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Project Management Information Systems: a Systematic Review

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Abstract

This paper presents a systematic scientific literature review of software in Project Management over the past five years. Through keyword-based research and subsequent selection, 108 papers were identified. Initially, these papers were categorized based on their research methodology and objectives. Then, trends related to the terminology, affiliation country, and journals and conferences where they were published were analyzed. The first result is related to the nomenclature: most sources refer to this kind of software as Project Management Information System (PMIS), followed by Project Management Software (PMS), Project Management System, and Project Management Tools. As for the contents, those include 43 case studies and/or technical reports on PMIS development, 28 case studies about implementing PMIS in business contexts, 27 frameworks and models for developing or implementing a PMIS, 13 models for comparing PMIS, and 12 surveys on PMIS adoption (some sources fall into multiple categories). No specific trending journals or conferences have emerged. It is discussed that the lack of standardized terminology has hindered the development of coherent literature strands, unlike in other business software domains such as Enterprise Resource Planning (ERP). This fragmentation could act as a barrier to competition among applications, delaying the development of quality software and necessitating customized solutions due to the scarcity and difficulty of obtaining commercial options.

Keywords: Project Management; Project Management Information System; Project Management Software; Systematic Literature Review.

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1. Introduction

Project Management is *"the application of knowledge, skills, tools, and techniques to project activities to meet project requirements"* [1]. This process includes the use of various project management tools: qualitative tools, which support interpersonal and organizational processes; quantitative tools, which facilitate the computational aspects of Project Management (PM); and computer tools [2]. The latter are called Project Management Information Systems (PMIS) and are useful for several purposes.

For instance, they can support projects, programs, and portfolios management [3], [4] by optimizing resource allocation [5], facilitating monitoring and control, and managing risks [6]. Also, they can provide a platform for reporting and sharing key information to decision-makers [6] and facilitate the integration and automation necessary to implement Industry 4.0 in PM [7]. Overall, PMIS increases the efficiency and digital transformation of project-oriented companies, while improving planning, scheduling, collaboration, and effective task delegation [8], [9]. The application of PMIS to construction projects has shown that they contribute to keeping these projects within the established timeframes and budgets [10]. Ultimately, PMIS can positively influence the reputation of organizations [11]. Therefore, they are identified as one of the key technologies with the highest growth potential [12]. PMIS literature also includes comparative studies. Retnowardhani and Suroso compare five applications of PMIS across different geographical areas, confirming the afore–mentioned benefits, while adding that PMIS implementation requires support from top management and needs to be done systematically [13]; Haloul et al. propose a literature review classifying the main applications of PMIS to construction projects [14].

However, to the best of the authors' knowledge, no systematic review has broadly addressed this subject. The fields are characterized by inconsistencies and a lack of unified terminology among sources, from both scientific literature and practitioners. This paper aims to bridge this gap by systematically analyzing and cataloging the literature on PMIS, enhancing cohesion and enriching the collective scientific understanding. The research questions (RQ) addressed in this paper are:

[RQ1] What research objectives and methodologies have been adopted in PMIS research?
[RQ2] What terminology is most commonly used to define software for PM?
[RQ3] Which are the main journals and conferences for this topic?

The structure of this paper is as follows: First, the methodology section outlines the review steps. Next, the results section displays the key findings from the corpus. Following that, the discussion section explores the contribution of this paper in both academic and practical contexts. Finally, conclusions are drawn.

2. Methodology

This research was conducted on the Scopus portal, which covers most peer-reviewed academic journals, especially in the fields of engineering [15], [16]. Considering that the goal is to find software applications in PM, the search query used was *"Project Management" and ("Software" OR "Information System") and year >= 2019*. This resulted in 3257 articles. As mentioned in the introduction, the majority of these articles relate to agile methodologies, that is, project management applied in IT contexts. Therefore, filtering based on abstracts was necessary, leading to the selection of only 108 articles. The inclusion criterion was: to present a study related to software supporting PM. Operational research papers that introduced models applicable in multiple contexts, including PMIS, were excluded unless it was explicitly clarified that their purpose was to be applied to PMIS.

Categories of analysis were derived inductively, focusing on the goals of the papers and the methodologies employed.

Fig. 1. Research Methodology

3. Analysis of results

3.1. Papers Categorization / Methodological approaches to PMIS

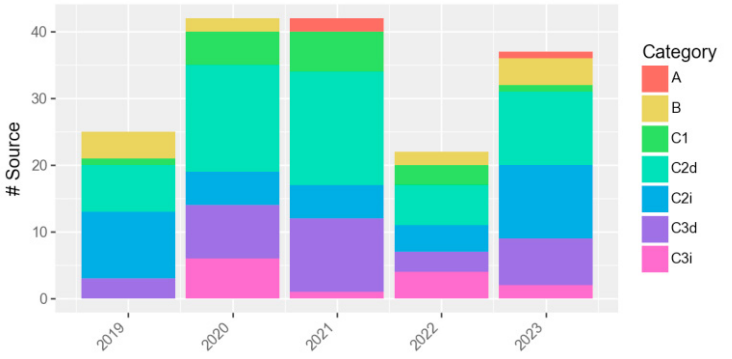
Analyzing the selected papers, three main categories based on the research methodology have been identified. Category A includes **conceptual papers** that place Project Management Information Systems (PMIS) within the broader discipline of Project Management. Category B consists of **survey-based studies** discussing the role, effectiveness, and impact of PMIS across various industries and countries. Category C includes **case studies** and frameworks.

Category C has been further subdivided into five subcategories based on the paper's objectives. Category C1 includes frameworks and case studies for selecting a PMIS suitable for specific contexts; category C2d includes case studies and technical reports on the development of new PMIS or PMIS modules; category C2i includes case studies and technical reports on the implementation of existing PMIS in real-world contexts; category C3d includes theoretical frameworks to develop PMIS, and category C3i includes theoretical frameworks to implement PMIS.

	Category *	#	Sources
A	Conceptual	3	[17], [18], [19]
B	Survey	12	[20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31]
C1	Frameworks and case study for PMIS selection	13	[9], [32], [33], [34], [35], [36], [37], [38], [39], [40], [41], [42], [43]
C2d	Case study and technical reports on PMIS development	43	[5], [8], [43], [44], [45], [46], [47], [48], [49], [50], [51], [52], [53], [54], [55], [56], [57], [58], [59], [60], [61], [62], [63], [64], [65], [66], [67], [68], [69], [70], [71], [72], [73], [74], [75], [76], [77], [78], [79], [80], [81], [82], [83]
C2i	Case study and technical reports on PMIS implementation	28	[5], [10], [44], [59], [76], [83], [84], [85], [86], [87], [88], [89], [90], [91], [92], [93], [94], [95], [96], [97], [98], [99], [100], [101], [102], [103], [104], [105]
C3d	Development Frameworks	19	[8], [9], [35], [46], [65], [70], [72], [75], [78], [82], [106], [107], [108], [109], [110], [111], [112], [113], [114]
C3i	Implementation Frameworks	8	[91], [96], [109], [110], [111], [115], [116], [117]
	Other	3	[6], [118], [119]

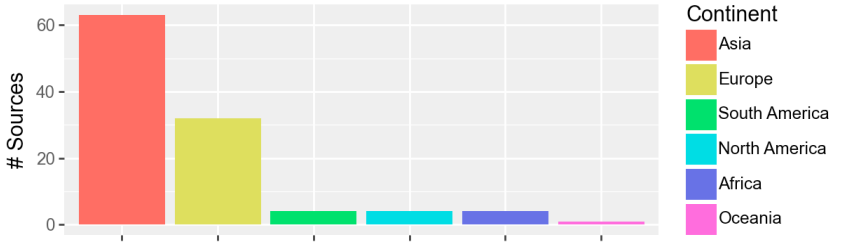
* Some sources are in more than one category.

3.2. Publications and Categories over Time



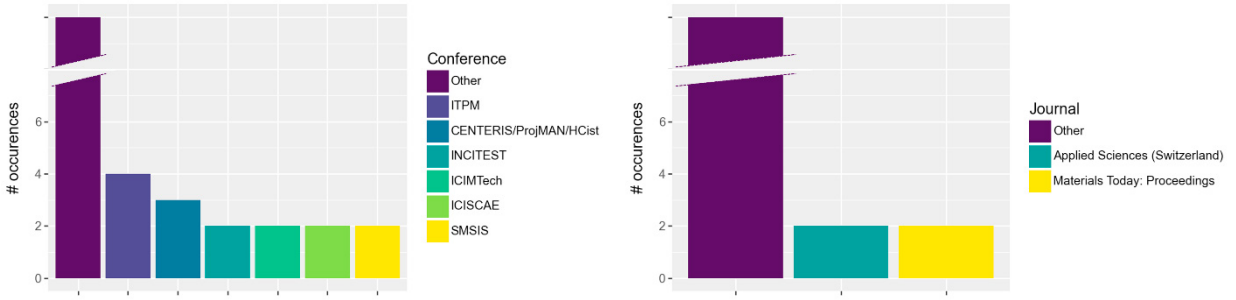
The dominant category is C, which includes case studies and technical reports, with 111 occurrences. This is followed by category B, which consists of surveys, with 12 occurrences; and finally, category A, conceptual papers, with 3 occurrences. The number of publications varies over the years, from a minimum of 22 to a maximum of 45.

3.3. Countries



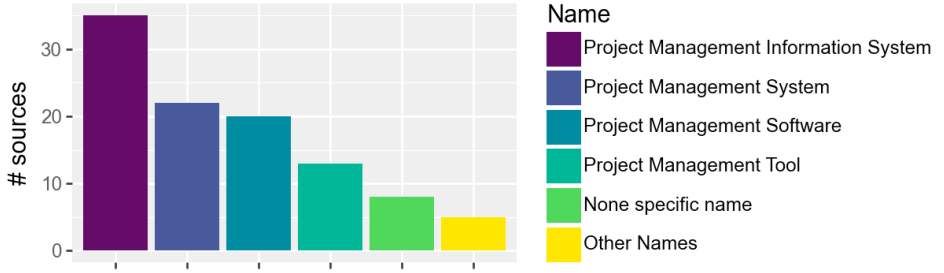
The publications originate from 44 different countries, with the majority in Asia and Europe.

3.4. Trending Journal and Conferences



There are 73 conference papers and 35 journal papers (we have adopted the subdivision of the portal used, Scopus, which also indexes some collections of proceedings as journal papers). Of the 73 conference papers, 4 are from the International Workshop on IT Project Management (ITPM), 3 from CENTERIS/ProjMAN - International Conference on ENTERprise Information Systems and Project Management, 2 from INCITEST - International Conference on Informatics, Engineering, Science, and Technology, 2 from ICIMTech - International Conference on Information Management and Technology, 2 from ICISCAE - International Conference on Information Systems and Computer Aided Education, 2 from SMSIS - International Conference on Strategic Management and its Support by Information Systems, and 58 from various other conferences with one paper each. For the 35 journal papers, “Applied Science” (Switzerland) and “Materials Today – Proceedings” each have two papers, while the other 31 are published in various journals. Hence, no particular conferences or journals emerge.

3.5. Nomenclature



The term “Project Management Information System” is the most commonly used to describe software for managing projects, used by 35 sources. It is followed by “Project Management System”, used by 22 sources, “Project Management Software”, used by 20 sources, and “Project Management Tool”, used by 13 sources. Other terms such as “Project Management Application System”, “Project Portfolio Management Information Systems”, and “Project

Data Management Information System" are used by fewer sources. Additionally, 8 papers do not specify any particular name for such software.

4. Discussion

The results confirm the scientific interest in the subject, showing a fluctuating yet consistent trend over each year analyzed, with a global interest in the field. The main finding is a significant fragmentation within the area. There is a lack of common terminology, and there are no journals or conferences with dedicated streams for PMIS. This defect becomes even more apparent when compared to the literature on other common business software like Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM) systems. For instance, searching for "ERP" or "CRM" on the same database yields thousands of articles and hundreds of reviews, a severe contrast to the situation described here.

The fragmentation extends to practitioners: websites for software like SAP, Salesforce, and Odoo identify themselves as ERP or CRM from their homepages, while websites for software like Microsoft Project or Project Libre do not adopt any specific nomenclature. We believe the consequences of this fragmentation are multiple.

From a practical perspective, we consider this fragmentation a barrier to competition among different applications and solutions, ultimately delaying the development of quality software. As authors, we have empirical evidence of this shortage: we have been involved in various applied research projects aimed at monitoring and controlling large projects and have often recommended the introduction of customized systems, even in relatively standard situations, given the scarcity of commercial solutions and the difficulty in obtaining them.

From a scientific standpoint, any comparative analysis becomes difficult and expensive in terms of efforts for source selection. This leads to the publication of similar studies that are unaware of each other's existence, slowing down the process of incremental research. Furthermore, without clear boundaries for PMIS, it is challenging for the literature to produce algorithms and frameworks that can be implemented in commonly used commercial platforms.

With our work, we hope to have contributed to highlighting and partially addressing this gap. A clear future development in research, we believe, is to continue the analysis and reorganization of knowledge. Studies that clearly qualify the functionalities of PMIS are lacking, as well as the validity and generalizability of previously proposed models and frameworks. Future research should also categorize sources basing on new orthogonal variables, such as "public or private" or "large enterprise or SME".

5. Conclusions and limitations

In this paper, we present a systematic review of research related to Project Management Information Systems (PMIS). By identifying and categorizing 108 research works on the topic published in the last five years we respond to the first [RQ1] question: *"What research objectives and methodologies have been adopted in PMIS research?"*.

As for [RQ2], *"What terminology is most commonly used to define software for project management?"*, we can state that "Project Management Information System (PMIS)" is the most commonly used term, followed by "Project Management System", "Project Management Software (PMS)", and "Project Management Tool".

Regarding [RQ3], *"Which are the main journals and conferences for this topic?"*, we find out that there is no dominant or emerging trending journal or magazine for the topic.

This study is constrained to an analysis of relevant literature from the last five years, reflecting the limited range of existing research. Future research could explore how terminology and the design of PMIS impact and are applied across different industrial sectors.

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