concluded) projects they had participated in and the frequency of implementing a list of project management processes. Subsequently, several statistical analyses were carried out to test the influence of processes implementation on project success.

This paper is organized into five sections: literature review; research design and methodology, main findings and results; discussion of results, and, finally, the conclusion, which presents the implications of this study for practice and research, as well as future work.

2. Background

2.1. *Information Systems Projects*

IS are a key element in modern organizations and are present in almost every aspect of business (Varajão and Trigo, 2016). This makes IS a vital organizational asset for improving productivity, reducing operating costs, or gaining competitive advantages, to mention a few aspects.

Business and technological environments are continually changing; thus, for organizations to be able to stand out from competitors, they need to develop and deploy new systems (Patnayakuni and Ruppel, 2010). One way of organizing tasks and resources is to carry out projects.

Companies use a panoply of IS solutions to support their activities at different levels of management. Due to the increasing sophistication of organizations, their business processes and IT requirements, IS projects are also becoming more complex. They can assume many sizes and forms, be more transversal in the organization or more specific, more strategic or more operational. Also, they can include implementation of ERP (Enterprise Resource Planning systems), CRM (Customer Relationship Management systems), SCM (Supply Chain Management systems), BI (Business Intelligence systems), and ERP modules, or development of customized systems, system improvement, process improvement using IT, system migration, infrastructure improvement, consulting and other (Cadle and Yeates, 2008). Moreover, development/implementation type can vary from customized development up to COTS (Customer Of The Shelf)/packaged software implementation (or both).

2.2. *Project Success*

Project management success and the success of project outputs are two distinct components of project success (Baccarini, 1999). On the one hand, project management success focuses on the management process, mainly on the project's successful execution regarding the three dimensions of scope, time, and cost, which indicates its degree of efficiency and effectiveness. On the other hand, outputs' success focuses mainly on the effects of the project's resulting products or services in the post-project stage.

Although project management success and success of outputs are independent, project management failure may jeopardize the outputs' success. Therefore, the project and its resulting products or services should not be considered in isolation (Marnewick, 2012). One of the difficulties in measuring success regards the fact that many criteria are stakeholder and context-specific (Davis, 2017) and should be defined for each particular project (Varajão, 2018a,b; Varajão *et al.*, 2022).

The literature offers many insights on success. For example, Davis (2017) identifies a measurement method for stakeholder groups' perceptions on project success, and states that benefits to the stakeholder group, time/cost/quality, and accountability are some of the dimensions of success analysis. The project managers' perspective has also been studied. For example, Sanchez *et al.* (2017) concluded that the project manager has a significant impact on success, particularly on the time success dimension; and Aga *et al.* (2016) contributed with a theory on the role of leadership in project success. Another study concluded that the quality of the project management information system (software) has a positive impact on project success (Rahman *et al.*, 2018). Furthermore, teamwork quality is perceived to affect team performance and significantly impact personal success (Lindsjørn *et al.*, 2016); risk identification and risk response planning influence process performance and the overall aspects of project success (Pimchangthong and Boonjing, 2017); and business managers' IT competence has a significant influence on project success (Engelbrecht *et al.*, 2017). However, there is a gap in the literature concerning the influence of project management practices on success, namely in what concerns project management processes.

2.3. *Project Management Processes*

A project management body of knowledge is the total knowledge within the profession of project management and may include proven traditional practices that are widely applied and innovative practices in the profession (Sydow *et al.*, 2004). The existence of identifiable patterns and generalizations from which rules, controls, and guidelines for best practices can be defined is the basis of the knowledge reflected in the Bodies of Knowledge (Martinsuo *et al.*, 2006), and practitioners use these Bodies of Knowledge as best practice guides (Shi, 2011).

In the last decades, professional project management associations have published several project management Bodies of Knowledge, such as PMBOK (PMI, 2021), ICB (IPMA, 2018), APM BOK (APM, 2019) and P2M (PMAJ, 2017). PMBOK, APM BOK, and P2M are among the most influential ones (White and Fortune, 2002).

PMBOK is a formal document that describes established norms, methods, processes, and practices and is a globally recognized standard for the project management profession, including accepted good practices for project management practitioners. PMBOK (PMI, 2013, 2017), includes several process groups: initiating, planning, executing, monitoring and controlling, and closing. It also identifies several "knowledge areas" for organizing processes, including integration, scope, schedule, cost, resource, quality, risk, stakeholder, communication; and procurement. The current version is PMBOK 7th edition (PMI, 2021).

ISO 21500:2012 (ISO, 2012) is an ISO (International Organization for Standardization) standard that provides guidance on project management concepts and processes and is aligned with the PMBOK. It identifies the following process groups: initiating, planning, implementing, controlling, and closing. It also defines ten "subject areas" for organizing processes: integration, scope, time, cost, resource, quality, risk, stakeholder, communication, and procurement. The current version is ISO 21502:2020 (ISO, 2020).

The differences between ISO 21500:2012 and PMBOK are minimal in what regards process groups and subject/knowledge areas. One of the differences lies in the description of tools and techniques, since ISO 21500:2012 does not include details about them (Varajão *et al.*, 2017).

3. Method

Our method involved administering an online survey to IS project managers. The collected data was analysed using quantitative statistical analysis, namely descriptive and inferential analysis.

3.1. *Measurement Instrument*

Based on the versions of standard ISO 21500:2012 (ISO, 2012) and the PMBOK Guide (PMI, 2013) available at the time of data collection, as well as on a literature review (e.g.

Varajão *et al.*, 2017), a survey instrument was created to measure both the implementation of IS project management processes and the success of projects. The questionnaire contained a list of forty-six processes (see Table 1), structured into ten areas of knowledge: Scope, Time (Schedule), Cost, Quality, Resources, Stakeholder, Risk, Communications, Procurement, and Integration. A Likert scale ("Never", "Occasionally", "Often", "Always"), concerning the frequency of process implementation in practice, was used to measure the different items.

The instrument was also used to measure several aspects of IS project success. We asked participants about the overall success level, since the criteria to evaluate project success are specific to each project in particular (Varajão *et al.*, 2022). Additionally, we focused on the project's efficiency (meeting cost, time, and scope goals) (Serrador and Pinto, 2015). Participants were asked to indicate the characteristics, the level of success achieved, and the level of compliance with the scope, time, and cost regarding the last three to five completed projects in which they had been involved.

The items were evaluated using a Likert scale. A similar scale was used for "scope", "time" and "cost". For instance, the scope scale was: "Scope not fulfilled"; "Scope fulfilled, WITH changes to the original plan"; "Scope fulfilled, WITHOUT changes to the original plan". The overall "level of success" was measured using a bipolar semantic differential continuous line scale. For purposes of analysis, the line was divided into eleven equal sections and coded from 0 ("project abandoned") to 10 ("complete success").

The data was collected at project level. Prior to the study, a pilot test was carried out to validate the questionnaire, involving two IS and project management professors, and nine IS project managers, which led to some subsequent adjustments to the questionnaire.

3.2. *Data Collection*

The sample for this study consists of IS project managers who were contacted via LinkedIn by posting a topic about the study in several project management and IS groups. Follow-up emails were subsequently sent to project managers and chief information officers (with project management duties) with a link to the online survey. A total of 111 responses were obtained. Since four of the responses were unusable because they were incomplete, a final number of 107 complete questionnaires, representing a total of 472 IS projects, were used in our analysis, yielding a total of 96.4% valid responses.

Appendix A summarizes the respondents' demographic data. The respondents are experienced project managers, most of them over 40 years of age (70.1%) and having more than ten years of experience (58%), whereas only 18.7% have more than 20 years of experience. Furthermore, 93.5% of the respondents indicated holding graduate or postgraduate degrees. Most respondents (65.4%) have training or certification in project management and have extensive experience in the field: 58% with more than 11 years of experience, and only 12.1% with five years or less). Finally, the respondents had already been project managers in a considerable number of projects: 76.6% with more than 11 projects, 37.4% of which had already managed more than 30 projects.

The respondents' organizations have different sizes (small, medium, and large). The companies in the sample come from two geographical areas, Europe (62.6%) and North

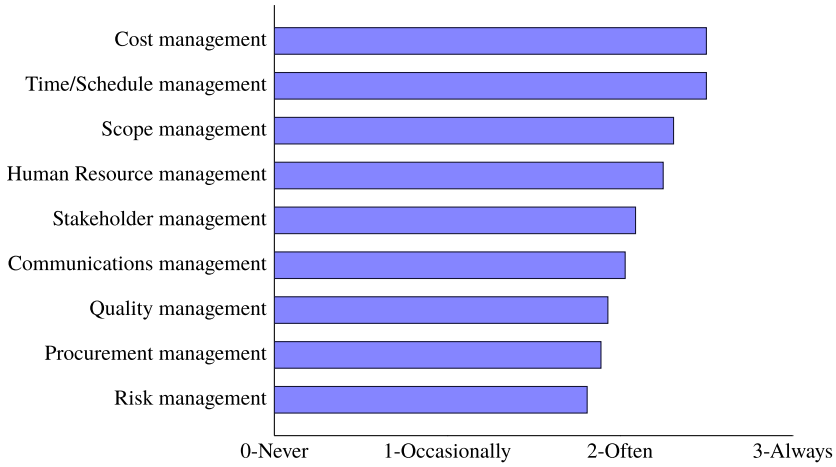

Fig. 1. Ranking of project management processes in IS Projects, grouped by knowledge area.

America (23.4%), most of them having an international presence (60.7%). Many of these companies align their project management methodology with PMBOK (37.4%), while only 12.1% use a project management maturity model to improve their project management practices. MS Project is the most used software in project management (51.4% of the answers), followed by MS Excel, and by customized solutions (18.7% and 12.1%, respectively).

In summary, the respondents in this study are experienced project management professionals from a wide range of companies.

4. Results

Project managers were asked to characterize the last projects they had participated in. Each of them reported three to five completed projects, of varying types, costs, and duration, as summarized in Appendix B. Almost 42% of the projects were related to the implementation of ERP/CRM systems; 19.3%, to the implementation of custom systems; and the remaining, to BI implementation, process improvement, and others (e.g. system maintenance). The systems' development/implementation type was mainly customized development (41.9%) and implementation of packaged software/Commercial of the Shelf (COTS) in combination with customized development (31.6%).

Regarding project duration, slightly more than half of the projects (54.1%) lasted up to nine months, and the average duration of a project was six months. Concerning budget, the reported projects represent a wide range of project sizes, including budgets under 25,000 Euros to budgets over 2,000,000 Euros, with the majority of the projects having a budget under 250,000 Euros).

Figure 1 shows the execution frequency of project management processes grouped by the respective knowledge area. As expected, cost, time, and scope management are

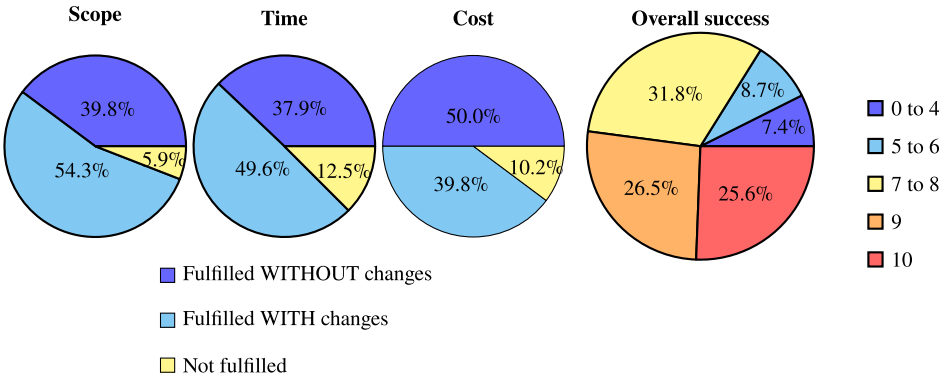

Fig. 2. Level of success achieved in IS projects.

performed very often. The same does not happen with processes such as risk, procurement, and quality management.

Regarding the projects' success level, as shown in Fig. 2, IS projects are achieving high levels of success, with the majority of projects at the top levels (about 52% of the projects are in levels 9 and 10 of success), and only 16.1% are below level 7. In contrast, the percentage drops to 7.4 regarding the projects below the middle point (level 5). Compliance with scope, time, and cost is also frequent, albeit with changes to the initial plan.

Mann-Whitney, Kruskal-Wallis, and Spearman's rho statistics were used to investigate the influence of project management processes on success. These non-parametric tests were selected since the assumptions for using parametric tests were violated (e.g. normal distribution of variables). These tests were also chosen considering: the number of variables, the type of measurement and the number of levels of variables, and compliance with statistical assumptions.

Kruskal-Wallis tests were used to compare the four levels of process implementation ("Never", "Occasionally", "Often", "Always") on the dependent variable scope management success, time (schedule) management success, and cost management success. Mann-Whitney tests were used to compare the four levels of process implementation on the projects' compliance to scope, time, and cost (i.e. projects in which "scope, time, and cost were *simultaneously* fulfilled WITHOUT changes to the original plan"). To check whether there was a statistically significant association between processes and the overall success (level of success), correlations were computed using Spearman's rho statistics.

Table 1 sums up the statistical tests, highlighting the cases that have significant results ($p < 0.05$), showing the relationship of project management processes' executing frequency on success.

5. Discussion

IT/IS projects have not been synonymous with "success" in the last decades (Petter and Vaishnavi, 2008). The Standish Group reports are a landmark in the development of this

Table 1
Influence of processes on success.

	Processes	Scope management success	Time management success	Cost management success	Proj: Scope, Time and Cost simultaneously fulfilled WITHOUT changes	Overall success
		p	p	p	r ($p < 0.05$)	
Integration Management (IM)	IM: Develop project charter	–	–	–	–	0.145
	IM: Develop project management plan	–	–	–	–	0.181
	IM: Direct and manage project work	–	–	–	–	0.163
	IM: Monitor and control project work	–	–	–	–	0.113
	IM: Perform integrated change control	–	–	–	–	–
	IM: Close project or phase	–	–	–	0.038	0.214
Scope Management (SM)	SM: Plan scope management	–	–	–	–	0.155
	SM: Collect requirements	–	–	–	–	0.156
	SM: Define scope	–	–	–	–	0.203
	SM: Create WBS	–	–	–	–	–
	SM: Validate scope	–	–	–	–	0.106
	SM: Control scope	–	–	–	–	–
Time (Schedule) Management (TM)	TM: Plan schedule (time) management	–	–	–	–	–
	TM: Define activities	–	–	–	–	0.152
	TM: Sequence activities	–	–	–	–	0.098
	TM: Estimate activity resources	–	–	–	–	–
	TM: Estimate activity duration	–	–	–	–	0.092
	TM: Develop schedule	–	–	–	–	0.121
	TM: Control schedule	–	–	–	–	0.128
Cost Management (CM)	CM: Plan cost management	–	–	–	0.002	0.159
	CM: Estimate costs	–	–	–	–	0.159
	CM: Determine budget	–	–	–	–	0.118
	CM: Control costs	–	–	–	0.022	–
Resource Management (HRM)	HRM: Plan resource management	–	–	–	0.002	0.192
	HRM: Acquire resources	–	–	–	0.021	0.195
	HRM: Develop team	–	–	–	<0.001	0.126
	HRM: Manage team	–	–	–	0.005	0.212
Quality Management (QM)	QM: Plan quality management	–	–	–	0.001	0.167
	QM: Manage quality	–	–	–	0.001	0.145
	QM: Control quality	–	–	–	0.001	0.230
Risk Management (RM)	RM: Plan risk management	–	–	–	0.043	0.171
	RM: Identify risks	–	–	–	–	0.162
	RM: Perform qualitative risk analysis	–	–	–	–	0.122
	RM: Perform quantitative risk analysis	–	–	–	–	0.169
	RM: Plan risk responses	–	–	–	0.040	0.149
	RM: Monitor risks	–	–	–	0.023	0.175
Stakeholder Management (StM)	StM: Identify stakeholders	–	–	–	0.003	0.224
	StM: Plan stakeholder engagement	–	–	–	0.002	0.188
	StM: Manage stakeholder engagement	–	–	–	0.017	0.165
	StM: Monitor stakeholder engagement	–	–	–	0.006	0.210
Communication Management (CmM)	CmM: Plan communication management	–	–	–	0.002	0.222
	CmM: Manage communications	–	–	–	0.014	0.168
	CmM: Monitor communications	–	–	–	<0.001	0.214
Procurement Management (PM)	PM: Plan procurement management	–	–	–	0.003	0.159
	PM: Conduct procurements	–	–	–	–	–
	PM: Control procurements	–	–	–	–	–
	No. of processes:	0	0	0	21	38

Legend: – Not significant.

vision of "failure". This entity has published the first Chaos Report in 1994 (Standish Group, 1994). Despite focusing on software development projects, the results of the study were extrapolated to IT and IS projects in general. The Chaos Report 2020 (Standish Group, 2020) shows that only 31% of projects are successful, 50% are challenged (fail in at least one criterion, and 19% fail. Over time, with the periodic publication of these reports, the idea that IS projects are problematic has persisted (Marnewick, 2012). Fincham (2002) states that this area often seems to be captive of its own failures (Thomas and Fernández, 2008).

However, the results of our study show that overall IS projects are being completed according to scope, time and cost (respectively, in 94.1%, 87.5% and 89.8%) of the surveyed cases. But when considering the initial baseline, the percentage of projects that simultaneously fulfilled scope, time, and cost (without changes to the initial plan) is about 26.1%. This shows that in the context of IS project management, under the perspective of project managers, fulfillment of scope, time, and cost is not rigidly tied to initial plans.

Table 1 shows that no individual relationship was found between project management processes and the three dimensions of project management success (scope management success, time management success, and cost management success). At first sight, this can be perplexing, since it was expected that at least scope management processes do influence scope management success (or scope compliance), time (schedule) processes do influence time management success (or time compliance), and, similarly, cost management processes do influence cost management success (or cost compliance).

Nevertheless, this can be justified by the fact that scope, time, and cost management processes are the most frequently executed and put in practice in almost all projects. In other words, these particular results can be explained due to insufficient variance in the data sample regarding the execution frequency of processes and the success obtained in each of these knowledge areas.

In contrast, a broad set of processes have a positive impact on overall success, including scope, time, and cost management processes. Overall success (success level) is influenced by 38 processes, which corresponds to more than 80% of the total processes under analysis. In fact, there are very few processes in which a relationship with success has not been found. It is observed that all processes from Resources, Quality, Risk, Stakeholders, and Communications process groups impact overall success. A large percentage (over two-thirds) of the number of processes in Integration, Scope, Time, and Cost process groups also influence overall success. The procurement process group has fewer influencing processes (only the "Planning procurement management" process impacts overall success), which is explainable by the fact that not all projects require procurement.

Regarding projects with no deviations of scope, time, and cost (simultaneously), the number of influencing processes decreases from 38 to 21. What stands out is the influence of processes of Risk Management and Quality Management, since these are the processes least put in practice, and these results highlight their importance for achieving higher levels of success.

Overall, considering the results as a whole, it is clear that projects with more mature and professional project management achieved higher levels of success. This is in line

with Kerzner (2019) findings, as he states that the implementation of project management processes is related to higher maturity levels of project management, enhancing the competitiveness of organizations (Głodziński, 2019).

The results obtained regarding the process group Integration (IM) are also in line with those reported in the literature. For example, Nasir and Sahibuddinm (2011) state that management processes, such as the processes identified in the process group Integration (IM), influence project success more than processes related to technical implementation and development. Plan and project management work are also some of the success factors referred by Chen (2012) and Ram *et al.* (2013). Other studies present similar insights (Chow and Cao, 2008; Farzin *et al.*, 2014; Ismail *et al.*, 2012; Ram *et al.*, 2013; Ziemba and Oblak, 2013).

There are also studies (Müller and Turner, 2007; Panopoulou *et al.*, 2014; Nelson, 2018; Thomas and Fernández, 2008) that confirm that the definition and management of the Scope (process group Scope (SM)) and the definition of the requirements are aspects that determine a project's overall success, as our study also concludes. The results related to the process group Time (schedule) (TM) are also aligned with several studies (Chow and Cao, 2008; Collins and Baccarini, 2004; Nasir and Sahibuddinm, 2011; Müller and Turner, 2007; Nelson, 2018; Thomas and Fernández, 2008), in particular regarding the development, management, and control of time, as well as the realistic estimation of schedule and its activities.

The results obtained in our study corroborate previous research regarding the process group Cost (CM) (Alias *et al.*, 2014; Denolf *et al.*, 2015; Fortune and White, 2006; Nasir and Sahibuddinm, 2011; Osei-Kyei and Chan, 2015), which point to a realistic estimation of costs and budget, as well as their management, as influential factors for success.

Regarding the processes related to the project team included in the Resources group (HRM), the study confirms the need for proper team management (Aga *et al.*, 2016; Ismail *et al.*, 2012; Morlhon *et al.*, 2014; Panopoulou *et al.*, 2014; Wu *et al.*, 2017). However, HRM is not just about team management, since it also involves team planning, building, and development (Chow and Cao, 2008; Nasir and Sahibuddinm, 2011; Ram *et al.*, 2013; Tam *et al.*, 2020), and the management of other resources.

As in our study, the need for quality assessment is referred as one of the processes influencing success (Collins and Baccarini, 2004; Nasir and Sahibuddinm, 2011; Müller and Turner, 2007; Thomas and Fernández, 2008). Regarding risk management, the identification of potential risks and risk plan management are processes mentioned in the literature as potential facilitators of success (Collins and Baccarini, 2004; Poon and Wagner, 2001). However, there was no evidence in the literature about the separation of qualitative risk analyses from quantitative risk analyses, as is considered in our study. Nevertheless, both type of analyses contribute to success.

Regarding the process group Stakeholders (StM), the importance of stakeholders engagement is mentioned by many other studies as a success enhancer (Denolf *et al.*, 2015; Ika and Donnelly, 2017; Nasir and Sahibuddinm, 2011; Pankratz and Basten, 2014; Ram *et al.*, 2013; Yin *et al.*, 2014). Regarding the process group Communication (CmM), several

authors stress the need for effective communication, not only among the project team elements, but also with the other stakeholders, as well as the strategy and channels of communication, and the quality of the information communicated (Brun, 2011; Chen, 2012; Chow and Cao, 2008; Denolf *et al.*, 2015; Dinter, 2013; Farzin *et al.*, 2014; Ismail *et al.*, 2012; Nasir and Sahibuddinm, 2011; Morlhon *et al.*, 2014).

As aforementioned, the process group Procurement (PM) is the one that contributes with fewer processes to success. In the literature, few studies analyse these processes as predictors of success, and the existing studies just refer to the importance of vendor support during project development and implementation (Chen *et al.*, 2012; Dinter, 2013; Farzin *et al.*, 2014).

6. Conclusion

The success of IS projects has been a hot topic in the literature for a long time. However, the reported success can be biased because it often only concerns software development (technical) projects, not enterprise IS (socio-technical) projects.

Our survey results show that IS projects are currently achieving high levels of success, which is in clear contrast to what is reported in the literature, probably because, as discussed, the research is usually focused on software development projects and the notion of success can be different.

Furthermore, this research also shows that overall project success is influenced by 38 project management processes out of 47 ISO 21500/PMBOK processes. Nevertheless, when we consider success as project scope, time, and cost fulfilled without deviation (simultaneously), the number of differentiating processes is 21, of which clearly stand out quality and risk management processes. These are some of the processes least put in practice, but our research shows that they are fundamental for achieving higher levels of success. According to Kerzner (2019), the implementation of project management processes is related to higher maturity levels of project management. Overall, higher levels of success are achieved by organizations with higher project management maturity, i.e. organizations that put into practice a complete set of project management processes from all the relevant knowledge areas.

Our study has important practical, educational, and research implications, because it stresses the relevance of the use of good practices (e.g. ISO 21500/21502 and PMBOK processes) for achieving success in project management. Furthermore, the results obtained highlight the importance of a competent and thorough project management approach that encompasses all the relevant processes and not just a few. One avenue for future research is to study the influence of project management processes on the success of projects in other industries. It would also be important to consider the impact of variables such as project manager training and experience, and contextual variables on the execution of IS project management processes, and consequently, on project success.

A. Respondents' Profile

Project managers			Companies		
	Frequency	Percent		Frequency	Percent
Gender			**Total employees**		
Male	85	79.4	1–200	33	30.8
Female	22	20.6	201–500	20	18.7
Age			501–2000	22	20.6
27–40	32	29.9	>2000	30	28.0
41–50	48	44.9	Did not know/answer	2	1.9
>50	27	25.2	**Turnover**		
Education			<1.000K	15	14.0
Undergraduate	7	6.5	1,000K–10,000K	19	17.8
Graduate	40	37.4	10,000,001–250,000K	24	22.4
Postgraduate	60	56.1	>250.000K	23	21.5
Education area			Did not know/answer	26	24.3
Informatics	20	18.7	**Headquarters**		
Inf. Systems	39	36.5	North America	25	23.4
Business Manag.	27	25.2	Europe	67	62.6
Other	21	19.6	Other	15	14.0
Training or certification in project management			**Number of countries where it is present**		
Yes	70	65.4	1	42	39.3
No	37	34.6	2–10	36	33.6
Current position			>10	29	27.1
Project manager	56	52.3	**Certifications**		
CIO/IT Director	21	19.7	Yes	50	46.7
Director/Manager	15	14.0	No	57	53.3
Other	15	14.0	**Project management approach/methodology**		
Average years in the position			PMBOK or Custom (based on PMBOK)	40	37.4
1–10	23	21.5	Custom based on various methodologies	26	24.3
11–20	45	42.1	No formal methodology is used	22	20.5
> 20	39	36.4	Other	19	17.8
Average years in project management			**Uses a project management maturity model**		
1–5	13	12.1	Yes	13	12.1
6–10	32	29.9	No	94	87.9
11–20	42	39.3	**Main software used in project management**		
> 20	20	18.7	MS Project	55	51.4
Number of projects as project manager			Excel	20	18.7
<11	25	23.4	Custom	13	12.1
11–30	42	39.2	Other	19	17.8
> 30	40	37.4			

B. Projects' Characteristics

	Frequency	Percent		Frequency	Percent
Project type			**Project duration (months)**		
ERP implementation	83	17.6	1–3	82	17.4
CRM implementation	37	7.8	4–6	118	25.0
BI implementation	44	9.3	7–9	55	11.7
ERP module implementation	78	16.5	10–12	94	19.9
Custom system implementation	91	19.3	13–24	89	18.9
Process improvement	41	8.7	>24	34	7.2
Other	98	20.8			
Development/implementation type			**Project budget (Euros)**		
Customized development	198	41.9	25,001–50,000	61	12.9
Packaged software/COTS	82	17.4	50,001–100,000	63	13.3
Customized development + COTS	149	31.6	100,001–250,000	62	13.1
Other	43	9.1	250,001–500,000	57	12.1
			500,001–2,000,000	70	14.8
			>2,000,000	57	12.1
			Did not know/answer	31	6.6

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References

Aga, D.A., Noorderhaven, N., Vallejo, B. (2016). Transformational leadership and project success: the mediating role of team-building. *International Journal of Project Management*, 34(5), 806–818.

Alias, Z., Zawawi, E.M.A., Yusof, K., Aris, N.M. (2014). Determining critical success factors of project management practice: a conceptual framework. *Procedia – Social and Behavioral Sciences*, 153, 61–69.

APM (2019). *APM Body of Knowledge*, 7th edition. Association for Project Management, UK.

Baccarini, D. (1999). The logical framework method for defining project success. *Project Management Journal*, 30(4), 25–32.

Bilir, C., Yafez, E. (2021). Project success/failure rates in Turkey. *International Journal of Information Systems and Project Management*, 9(4), 24–40.

Brun, A. (2011). Critical success factors of Six Sigma implementations in Italian companies. *International Journal of Production Economics*, 131(1), 158–164.

Cadle, J., Yeates, D. (2008). *Project Management for Information Systems*. Pearson Education, London, UK.

Cerpa, N., Verner, J.M. (2009). Why did your project fail? *Communications of the ACM*, 52(12), 130–134.

Chen, K., Chen, T., Zheng, G., Jin, O., Yao, E., Yu, Y. (2012). Collaborative personalised tweet recommendation. In: *SIGIR'12 – Proceedings of the International ACM SIGIR Conference on Research and Development in Information Retrieval*.

Chen, Y. (2012). The empirical analysis model on critical success factors for emergency management engineering information system. *Systems Engineering Procedia*, 5, 234–239.

Chow, T., Cao, D.-B. (2008). A survey study of critical success factors in agile software projects. *Journal of Systems and Software*, 81(6), 961–971.

Collins, A., Baccarini, D. (2004). Project success – a survey. *Journal of Construction Research*, 5(2), 211–231.

Davis, K. (2017). An empirical investigation into different stakeholder groups perception of project success. *International Journal of Project Management*, 35(4), 604–617.

Denolf, J.M., Trienekens, J.H., Wognum, P.M.N., van der Vorst, J.G.A.J., Omta, S.W.F.O. (2015). Towards a framework of critical success factors for implementing supply chain information systems. *Computers in Industry*, 68, 16–26.

Dinter, B. (2013). Success factors for information logistics strategy – an empirical investigation. *Decision Support Systems*, 54(3), 1207–1218.

Engelbrecht, J., Johnston, K.A., Hooper, V. (2017). The influence of business managers' IT competence on IT project success. *International Journal of Project Management*, 35(6), 994–1005.

Farzin, M.R., Kahreh, M.S., Hesan, M., Khalouei, A. (2014). A survey of critical success factors for strategic knowledge management implementation: applications for service sector. *Procedia – Social and Behavioral Sciences*, 109, 595–599.

Fincham, R. (2002). Narratives of success and failure in systems development. *British Journal of Management*, 13(1), 1–14.

Fortune, J., White, D. (2006). Framing of project critical success factors by a systems model. *International Journal of Project Management*, 24(1), 53–65.

Głodziński, E. (2019). Performance measurement of complex project: framework and means supporting management of project-based organizations. *International Journal of Information Systems and Project Management*, 7(2), 21–34.

Hu, Q., Quan, J. (2005). Evaluating the impact of IT investments on productivity: a causal analysis at industry level. *International Journal of Information Management*, 25(1), 39–53.

Ika, L.A., Donnelly, J. (2017). Success conditions for international development capacity building projects. *International Journal of Project Management*, 35(1), 44–63.

IPMA (2018). *Individual Competence Baseline for Project Management*. International Project Management Association, Switzerland.

Iriarte, C., Bayona, S. (2020). IT projects success factors: a literature review. *International Journal of Information Systems and Project Management*, 8(2), 49–78.

Ismail, F., Yusuwan, N.M., Baharuddin, H.E.A. (2012). Management factors for successful IBS projects implementation. *Procedia – Social and Behavioral Sciences*, 68, 99–107.

ISO (2012). *ISO 21500:2012 Guidance on Project Management*. International Organization for Standardization, Geneva, Switzerland.

ISO (2020). *ISO 21502:2020 Guidance on Project Management*. International Organization for Standardization, Geneva, Switzerland.

Kerzner, H. (2019). *Using the Project Management Maturity Model: Strategic Planning for Project Management*. Wiley, John & Sons.

Lindsjørn, Y., Sjøberg, D.I.K., Dingsøyr, T., Bergersen, G.R., Dybå, T. (2016). Teamwork quality and project success in software development: a survey of agile development teams. *Journal of Systems and Software*, 122, 274–286.

Marnewick, C. (2012). A longitudinal analysis of ICT project success. In: *Proceedings of the South African Institute for Computer Scientists and Information Technologists Conference – SAICSIT'12*. ACM Press, USA.

Martinsuo, M., Hensman, N., Artto, K., Kujala, J., Jaafari, A. (2006). Project-based management as an organizational innovation: drivers, changes, and benefits of adopting project-based management. *Project Management Journal*, 37(3), 87–97.

Morcov, S., Pintelon, L., Kusters, R. (2020). Definitions, characteristics and measures of IT project complexity – a systematic literature review. *International Journal of Information Systems and Project Management*, 8(2), 5–21.

Morlhon, R., Pellerin, R., Bourgault, M. (2014). Building information modeling implementation through maturity evaluation and critical success factors management. *Procedia Technology*, 16, 1126–1134.

Müller, R., Turner, R. (2007). The influence of project managers on project success criteria and project success by type of project. *European Management Journal*, 25(4), 298–309.

Nasir, M.H.N.r., Sahibuddinm, S. (2011). Critical success factors for software projects: a comparative study. *Scientific Research and Essays*, 6(10), 2174–2186.

Nelson, R. (2018). Project retrospectives: evaluating project success, failure, and everything in between. *MIS Quarterly Executive*, 4(3), 361–372.

Osei-Kyei, R., Chan, A.P.C. (2015). Review of studies on the critical success factors for Public–Private Partnership (PPP) projects from 1990 to 2013. *International Journal of Project Management*, 33(6), 1335–1346.

Pankratz, O., Basten, D. (2014). Ladder to success-eliciting project managers' perceptions of IS project success criteria. *International Journal of Information Systems and Project Management*, 2(2), 5–24.

Panopoulou, E., Tambouris, E., Tarabanis, K. (2014). Success factors in designing eParticipation initiatives. *Information and Organization*, 24(4), 195–213.

Patnayakuni, R., Ruppel, C.P. (2010). A socio-technical approach to improving the systems development process. *Information Systems Frontiers*, 12(2), 219–234.

Petter, S., Vaishnavi, V. (2008). Facilitating experience reuse among software project managers. *Information Sciences*, 178(7), 1783–1802.

Pimchangthong, D., Boonjing, V. (2017). Effects of risk management practices on IT project success. *Management and Production Engineering Review*, 8, 30–37.

PMAJ (2017). *P2M A Guidebook of Program & Project Management for Enterprise Innovation (International Edition)*, 3rd edition. Project Management Association of Japan, Japan.

PMI (2013). *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, 5th edition. Project Management Institute, Newton Square, PA, USA.

PMI (2017). *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, 6th edition. Project Management Institute, Newton Square, PA, Newton Square, PA, USA.

PMI (2021). *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, 7th edition. Project Management Institute, Newton Square, PA, Newton Square, PA, USA.

Poon, P., Wagner, C. (2001). Critical success factors revisited: success and failure cases of information systems for senior executives. *Decision Support Systems*, 30(4), 393–418.

Rahman, H., Shafique, M.N., Rashid, A. (2018). Project success in the eyes of project management information system and project team members. *Abasyn University Journal of Social Sciences*, July, 1–8.

Ram, J., Corkindale, D., Wu, M.-L. (2013). Implementation critical success factors (CSFs) for ERP: do they contribute to implementation success and post-implementation performance? *International Journal of Production Economics*, 144(1), 157–174.

Sanchez, O.P., Terlizzi, M.A., de Moraes, H.R.d.O.C. (2017). Cost and time project management success factors for information systems development projects. *International Journal of Project Management*, 35(8), 1608–1626.

Serrador, P., Pinto, J.K. (2015). Does Agile work? – a quantitative analysis of agile project success. *International Journal of Project Management*, 33(5), 1040–1051.

Shi, Q. (2011). Rethinking the implementation of project management: a value adding path map approach. *International Journal of Project Management*, 29(3), 295–302.

Standish Group (1994). *CHAOS Report*. The Standish Group, Boston, USA.

Standish Group (2015). *CHAOS Report 2015*. The Standish Group, Boston, USA.

Standish Group (2018). *CHAOS Report: Decision Latency Theory: It Is All About the Interval*. The Standish Group, Boston, USA.

Standish Group (2020). *Chaos 2020: Beyond Infinity Overview*. The Standish Group, Boston, USA.

Sydow, J., Sydow, J., Lindkvist, L. (2004). Project-based organisations, embeddedness and repositories of knowledge: editorial. *Organization Studies*, 25(9), 1475–1489.

Tam, C., Moura, E.J.C., Oliveira, T., Varajão, J. (2020). The factors influencing the success of on-going agile software development projects. *International Journal of Project Management*, 38(2020), 165–176.

Thomas, G., Fernández, W. (2008). Success in IT projects: a matter of definition? *International Journal of Project Management*, 26(7), 733–742.

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

Varajão, J. (2018b). 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., Carvalho, J.A. (2018). Evaluating the Success of IS/IT Projects: How Are Companies Doing It? *International Research Workshop on IT Project Management*, 13.

Varajão, J., Trigo, A. (2016). Evaluation of IS project success in InfSysMakers: an exploratory case study. In: *ICIS – International Conference on Information Systems*. Association for Information Systems, Dublin, Ireland.

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.

Varajão, J., Magalhães, L., Freitas, L., Rocha, P. (2022). Success management – from theory to practice. *International Journal of Project Management*. https://doi.org/10.1016/j.ijproman.2022.04.002.

White, D., Fortune, J. (2002). Current practice in project management – an empirical study. *International Journal of Project Management*, 20(1), 1–11.

Wu, G., Liu, C., Zhao, X., Zuo, J. (2017). Investigating the relationship between communication-conflict interaction and project success among construction project teams. *International Journal of Project Management*, 35(8), 1466–1482.

Yin, P., Davison, R.M., Bian, Y., Wu, J., Liang, L. (2014). The sources and consequences of mobile technostress in the workplace. In: *PACIS – Pacific Asia Conference on Information Systems*. Association for Information Systems, Chengdu, China.

Ziemba, E., Oblak, I. (2013). Critical success factors for ERP systems implementation in public administration. *Interdisciplinary Journal of Information, Knowledge and Management, Informing Science Institute*, 8, 1–20.

Özturan, M., Gürsoy, F., Çeken, B. (2019). An empirical analysis on the effects of investment assessment methods on IS/IT project success. *International Journal of Information Systems and Project Management*, 7(4), 33–52.

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