Information systems project management practice in Portugal - looking at the past to perspective the future

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Abstract:
The study of Information Systems Project Management (ISPM) practice is fundamental for developing knowledge in this field. Over the past few years, several studies have been conducted in organizations by professionals and academics to identify approaches, processes, tools, and techniques, among other relevant aspects of project management practice. The use of these practices can be related to various factors, such as trends in the world of work or even the cultural context. In this way, an insight into the context of a given region can support actions to improve ISPM practice and raise success rates in information systems projects. This paper presents the results of a systematic literature review that seeks to synthesize how project management on information systems is practiced in Portugal and identify opportunities for developing the project management body of knowledge.

Keywords:
information systems; project management; practice; literature review; country; Portugal.

1. Introduction

It is widely recognized that the proper use of information leads to better organizational planning, decision-making, and results [1]. In business information management, Information Systems (IS) are critical to improve productivity, reduce operational costs, and achieve competitive advantages [2, 3]. Moreover, in an increasingly digital and complex world [4], IS investments require constant attention to keep up with the changes in organizations and their information needs [5].

Projects are one of the ways to accomplish organizational changes [6]. The IS projects can take many sizes and forms, including, for instance, implementation and improvement of systems (e.g., Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management), process improvement using information technology, and infrastructure improvement [7]. Achieving success in IS projects is challenging as it depends on many contextual and organizational variables [8, 9].

Organizations have a high investment in information technology (IT) [10]; thus, project management and IS projects are essential to the success of these investments. Several works aim to characterize organizations' IS project management (ISPM) practice. Some of these works are related to the use of agile methodologies [11, 12], team management [13, 14], business process management [15], and success evaluation [8, 16, 17]. Systematizing ISPM practice in organizations is relevant since it helps envision actions to prepare organizations for future challenges. Based on this opportunity, this research focused on identifying the organizational practice for ISPM. A systematic literature review (SLR) was conducted to understand how organizations in Portugal have been carrying out ISPM. The results achieved allow a characterization of the practice of ISPM and the identification of future research opportunities. Another significant contribution of this work is the proposal of an SLR process for analyzing empirical research on ISPM in specific geographic, to make it possible to compare the realities among different countries in the future.

Following this introduction section, this paper presents the main concepts of IS projects and ISPM in section 2. Then, section 3 describes the research design. Section 4 presents the main results of the SLR, namely the identification and summary of the selected studies. Section 5 discusses the results and the future trends in project management. Section 6 presents the process for replication of future studies. Finally, in section 7, we conclude with the main contributions, limitations, and highlights for further research.

2. Information systems project management practice

Projects are one of the main ways to develop organizations and turn their strategic initiatives into reality [18]. The IS projects can be simple or complex [19], depending on the many different variables involved in the project (e.g., number of business areas affected, number and type of technologies, or team's experience). Some examples of IS projects are integrated systems implementations related to:

- Enterprise Resource Planning (ERP): a comprehensive and integrated software solution used by organizations to manage business processes. ERP systems are designed to centralize and automate key business activities, such as accounting, human resources, inventory management, procurement, and manufacturing [20];

- Supply Chain Management (SCM): a process within businesses that focuses on the planning, execution, and optimization of all activities related to the flow of goods, services, information, and finances from the initial supplier to the final customer [21];

- Customer relationship management (CRM): a customer-focused business strategy that dynamically integrates sales, marketing, and customer care service to create and add value for the company and its customers [22].

Integrated systems are, by definition, complex and challenging to implement [23] because they change business processes and the organization's configuration. However, IS projects are not restricted to these types of projects. IS projects can also involve other variants, such as Business Intelligence [24, 25], Big Data [26, 27], and Blockchain projects [28]. Understanding and managing IS projects is essential to organizational success.

Information Systems Project Management includes using several processes, techniques, and tools to achieve project objectives on time, within budget, and meeting user requirements [29, 30]. Therefore, they are essential to achieve the IS project's success [31]. These practices can be found in project management standards and guides, such as PMBOK - Project Management Body of Knowledge [6], PRINCE2 - PRojects IN Controlled Environments [32], PM2 - Project Management Methodology [33], ISO 21502 [34], and in several scientific works [3, 8, 9, 11, 13, 16, 35-38]. Of the various practices proposed by project management standards and guides and the literature, actually knowing which ones are being used can help direct organizational efforts.

3. Research design

The research design followed the PRISMA methodology [39] and other works [40, 41]. According to these works, an SLR comprises three main phases: Planning, Execution, and Results. The planning phase includes formulating the research question and defining the SLR protocol (rules/restrictions, databases, search strings, and selection criteria). The Execution phase involves conducting the protocol defined for the SLR. Finally, the Results phase considers the presentation and discussion of the results.

This research aimed to identify and analyze published works on ISPM practice, and then systematize the knowledge recovered. Following [39-41], an SLR process consisting of seven steps was defined to be employed in this research. The seven steps of the SLR process were:

1. Definition of the research scope
   Pondering the complexity of IS projects and the diversity of contexts in which they are carried out, it is important to conduct a study limited to a country or an area/region (e.g., group of countries). This option provides insights into the ISPM practice of a country (or an area/region) and, later on, with further studies, enables comparing different realities to understand the context and the practice maturity better. Due to the authors' proximity to the research conducted, it was decided in this research to study the ISPM practice in Portugal.

2. Identification of information sources
   Identifying relevant information sources for research aims to ensure that relevant publications are included in the analysis and that conclusions are based on quality evidence. This ensures that the research is comprehensive, up-to-date, and reliable. Failure to properly define relevant information sources can lead to the exclusion of relevant publications and the inclusion of inadequate or low-quality publications, which can compromise the validity of the results and lead to incorrect or misleading conclusions.

   Identifying sources of information on ISPM practice in a given country or region should include scientific databases or indexers, like Scopus, Web of Science, or Google Scholar, and other sources that allow obtaining the papers published by researchers/scholars in this area of knowledge. In the case of Portugal, there is an open-access scientific database, known as the Open Access Scientific Repositories of Portugal – RCAAP, that was understood to be essential to use.

   Furthermore, it would be useful to identify the works published by professors of ISPM courses in higher education programs for this research. First, a search for ISPM course professors was performed on the websites of Portuguese Universities and Polytechnic Institutes. Then, the names of professors were used to search in the databases and to contact them to obtain suggestions for papers on ISPM practice. In sum, 32 professors of ISPM courses in higher education programs were identified.

3. Definition of inclusion/exclusion criteria
   Inclusion or exclusion criteria were defined in advance and were used to determine which studies would be selected for review and which would be excluded [42]. Inclusion criteria are used to select studies that meet specific predetermined requirements. In contrast, exclusion criteria remove studies that do not meet these requirements or are irrelevant to the research question.

In research that aims to identify the ISPM practice, the inclusion criteria may be related to aspects such as a clear description of ISPM practice, ISPM practice adopted/used by the organization, ISPM practice adopted/used in a specific country/region, or in the case of survey research, it was required that more than half of the respondents should be from the country/region of interest.

In this work, the following inclusion criteria were set:

- The paper should present and describe some aspects of ISPM practice;
- The IPSM practice in the paper must have been adopted/used in IS Projects in Portugal;
- In the case of papers with surveys, at least 60% of the respondents should be from Portugal.

4. Search for works

Given the nature of this study, searches for related work were conducted in three ways:

- A search in Scopus, Web of Science, Google Scholar, and the RCAAP databases of papers published by professors of the ISPM courses.
- A search in the Scopus database of papers using a search string with keywords relevant to the research question, namely the keywords "practice", "project management", "technologies", and "information systems" in the title, abstract, or keywords of the papers, as well as terms related to the country or countries of affiliation of the authors. Keywords in the native language related to the country searched also should be considered.
- Consult/contact researchers/scholars of ISPM courses to obtain suggestions for documents on ISPM practice.

From the search in the scientific databases of researchers/scholars' works, 57 papers were identified. From the search in Scopus, using the search string, 198 papers were identified. The search string was:

TITLE-ABS-KEY ("project management" OR "gerenciamento de projecto" OR "gestão de projeto" OR "gestão do projeto") AND TITLE-ABS-KEY (practice OR prática OR tool OR ferramenta OR technique OR técnica OR competences OR competencies OR competency) AND TITLE-ABS-KEY ("information system" OR "sistema de informação" OR "tecnologia da informação" OR "information technology") AND AFFILCOUNTRY ("Portugal")

Finally, eight papers were suggested from the contacts made with the researchers/scholars.

5. Study selection

Study selection is critical in conducting SLR, and following a systematic and transparent approach is important [42]. To this end, the following steps have been defined:

- Remove duplicates;
- Review titles and abstracts to remove papers that are not directly related to ISPM practice. The goal was to find what practitioners and organizations were actually doing. Note that a research project applying the practice to validate and collect data on usage does not necessarily indicate that the organization is using it and should not be considered an existing organizational practice in this literature review;
- Apply the inclusion and exclusion criteria.

By removing duplicate works and analyzing the title and abstract, 33 works remained. After applying the inclusion and exclusion criteria, 27 works about ISPM practice in Portugal were identified and selected for complete analysis.

6. Data Extraction

The data extraction and collection should be carried out consistently and standardized [42]. In this sense, it is important to consider what data should be extracted to identify ISPM practice. In the context of this work, it was considered necessary to create a shared spreadsheet in the cloud to record the list of professors, the selected articles, the identified ISPM practice, and a matrix that associates the papers with the proposed categorization of ISPM practice.

7. Synthesis and Discussion of Results

Finally, in synthesizing and discussing results, it is important to summarize the results of the studies included in the systematic review [42]. In this work, the synthesis essentially consists of presenting a summary of the studies analyzed, focusing on identifying ISPM practice. These ISPM practices are organized into ten categories.

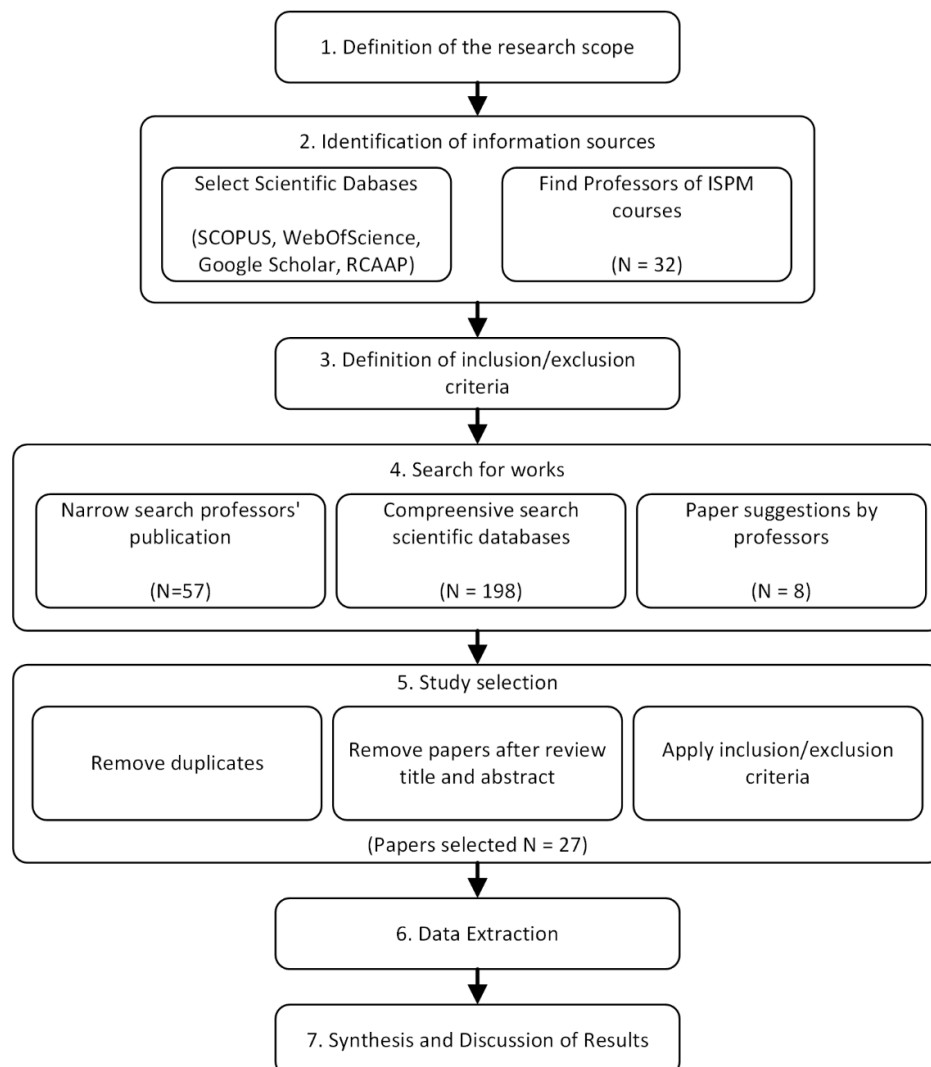Figure 1 summarizes the SLR process developed in this research work.

Figure 1. SLR process

4. SLR results

Table 1 presents the 27 papers selected during the SLR process, with information about authors, references, work titles, and proposed categorization. The categorization of each paper was defined according to their results related to ISPM practice. The twelve categories defined are: Agile, quality management, success evaluation, success factors, benefits management, project team, processes, success management, competences, tools and techniques, risk management, and general practices.

Table 1 - Selected works in SLR process

Id	Authors / Citation	Year	Work Title	Category
1	Varajão, J., Cardoso, J., Gonçalves, D., and Cruz, J. [43]	2008	Analysis of software development project management in large Portuguese companies	General
2	Catarino, M., Gonçalves, D., Pereira, A., and Varajão, J. [44]	2009	Software projects' most important activities of quality management: A Delphi study	Quality management
3	Paiva, A., Varajão, J., Domínguez, C., and Ribeiro [16]	2011	Key aspects in the assessment of success in software development projects. Is there a relationship with what is considered in other industries?	Success evaluation
4	Rodrigues, J. S., Costa, A. R., and Gestoso, C. G. [45]	2014	National Culture and Planning and Control of Projects in Portugal	General
5	Varajão, J., Dominguez, C., Ribeiro, P., and Paiva, A. [35]	2014	Critical success aspects in project management: Similarities and differences between the construction and the software industry	Success factors
6	Varajão, J., Dominguez, C., Ribeiro, P., and Paiva, A. [46]	2014	Failures in software project management - are we alone? A comparison with construction industry	Success evaluation
7	Varajão, J., and Trigo, A. [47]	2016	Evaluation of IS project success in InfSysMakers: an exploratory case study	Success evaluation
8	Fernandes, T. M., Gomes, J., and Romão, M. [48]	2017	Investments in E-Government: A benefit management case study	Benefits management
9	Silva, L., Varajão, J., Dominguez, C., and Moura, I. [49]	2017	Motivations for high-performance teams of information systems projects	Project team
10	Varajão, J., Colomo-Palacios, R., and Silva, H. [7]	2017	ISO 21500:2012 and PMBoK 5 processes in information systems project management	Processes
11	Varajão, J., Magalhães, L., Freitas, L., Ribeiro, P., and Ramos, J. [50]	2018	Implementing Success Management in an IT Project	Success management
12	Varajão, J., and Carvalho, J. A. [51]	2018	Evaluating the Success of IS/IT Projects: How Are Companies Doing It?	Success evaluation
13	Ribeiro, A., and Domingues, L. [11]	2018	Acceptance of an agile methodology in the public sector	Agile
14	Laranjeira, M., Trigo, A., and Varajão, J. [17]	2019	Success of Software Development Projects in Portugal - preliminary results	Success evaluation
15	Moura, I., Dominguez, C., and Varajão, J. [52]	2019	Information systems project teams: factors for high performance	Project team
16	Tereso, A., Ribeiro, P., Fernandes, G., Loureiro, I., and Ferreira, M. [36]	2019	Project Management Practices in Private Organizations	General
17	Varajão, J., Silva, H., and Bach, M. 2019. [53]	2019	Key Competences of Information Systems Project Managers	Competences
18	Silva, F., Jerónimo, H., and Vieira, P. [14]	2019	Leadership competencies revisited: A causal configuration analysis of success in the requirements phase of information systems projects	Competences

Id	Authors / Citation	Year	Work Title	Category
19	Teixeira, A., Oliveira, T., and Varajão, J. [25]	2019	Evaluation of Business Intelligence Projects Success – a Case Study	Success evaluation
20	Varajão, J., Fernandes, G., and Silva, H. [54]	2020	Most used project management tools and techniques in information systems projects	Tools and techniques
21	Tam, C., Moura, E. J. C., Oliveira, T., and Varajão, J. [12]	2020	Factors influencing the success of on-going agile projects	Agile
22	Gonçalves, A., Oliveira, P. M., and Varajão, J. [55]	2021	Success Factors of Information Systems Projects in Portuguese Public Institutions	Success factors
23	Moura, I., Dominguez, C., and Varajão, J. [13]	2021	Information systems project team members: factors for high performance	Project team
24	Varajão, J., and Amaral, A. [56]	2021	Risk Management in Information Systems Projects: It Can Be Risky Not To Do It	Risk management
25	Varajão, J., Trigo, A., Pereira, J. L., and Moura, I. [57]	2021	Information systems project management success	Success evaluation
26	Pereira, J., Varajão, J., and Takagi, N. [8]	2022	Evaluation of Information Systems Project Success – Insights from Practitioners	Success evaluation
27	Varajão, J., and Takagi, N. [38]	2024	Information systems project managers technical competences – perceived importance and influencing variables	Competences

4.1 General, processes, and tools and techniques

Five of the 27 papers reviewed present results about transversal topics on ISPM. The papers identified in this category are from the authors Varajão et al. [43], Rodrigues et al. [45], Varajão et al. [7], Tereso et al. [36], and Varajão et al. [54]. The following is a summary of each of these papers.

Varajão et al. [43] surveyed 20 project managers working in large Portuguese companies. The survey focused on evaluating how project management was perceived in projects in these companies. From this survey, it was concluded that in 2008, few project managers of Portuguese companies used internationally recognized project management standards and guides, such as the PMBOK (15%) or even maturity assessment models (5%). The low adherence is reflected in their inadequate training (10%) in project management and the high use of previous experiences (85%) to estimate deadlines to the detriment of good practices presented in project management standards and guides.

Rodrigues et al. [45] aimed to analyze the hypothesis that the Portuguese culture is little adept at planning and controlling projects, in contrast to the culture of other countries. For this, they surveyed 634 professionals involved in projects in Portugal about which planning and control processes were used in their projects. They compared the results obtained with a similar survey applied to project managers in the United States, concluding that there was no significant difference in adopting these processes between these two cultures. Notably, this research was conducted with project managers in Portugal with high educational levels and considerable experience in the management area, thus probably already well-familiarized with the current project management methodologies.

Varajão et al. [7] conducted, between 2014 and 2015, an online survey on information systems project management, which was made available to many groups of information systems project managers. The survey contained a list of 47 processes organized into ten knowledge areas (integration, scope, time, cost, quality, human resources, communication, risks, acquisition, and stakeholders) based on both PMBOK 5 and ISO 21500:2012. A total of 107 complete responses were collected, representing 472 projects. The results showed that all 47 processes were used at least occasionally in the last projects managed by these managers, even with 53.3% of these managers not having some certification in Project Management and not using the ISO 21500:2012/PMBOK methodology in their projects (62.6%). Also, according to the results of this work, the most used processes are from scope, time, and cost; among the least used processes are from quality and risks, which may explain the still frequent failures in project management, considering that risk

management works with the anticipation of significant changes in the project environment and planning to control their effects. The study concludes that greater use of risk management processes and more substantial experience in project management are essential factors for success in complex projects.

Tereso et al. [36] conducted an online survey with members of two professional associations of project managers from Portugal (the PMI Portugal Chapter and the APOGEP - Portuguese Association of Project Management) to understand the leading project management practices used in four different areas of the economy in Portugal. In this survey, the area with the highest number of answers was "information technology and communication", with 48.4% of the answers. The most used practices are from the planning group ("Gantt chart", "activity list", "baseline plan", "project scope statement", "requirements analysis") and from the monitoring and control group ("progress meetings", "progress report", "change request").

Varajão et al. [54] present the results from a survey on the main techniques and tools used by IS project managers. Accordingly to this study, the five most used techniques and tools were "kick-off meetings", "progress meetings", "progress reports", "requirements analysis", and "activity list". In contrast, techniques such as "earned value management", "quantitative risk analysis", and "critical chain method and analysis" showed up at the bottom of the list, which is concerning considering that these are essential techniques to assist in the project management process. One explanation for the low use of these techniques may be that they are advanced and complex techniques, and therefore their adoption requires more specialized project managers.

4.2 Success evaluation, success factors, and success management

The topics related to the success evaluation, success factors, and success management of ISPM are addressed in 11 of the 27 papers reviewed. The identified works are presented below.

Paiva et al. [16] presented the results of a survey that counted the participation of 80 project managers, focusing on identifying and prioritizing the main aspects considered in evaluating the success of projects in software development and construction. From the literature review that supported the study, the following were identified as the main aspects considered in the assessment of project success: "finish the project within the predefined timeframe"; "finish the project within budget"; "finish the project according to the specified requirements"; "optimally use the available resources"; "present solutions with superior technological performance"; "achieve project acceptance by the customer"; "keep the team motivated"; and "finish within quality limits". Regarding the prioritization of aspects, the aspect considered to be the most important in evaluating software projects' success is finishing the project according to the specified requirements. For construction project managers, the most critical aspect is to complete the project within budget. The authors conclude that typical aspects related to meeting budget, schedule, and scope are still those considered most important, regardless of industry, even though other aspects are also considered.

Varajão et al. [35] explored the critical factors for the success of project management, having identified in the literature the following success factors: "project planning"; "top management involvement"; "customer involvement throughout the process"; "well-defined objectives and requirements"; "cost control"; "project monitoring"; "frequent control checkpoints"; "project strategy"; "involvement of the team in achieving the objectives"; "project manager efficiency"; "way of resolving conflicts"; and "communication efficiency". These aspects were ranked in importance by surveying 40 construction project managers and 40 software development project managers. The results show that "project planning" and "well-defined objectives and requirements" occupy the first two places in the ranking of importance for both industries, demonstrating strong agreement between project managers. Regarding the least important factors, two factors coincide in both industries: "frequent control checkpoints" and "way of resolving conflicts". Overall, the authors conclude that despite the significant differences between the industries studied, the most important factors in project management are similar, contributing to researchers, professionals, and training institutions focusing on these.

In addition, Varajão et al. [46] discussed the success of software and construction projects based on the Iron Triangle's three dimensions (scope, cost, and time). The authors report that in the case of software development projects, about 72% of the completed projects meet the expected costs, 70% meet the established scope, and only 59% are completed within the initially defined deadlines. On the other hand, concerning civil construction projects, the results show that

about 70% of the completed projects meet the expected costs, 88% meet the established scope, and 72% are completed within the initially defined deadlines. The authors conclude that software development and construction projects' results are similar and slightly more favorable for construction projects. This is particularly visible in the results of the scope dimension, something that, according to the authors, can be justified by the fact that in construction projects, there is a clear separation between the planning and design phases and the construction and implementation phases and, consequently, a reduction of risks.

Varajão and Trigo [47] presented an exploratory case study in a software company, reporting project evaluation results in terms of project management practices, definition of the evaluation process, criteria used to measure success, evaluation of success, and overall project results. This company internally uses PMBOK and PRINCE2 project management processes in addition to the OPM3 maturity assessment model. Interviews were conducted face-to-face or via videoconference with portfolio and project managers to understand the success evaluation processes used by the company in ISPM. The work concluded that, besides the Iron Triangle (scope, cost, deadlines), the company also implements critical processes that explain this high success rate, such as: "ensuring that the business objectives are taken into account in the project"; "ensure that the customer's business objectives are taken into account in the project"; "user satisfaction"; "customer satisfaction"; "operational Team satisfaction"; "sponsor satisfaction"; and "analysis of product/service delivery quality".

Varajão et al. [50] presented the preliminary results of the first phase of implementing a success management process in an IT project in a multinational company. According to the authors, these results show that, with a slight increase in management effort, the implementation of a success management process allows for a precise definition of what success means in the context of a project, a better understanding of the different perspectives of the participating stakeholders, a greater focus on what is most important to achieve project success, unbiased identification, the definition of criteria to evaluate success, and the definition of milestones to carry out the evaluation. Concerning IT project success factors, the following have been identified in this work: "commitment of all team elements in the development of the work"; "availability of the technological infrastructure"; "detailed planning of the project's activities"; "work carried out by sub-teams"; "good communication management"; "fulfillment of the communication rules"; "good planning of meetings"; "knowledge management inside team"; "promote the teamwork over individual work, i.e., task sharing"; "satisfaction and motivation"; "team punctuality"; "good workplace conditions"; "good team relationship"; "team trust"; "technical knowledge needed for developing the solutions"; and "availability of information necessary for the project development".

Varajão and Carvalho [51] described an exploratory study that inquired ten companies about their project success evaluation practices. According to the authors, the results show that, regardless of company size, sector, or project management methodology adopted, project success evaluation is currently an informal and rudimentary process, focused mainly on the success of project management and not on the success of project outcomes. Given the importance and complexity of project success evaluation, companies should define and implement systematic success management processes to improve project performance and expected benefits. Unfortunately, this does not seem to be happening in practice.

Laranjeira et al. [17] presented the preliminary results of research conducted to characterize the success of software development projects in Portugal. Through a questionnaire answered by 202 managers or team members of software development projects, it was possible to assess that most respondents consider: (1) that the project in which they participated has achieved or was close to achieving total success; (2) that after the end of the project, most customers made maintenance contracts and/or hired new projects; (3) that there is growing importance assigned to certifications; and (4) that there is increasing use of agile methodologies in project management. Also, according to the authors, the results reveal high levels of success, contrary to the idea of failure that has predominated in recent decades.

Teixeira et al. [25], through 11 interviews, analyzed how success is evaluated in a large company in Portugal in Business Intelligence (BI) projects. Among the main conclusions are: the quality of BI software is a relevant success factor; there is the need to formally define the process for evaluating the success; the success of a BI project should be assessed along the project lifecycle; some important criteria are sales results, the number of customers, sales margin,

optimization and standardization of information, and people performance; All the people involved in a business intelligence project should also be involved in its evaluation.

Gonçalves et al. [55] presented a model of success factors for information technology and information systems projects in public institutions. This model resulted from a literature review, six cases of Portuguese central government and local government organizations, and a questionnaire-based survey. In total, 44 success factors for IS/IT projects carried out in public institutions were identified by the authors. The proposed model suggests the organization of the success factors into nine categories according to their affinity: "organization and environment"; "pre-project"; "project"; "scope"; "project manager and team"; "stakeholders"; "suppliers"; "customers and users"; and "monitoring and control". According to the authors, the success factors with the highest levels of importance in local government are: "definition of project goals and final objectives"; "leadership capacity of the project manager"; and "motivation of the project execution team". These factors belong to the categories of scope and project manager and team. It is also noted that the importance of these factors is consistent with the results of the works found in the literature focusing on the public sector. Concerning the results obtained for the central government, the factors considered to be most important are: "leadership ability of the project manager"; "formalization and presentation of the project objectives in a clear way"; and "adequate resources for the project, particularly internal human resources with the skills needed to operate the information system". These factors belong to the categories scope, project manager and team, and organization and environment. For other types of public administration, the factors considered most important are: "definition of final project goals and objectives"; "formalization and presentation of project objectives in a clear way"; and "detailed definition of the project scope". These factors are found in the scope category.

Varajão et al. [57] aimed to provide new insights into the success of information systems project management. The work presents and discusses the 107 responses from an international survey comprising 472 projects, mainly in Portugal. The results show that ISPM is achieving high levels of success; however, a minority of projects end without changes in scope, schedule, or cost. In addition, the results show that scope, schedule, or cost changes are frequent in this type of project and do not significantly affect the perception of success.

Pereira et al. [8] presented the results of an exploratory survey of project managers on evaluating information systems project success. Overall, the results show that the assessing success process is often not formally defined or even put into practice. Regarding the criteria for evaluating success, the Iron Triangle criteria remain the most frequent. Often, projects' reported success results from perceptions rather than formal evaluations. Furthermore, a limited view of project success - focusing only on time, cost, and scope - can lead to projects being managed based on incomplete objectives, leading to dissatisfaction among different stakeholders.

4.3 Project team performance and project managers' competences

A total of seven papers address topics related to teams and project managers' categories, with a particular focus on the technical and behavioral skills that are most relevant to IS projects. The identified papers are presented below.

The works of Silva et al. [49], Moura et al. [52], and Moura et al. [13] present results about IS project teams with high performance. The focus of this research was identifying a set of aspects that contribute to the motivation of team members, according to their perspectives. A case study was used with a group of IT/IS companies (holding) in Portugal as a research method. The main motivating aspects identified were: "financial incentives" (e.g., profit sharing, overtime pay, better pay); "non-financial benefits" (e.g., time off, flextime); "management/leadership" (e.g., allocation of tasks in a fair way, involvement of the manager in the team, seeking that the team is in tune with the project objectives); "knowledge" (e.g., to know the tools well, to know the context in which one is working, to participate in training); and "working conditions" (e.g., to have adequate equipment, accessibility).

Varajão et al. [53] analyzed with project managers the importance of a set of 47 competencies listed in ICB 3.0 and added the resilience competency to enable success in ISPM. The competencies were grouped into three different groups: "technical"; "behavioral"; and "contextual". Of the 12 highlighted competencies in the survey, four were technical competencies, seven were behavioral competencies, and one was contextual, showing the importance of soft

skills in the profile of an IS project manager. In addition, the four most frequently mentioned competencies were: "communication"; "engagement and motivation"; "project requirements and objectives"; and "leadership".

Silva et al. [14] explored the types of leadership competencies most relevant for activities in the requirements phase in IS projects. Over 30 semi-structured interviews were conducted in 12 of Portugal's largest IS companies. As a result, in general, intellectual, emotional, and managerial competencies are much more present in conceptual and interactive activities (from initiation to specification). As leadership depends on emotional issues, emotional competence is more present in activities with more stakeholder interaction. As far as intellectual competencies are concerned, the analysis considers them less relevant than their counterparts, although they are present in activities that need to present a viable solution. Surprisingly, managerial competencies are present in all activities except validation.

Varajão and Takagi [38] explored the technical competencies of IS project managers. The data was collected through a survey in several countries, with most respondents from Portugal. The technical competencies of IS project managers that stood out were: "communication management"; "defining project requirements and objectives"; "teamwork"; "stakeholder management"; and "scope and deliverables management". The results also show the relevance of project managers' experience since it influences the perceived importance of 45% of the competencies under study.

4.4 Agile ISPM practice

In the Agile category, two studies were identified related to Agile methodologies and the success factors of Agile software development projects. The identified papers are presented below.

Ribeiro and Domingues [11] presented the implementation process of an agile software development methodology based on Scrum, customized for a Portuguese public organization, and tested its acceptance. The public organization in question is responsible for the IS of a specific Portuguese public sector. To verify the acceptance of the proposed methodology, a workshop was held with 16 participants, the equivalent of 90% of the organization's project managers. In conclusion, the general results were positive despite identifying some resistance and disagreement about the implemented agile methodology. In this sense, 73% of the respondents considered having a single software development methodology in the organization important - something that did not exist. Still, more than half of the respondents considered the methodology adequate to the organization's context.

Tam et al. [12] proposed a model of five personal factors that influence the success of software development projects, success being considered in terms of cost, time, and customer satisfaction. After a survey with 216 agile practitioners from different areas in Portugal, the results suggested that the constructs "team capability" and "customer involvement" are the main factors contributing to the success of agile software development projects. In addition, the constructs "personal characteristics", "training and learning", and "societal culture" had no evidence of contributing to success in the researched context.

4.5 Benefits, quality, and risk management

Three papers were identified regarding the categories related to benefits, quality, and risk management. The identified papers are presented below.

Catarino et al. [44] conducted a survey using the Delphi methodology with 30 experts in quality management. The experts were asked to rank 24 different quality management activities, considering the degree of importance in a software development project. After two rounds of analysis, it was possible to reach a consensus order of the activities and divide them into three groups: activities that are critical to a project and always need to be performed, such as "define a project plan" and "identify and define the critical project aspects"; very important activities, which are activities that should be performed whenever possible such as "perform change management" and "produce reports to customers"; and important activities, which are activities that can be performed whenever possible such as "define a metrics plan", and "audit the project according to the quality plan".

Fernandes et al. [48] applied a study focused on benefits management in an online youth recruitment program for the Public Administration in Portugal (PEPAC Program) to make this service more efficient. Using methodologies such as

direct observation, reading available documentation, database searches, and interviews with some of those responsible for implementing the program, it was possible to identify the macro benefits achieved in each service process and how to interconnect them to achieve their goals better. The macro benefits analyzed were: "improved quality of service"; "cost reduction for applicants"; "cost reduction for the public administration"; "increased effectiveness of the program"; "increased effectiveness of public services"; and "increased decision-making capacity for managers". In addition, an online survey with candidates for this recruitment was also conducted to analyze the satisfaction of customers/users with the service.

Varajão and Amaral [56] analyzed data from a survey of project managers about the use of risk management processes within IS projects. The survey concludes that processes in the area of risk management occupy the lowest utilization rates in the project development cycle. Since risk management involves the adaptability of a project to positive or negative changes that occur throughout its execution, the low importance of these processes within the project management cycle may explain the still high failure rate in ISPM.

5. Discussion

The results of the SLR on ISPM practice in Portugal reveal the complexity of the topic, with different perspectives of analysis, namely, the type of project management approach, the various existing tools and techniques, the competencies required for its execution, the success factors and, more recently, the concerns with the method of evaluation and management of project success.

Over time, there has been an evolution in the methodology used in project management, starting with ad hoc initiatives that become more formalized and led to the development of standards that try to include all aspects of project management. Given the complexity that some of these standards reached, they were no longer viable for conducting smaller projects, so naturally, lighter project management methodologies emerged, such as the ones based on agile approaches. However, the evolution does not stop, and nowadays, many organizations use both types of methodologies, or even a fusion of methodologies, named hybrid methodologies (see Figure 2).

Concerning formalism in project management approaches, one can also notice an evolution over the years toward adopting methodologies for project management. If, in 2008, few companies used well-defined methodologies in project management [43], this is no longer true in recent years. In the research by Laranjeira et al. [17], Paiva et al. [16] and Pereira et al. [8], it is possible to verify that only 16.6% of the project managers indicated that they did not use any formal project management methodology when conducting their projects. It is also noteworthy that project managers not only claim to use the methodologies but, in fact, know them. For example, the study by Varajão et al. [7] mentions that all project managers used, even if occasionally, the 47 processes described in PMBOK5 and ISO 21500:2012. These results are consistent with the international scenario where project managers have increasingly adopted the best practices in project management over time.

Regarding the use of tools and techniques, it is possible to observe, on the one hand, their evolution with the recent exploitation of tools and techniques in the field of artificial intelligence, for example, at the level of the selection of team members [58]. On the other hand, project managers exploit usual tools and techniques in project management, such as "Gantt chart", "activity list", "baseline plan", "project scope statement", "requirements analysis", "progress meetings", "progress report", "change request", "kick-off meeting", "value management", and "quantitative risk analysis", among others [36, 54]. IS project managers need to keep up with the trends in technologies and IS. Otherwise, they will lose competitive advantages over others, and they will continue to look for the latest tools and techniques that can help them conduct projects, such as those in the field of data analysis, whether on a small or large scale (big data), artificial intelligence, among other emerging technologies (see Figure 2).

The lack of hard and soft skills has been a constant concern in project management because, without capable teams, it is difficult to achieve good results with projects in an increasingly competitive world. It is possible to see from the studies listed in this work the need for these professionals to have the following competencies [38, 53]: "communication management"; "definition of project requirements and objectives"; "teamwork"; "stakeholder management";

"management of project scope and deliverables"; "team engagement and motivation"; "leadership"; "reliability"; "results orientation"; "conflict and crisis management"; "project team orientation"; "resilience"; and "ethics". As can be seen from the list of competencies presented, although the project manager should continue to master the technical competencies associated with their profession, they should place much more emphasis on the domain of soft skills, something that has been identified as one of the trends in the area of ISPM (see Figure 2). These competencies are also crucial for the other members of the team. Furthermore, knowing the competencies required for IS projects can help hire or qualify project managers with these competencies [59].

A trend imposed with the pandemic and previously identified in the work of Varajão, Trigo, and Rodrigues [60] is the practice of remote work. Remote work can include new tools, techniques, and different competencies, such as the ability to self-motivate and organize your own work.

Finally, the dimension of success and its management practices, which, although it does not appear in the trends in ISPM (see Figure 2), has been a concern since the concept of the project emerged and will remain so as long as there are projects to be carried out, whether or not in the field of IS.
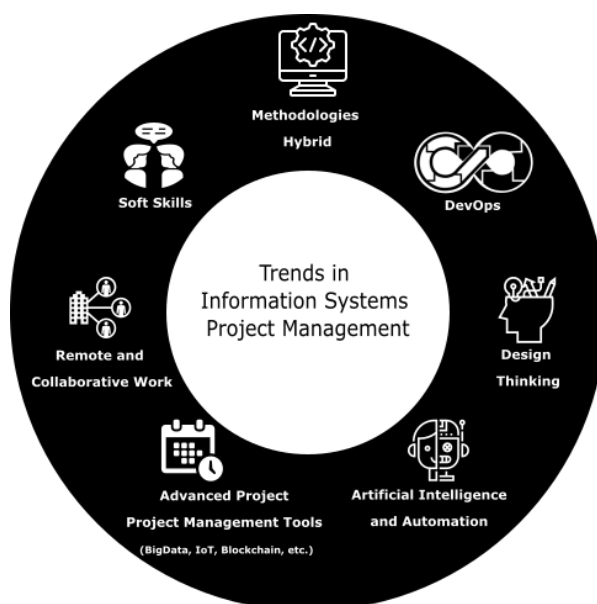

Figure 2. Trends in ISPM. Source: [60]

6. Process for replication studies

With the definition of the research method and with the experience and lessons learned from its execution, we propose a process for replication studies with ten steps to perform this process focused on characterizing project management practice in information systems projects in a region or country. This proposed process can be adapted to look for other aims, such as future practices in project management information systems projects, focusing on what practices the researchers are studying/considering. The ten steps of the process are summarily presented in Figure 3 and described in the next.
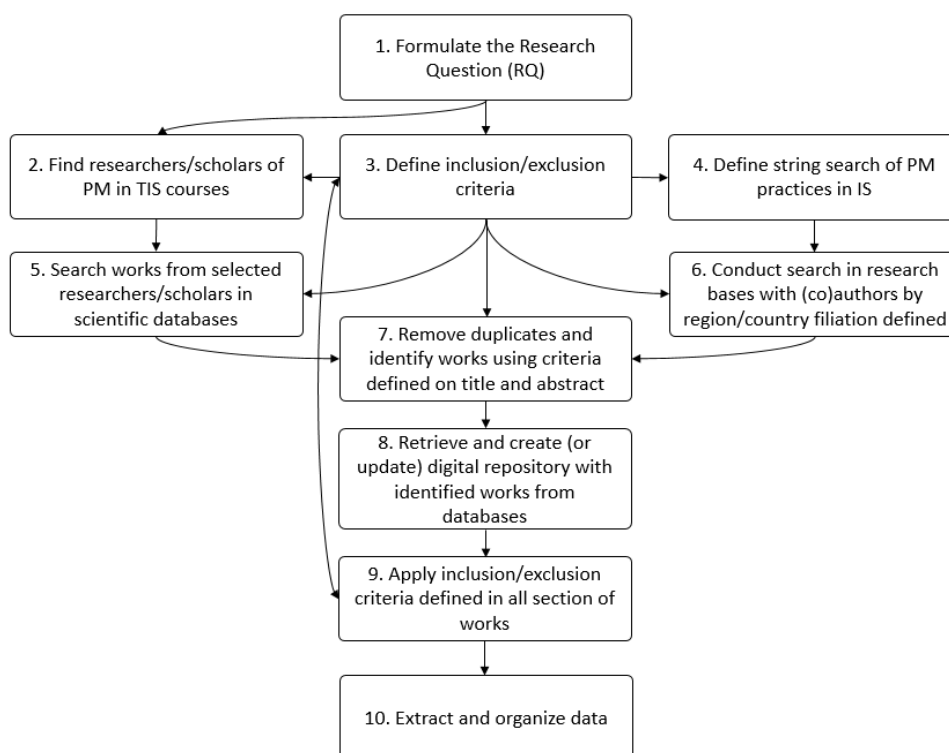
Figure 3. Process for ISPM practice replication studies

1. **Formulate the Research Question (RQ)**: The original research question of this work is focused on information systems project management practices. However, this can be adapted to research practices or even what is being taught in academia to manage information systems projects. This step aims to define the scope of the research, focused, for example, on practices, research, or even the teaching of information systems project management. Also, depending on the geographical dimension, the study can contemplate a region within a country or even consolidate groups of countries.

2. **Find researchers/scholars of PM in IT/IS courses**: Discovering the researchers is one way to find published scientific works on project management practice in a region or country. The researchers can also be project management scholars in technology and information systems courses. In other words, finding the researchers/scholars of project management in technology and information systems courses in higher education can help to find research works related to project management practices (or other research questions of ISPM). These researchers/scholars can be found in different ways; groups of practitioners can also be a good source.

3. **Define inclusion/exclusion criteria**: The inclusion/exclusion criteria will guide the selection of the works found. Inclusion/exclusion criteria may be related, for example, to a clear description of information systems project management practice; the practice is, in fact, being used by the organization; the described practice should have been applied in the country/region of interest; in the case of works with surveys, more than half of the respondents should be from the country/region of interest.

4. **Define string search of PM practices in IS**: A string should be developed based on the defined inclusion criteria to extend the search and try to find work by other researchers. Should be used word variations with "practice", "project management", "technology" and "information system" with a search in the title, abstract, and keywords. There may be works in the native language of the country, this also needs to be considered in the query variations. If the researchers focused on the research practices, the string search needs to be adapted.

5. **Search works from selected researchers/scholars in scientific databases**: This step is focused on searching for papers addressing ISPM practice in the profile of project management researchers/scholars in technology and information systems courses. Google Scholar, ORCID, and Scopus are examples that consolidate the results by author. If there are databases of research works from the country of interest, they should also be considered in the search.

6. **Conduct search in research bases with (co)authors by region/country filiation defined**: To identify articles from the region/country of interest, one path is through the authors' affiliations. In this case, it is necessary to use some scientific database that has the identification of the author's country as a filter. For example, the Scopus database defines the authors' country of affiliation and the option to include it in the search string.

7. **Remove duplicates and identify works using criteria defined in the title and abstract:** At this stage, duplicate papers should be removed, and inclusion/exclusion criteria should be applied by reviewing the title and abstract. If it is not sufficient to accurately identify the criteria when assessing the abstract, the paper should proceed to a content analysis in step nine.

8. **Retrieve and create (or update) a digital repository with the identified works:** This step involves creating a shared repository to store the selected works and control files with a list of all the works listed by the scientific databases.

9. **Apply inclusion/exclusion criteria defined (in all sections of works)**: In this step are applied the defined inclusion/exclusion criteria. Some sections can be targeted for this application, such as the section describing data collection and results. Note that some criteria may no longer make sense when analyzing the full texts, and others may emerge. If this happens, the defined criteria should be adjusted, and some initial steps may need to be repeated in searching for new works.

10. **Extract and organize data**: Finally, the ISPM practice found should be extracted. A spreadsheet with a list of practices can be created. Once described, it can be synthesized into categories (e.g., tools, techniques, competences, etc.).

7. Conclusion

The success of IS projects cannot be disassociated from the practices adopted by organizations to manage their projects. This work aimed to identify and systematize ISPM practice. For this purpose, an SLR was performed, focusing on the management of IS projects in Portugal.

During the application of the SLR protocol, 27 papers were selected and consequently reviewed. The review of the selected papers has made it possible to achieve the following contributions: the identification of ten categories of ISPM practice, the categorization of each reviewed paper according to the results presented, and also the presentation of summaries of these papers where ISPM practice in Portugal is detailed.

In our opinion, another important contribution comes from the experience and lessons learned from the execution of the SLR process presented and applied in this research. In this sense, the ten-step process, focused on identifying ISPM practice, can be useful for replication studies focusing on other countries or regions. This work can be a starting point for further, more comprehensive studies to understand different realities and thus create a more complete knowledge base about ISPM practice. As the main limitation, we can point out that this study focused on the research literature. In future studies, the gray literature should also be considered.

References

[1] W. B. Adeoti-Adekeye, "The importance of management information systems," *Library Review,* vol. 46, no. 5, pp. 318-327, 1997, doi: 10.1108/00242539710178452.

[2] J. Varajão, A. Trigo, and J. Barroso, "Motivations and Trends for IT/IS Adoption: Insights from Portuguese Companies," *International Journal of Enterprise Information Systems,* vol. 5, no. 4, pp. 34-52, 2009, doi: 10.4018/jeis.2009090203.

[3] N. Takagi and J. Varajão, "Success Management and Scrum for IS Projects – An Integrated Approach," in *Pacific Asia Conference on Information Systems*, 2021: Association for Information Systems, pp. 1-8.

[4] H. Benbya, N. Nan, H. Tanriverdi, and Y. Yoo, "Complexity and information systems research in the emerging digital world," *Management Information Systems Quarterly,* vol. 44, no. 1, pp. 1-17, 2020.

[5] J. Varajão, "The many facets of information systems (+ projects) success," *International Journal of Information Systems and Project Management,* vol. 6, no. 4, pp. 5-13, 2018, doi: 10.12821/ijispm060401.

[6] PMI, *A Guide to the Project Management Body of Knowledge: (PMBOK guide)*, 7th ed. Newtown Square, PA, US: Project Management Institute, 2021.

[7] J. Varajão, R. Colomo-Palacios, and H. Silva, "ISO 21500:2012 and PMBoK 5 processes in information systems project management," *Computer Standards & Interfaces,* vol. 50, no. 2017, pp. 216-222, Feb 2017, doi: 10.1016/j.csi.2016.09.007.

[8] J. Pereira, J. Varajão, and N. Takagi, "Evaluation of Information Systems Project Success – Insights from Practitioners," *Information Systems Management,* vol. 39, no. 2, pp. 138-155, 2022, doi: 10.1080/10580530.2021.1887982.

[9] N. Takagi and J. Varajão, "Success Management in Information Systems Projects – work-in-progress," in *Proceedings of the Portuguese Association for Information Systems Conference*, Porto, Portugal, 2020.

[10] L. Kappelman *et al.*, "The 2020 SIM IT issues and trends study," *MIS Quarterly Executive,* vol. 20, no. 1, pp. 69-107, 2021, doi: 10.17705/2msqe.000XX.

[11] A. Ribeiro and L. Domingues, "Acceptance of an agile methodology in the public sector," *Procedia Computer Science,* vol. 138, pp. 621-629, 2018/01/01/ 2018, doi: 10.1016/j.procs.2018.10.083.

[12] C. Tam, E. J. C. Moura, T. Oliveira, and J. Varajão, "The factors influencing the success of on-going agile software development projects," *International Journal of Project Management,* vol. 38, no. 3, pp. 165-176, 2020/04/01 2020, doi: 10.1016/j.ijproman.2020.02.001.

[13] I. Moura, C. Dominguez, and J. Varajão, "Information systems project team members: factors for high performance," *The TQM Journal,* vol. 33, no. 6, pp. 1426-1446, 2021, doi: 10.1108/TQM-07-2020-0170.

[14] F. Silva, H. Jerónimo, and P. Vieira, "Leadership competencies revisited: A causal configuration analysis of success in the requirements phase of information systems projects," *Journal of Business Research,* vol. 101, pp. 688-696, 2019/08/01 2019, doi: 10.1016/j.jbusres.2019.01.025.

[15] A. Cardoso, T. F. B. Silva, N. Takagi, C. Silva, and A. Micelli, "A value chain development model for the public sector," *Business Process Management Journal,* vol. 28, no. 5/6, pp. 1229-1250, 2022, doi: 10.1108/BPMJ-09-2021-0619.

[16] A. Paiva, J. Varajão, C. Domínguez, and P. Ribeiro, "Key aspects in the assessment of success in software development projects. Is there a relationship with what is considered in other industries?," *Interciencia,* Conference Paper vol. 36, no. 3, pp. 200-204, 2011.

[17] M. Laranjeira, A. Trigo, and J. Varajão, "Success of Software Development Projects in Portugal - preliminary results," in *Proceedings of the Portuguese Association for Information Systems Conference*, Lisbon, Portugal, 2019: Associação Portuguesa de Sistemas de Informação (APSI).

[18] N. Takagi and J. Varajão, "ISO 21500 and success management: an integrated model for project management," *International Journal of Quality & Reliability Management,* vol. 39, no. 2, pp. 408-427, 2022, doi: 10.1108/IJQRM-10-2020-0353.

[19] A. Botchkarev and P. Finnigan, "Complexity in the context of information systems project management," *Organisational Project Management,* vol. 2, no. 1, pp. 15-34, 2015, doi: 10.5130/opm.v2i1.4272.

[20] E. M. Shehab, M. W. Sharp, L. Supramaniam, and T. A. Spedding, "Enterprise resource planning: An integrative review," *Business Process Management Journal,* vol. 10, no. 4, pp. 359-386, 2004, doi: 10.1108/14637150410548056.

[21] H. Stadtler, "Supply Chain Management — An Overview," in *Supply Chain Management and Advanced Planning: Concepts, Models, Software, and Case Studies*, H. Stadtler and C. Kilger Eds. Berlin, Heidelberg: Springer Berlin Heidelberg, 2008, pp. 9-36.

[22] R. Chalmeta, "Methodology for customer relationship management," *Journal of Systems and Software,* Article vol. 79, no. 7, pp. 1015-1024, 2006, doi: 10.1016/j.jss.2005.10.018.

[23] S. F. King and T. F. Burgess, "Understanding success and failure in customer relationship management," *Industrial Marketing Management,* vol. 37, no. 4, pp. 421-431, 2008/06/01 2008, doi: 10.1016/j.indmarman.2007.02.005.

[24] M. Williams, T. Ariyachandra, and M. Frolick, "Business Intelligence- Success Through Agile Implementation," (in English), *Journal of Management & Engineering Integration,* vol. 10, no. 1, pp. 14-21, 2018-05-26 2017.

[25] A. Teixeira, T. Oliveira, and J. Varajão, "Evaluation of Business Intelligence Projects Success - a Case Study," *Business Systems Research,* Article vol. 10, no. 1, pp. 1-12, 2019, doi: 10.2478/bsrj-2019-0001.

[26] F. S. Cardoso, J. Varajão, and A. Carvalho, "The adoption of Big Data technologies-A challenge for National Statistics Offices," in *Americas Conference on Information Systems*, Montreal, CA, 2021.

[27] S. Dash, S. K. Shakyawar, M. Sharma, and S. Kaushik, "Big data in healthcare: management, analysis and future prospects," *Journal of Big Data,* vol. 6, no. 1, pp. 1-25, 2019/06/19 2019, doi: 10.1186/s40537-019-0217-0.

[28] P. Chakraborty, R. Shahriyar, A. Iqbal, and A. Bosu, "Understanding the software development practices of blockchain projects: a survey," in *ACM / IEEE International Symposium on Empirical Software Engineering and Measurement*, Oulu, Finland, 2018 2018, pp. 1-10, doi: 10.1145/3239235.3240298.

[29] M. Mignerat and S. Rivard, "The institutionalization of information system project management practices," *Information and Organization,* vol. 22, no. 2, pp. 125-153, 2012/04/01 2012, doi: 10.1016/j.infoandorg.2012.01.003.

[30] R. C. Mahaney and A. L. Lederer, "Information systems project management: an agency theory interpretation," *Journal of Systems and Software,* vol. 68, no. 1, pp. 1-9, 2003/10/15 2003, doi: 10.1016/S0164-1212(02)00132-2.

[31] F. Hartman and R. A. Ashrafi, "Project Management in the Information Systems and Information Technologies Industries," *Project Management Journal,* vol. 33, no. 3, pp. 5-15, 2002/09/01 2002, doi: 10.1177/875697280203300303.

[32] AXELOS, *Managing successful projects with PRINCE2*, Sixth ed. London: The Stationery Office, 2017.

[33] EU, *The PM² Project Management Methodology Guide 3.0.1*. Luxembourg, Brussels: European Union, 2021.

[34] *ISO 21502 - Project, programme and portfolio management — Guidance on project management*, ISO, Geneva, Switzerland, 2020.

[35] J. Varajão, C. Dominguez, P. Ribeiro, and A. Paiva, "Critical success aspects in project management: Similarities and differences between the construction and the software industry," *Tehnicki Vjesnik,* Article vol. 21, no. 3, pp. 583-589, 2014.

[36] A. Tereso, P. Ribeiro, G. Fernandes, I. Loureiro, and M. Ferreira, "Project Management Practices in Private Organizations," *Project Management Journal,* vol. 50, no. 1, pp. 6–22, 2019, doi: 10.1177/8756972818810966.

[37] A. Varshosaz, J. Varajão, and N. Takagi, "Integrating the Information Systems Success Model With Project Success Management Process," *International Journal of Applied Management Theory and Research,* vol. 3, no. 2, pp. 1-13, 2021, doi: 10.4018/IJAMTR.2021070101.

[38] J. Varajão and N. Takagi, "Information systems project managers technical competences – perceived importance and influencing variables," *International Journal of Business Information Systems,* vol. ahead-of-print, 2024, doi: 10.1504/IJBIS.2021.10039704.

[39] A. Liberati *et al.*, "The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration," *Journal of Clinical Epidemiology,* vol. 62, no. 10, pp. 1-34, 2009/10/01 2009, doi: 10.1016/j.jclinepi.2009.06.006.

[40] B. Kitchenham and P. Brereton, "A systematic review of systematic review process research in software engineering," *Information and Software Technology,* vol. 55, no. 12, pp. 2049-2075, 2013/12/01 2013, doi: 10.1016/j.infsof.2013.07.010.

[41] C. Okoli and K. Schabram, "A Guide to Conducting a Systematic Literature Review of Information Systems Research," *SSRN Electronic Journal,* vol. 10, no. 26, pp. 1-49, 2010, doi: 10.2139/ssrn.1954824.

[42] T. Meline, "Selecting Studies for Systemic Review: Inclusion and Exclusion Criteria," *Contemporary Issues in Communication Science and Disorders,* vol. 33, no. Spring, pp. 21-27, 2006/03/01 2006, doi: 10.1044/cicsd_33_S_21.

[43] J. Varajão, J. Cardoso, D. Gonçalves, and J. Cruz, "Análise à gestão de projectos de desenvolvimento de software em grandes empresas portuguesas," *Semana Informática,* vol. 904, pp. 10-12, 2008.

[44] M. Catarino, D. Gonçalves, A. Pereira, and J. Varajão, "Software projects' most important activities of quality management: A Delphi study," IBIMA, Marrakech, Morocco, 2009.

[45] J. S. Rodrigues, A. R. Costa, and C. G. Gestoso, "National Culture and Planning and Control of Projects in Portugal," presented at the International Congress on Project Management and Engineering, Alcañiz, Spain, 2014. [Online]. Available: 10.1007/978-3-319-26459-2_5.

[46] J. Varajão, C. Dominguez, P. Ribeiro, and A. Paiva, "Failures in software project management - are we alone? A comparison with construction industry," *Journal of Modern Project Management,* Article vol. 2, no. 1, pp. 22-27, 2014.

[47] J. Varajão and A. Trigo, "Evaluation of IS project success in InfSysMakers: an exploratory case study," *International Conference on Information Systems*, Dublin-Ireland, 2016.

[48] T. M. Fernandes, J. Gomes, and M. Romão, "Investments in E-Government: A benefit management case study," *International Journal of Electronic Government Research,* vol. 13, no. 3, pp. 1-17, 2017, doi: 10.4018/IJEGR.2017070101.

[49] L. Silva, J. Varajão, C. Dominguez, and I. Moura, "Motivations for high performance teams of information systems projects," in *Proceedings of the Portuguese Association for Information Systems Conference*, Guimarães, Portugal, 2017: Associação Portuguesa de Sistemas de Informação, doi: 10.18803/capsi.v17.00-00.

[50] J. Varajão, L. Magalhães, L. Freitas, P. Ribeiro, and J. Ramos, "Implementing Success Management in an IT project," *Procedia Computer Science,* vol. 138, no. 2018, pp. 891–898, 2018, doi: 10.1016/j.procs.2018.10.116.

[51] J. Varajão and J. A. Carvalho, "Evaluating the Success of IS/IT Projects: How Are Companies Doing It?," presented at the International Research Workshop on IT Project Management, 2018.

[52] I. Moura, C. Dominguez, and J. Varajão, "Information systems project teams: factors for high performance," *Team Performance Management: An International Journal,* vol. 25, no. 1/2, pp. 69-83, 2019, doi: 10.1108/TPM-03-2018-0022.

[53] J. Varajão, H. Silva, and M. Pejic-Bach, "Key Competences of Information Systems Project Managers," *International Journal of Information Technology Project Management,* vol. 10, no. 4, pp. 73-90, 2019, doi: 10.4018/IJITPM.2019070105.

[54] J. Varajão, G. Fernandes, and H. Silva, "Most used project management tools and techniques in information systems projects," *Journal of Systems and Information Technology,* vol. 12, no. 3, pp. 225-242, 2020, doi: 10.1108/JSIT-08-2017-0070.

[55] A. Gonçalves, P. M. Oliveira, and J. Varajão, "Success Factors of Information Systems Projects in Portuguese Public Institutions," *Portuguese Association for Information Systems Conference*, Vila Real/Leiria, Portugal, 2021.

[56] J. Varajão and A. Amaral, "Risk Management in Information Systems Projects: It Can Be Risky Not To Do It," *International Journal of Project Management and Productivity Assessment,* vol. 9, no. 1, pp. 1-10, 2021, doi: 10.4018/IJPMPA.20210101.oa.

[57] J. Varajão, A. Trigo, J. L. Pereira, and I. Moura, "Information systems project management success," *International Journal of Information Systems and Project Management,* vol. 9, no. 4, pp. 62-74, 2021, doi: 10.12821/ijispm090404.

[58] R. Colomo-Palacios, I. González-Carrasco, J. L. López-Cuadrado, A. Trigo, and J. Varajão, "I-Competere: Using applied intelligence in search of competency gaps in software project managers," *Information Systems Frontiers,* vol. 16, no. 4, pp. 607-625, 2014, doi: 10.1007/s10796-012-9369-6.

[59] F. Escobar, J. Varajão, N. Takagi, and U. A. Neto, "Multi-criteria model for selecting project managers in the public sector," *International Journal of Information and Decision Sciences,* vol. 14, no. 3, pp. 205-242, 2022/01/01 2022, doi: 10.1504/IJIDS.2022.125168.

[60] J. Varajão, A. Trigo, and L. Rodrigues, "Gestão de Projetos de Sistemas de Informação: Realidades e Tendências," in *Sistemas de Informação: Diagnósticos e Prospectivas*: Sílabo, 2022.

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