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Process Mining for IS Project Management:
A Systematic Literature Review

Joana Pedrosa
https://orcid.org/0000-0002-9514-268X
ALGORITMI Center, University of Minho, Portugal

Luís Gonzaga Magalhães
ALGORITMI Center/LASI, University of Minho, Portugal

Ricardo Martinho
https://orcid.org/0000-0003-1157-7510
INESCC-DL, ESTG, Polytechnic University of Leiria, Portugal

ABSTRACT

Recently, process mining techniques have been used to discover, analyze, and improve business processes' performance, including project management processes conducted in IS projects. In this literature review, 383 documents were found and 59 were selected as relevant in the use of process mining for project management. These works were categorized according to the eight project performance domains presented by the Project Management Body of Knowledge. Approximately 50% were associated with the development approach and life cycle domain, in contrast to only 3% associated with the stakeholder domain. In addition to this review, other reviews were identified that explored the same theme but with an emphasis on agile software development. The process mining discovery techniques were the most applied in this context. The findings from the review suggested a gap in the literature regarding the correlation between process mining and IS project success.

KEYWORDS

Process Mining, Information System, Project Management, Project Performance Domains

INTRODUCTION

Many improvements have been made in the information technology (IT) and information systems (IS) areas over the last decades. The emergence of these digital technologies has enabled a new digital era to begin, transforming the business strategy of organizations. As a result of this evolution, business processes that used to be carried out manually by organizations are now executed in a more digital way, supported by IT and IS, and this has enabled the decision-making process to be quicker (Bharadwaj et al., 2013). With this, organizations have become more digital firms, as their relationships with the market—namely, customers and suppliers—occur digitally (Laudon & Laudon, 2020).

A business process can be described as a set of combined activities/tasks, (human) resources, and data, that allow organizations to achieve their goals (Chfouka et al., 2013). Related to business processes are projects, which can be defined as the composition of specific properties, such as a start and end date, well-defined objectives, a set of tasks, and a budget (Sudhakar, 2012). Therefore, projects can also be observed as a set of correlated business processes, which together aim to deliver a product and/or service with success.

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IS projects are characterized by high technical complexity, quick and frequent changes in requirements, and a high degree of uncertainty and risk. Furthermore, the intangible nature of software products makes managing them even more challenging. However, the benefits produced by using IS for managing and improving business process are significant and help managers make decisions (Figueiredo et al., 2014).

Project management is also "seen as the art and science" of structuring and coordinating the completion of tasks at all stages of the project throughout its entire life cycle (Figueiredo et al., 2014). Today, the knowledge and practice of project management has improved considerably, and organizations recognize its relevance to the growth and success of their businesses (Gonçalves et al., 2018).

Process mining presents itself, in this scenario, as a non-intrusive research area that can be used to discover IS project management processes as well as analyze their conformance towards accomplishing certain success factors.

The objective of this article is to analyze and present the state of the art in terms of the application of process mining techniques to IS project management processes.

Other literature reviews have been developed that discuss the two topics addressed in this review, such as the work of Arias et al. (2018), Erdem et al. (2018), Erdem and Demirörs (2017), Feres et al. (2023), and Urrea-Contreras et al. (2021). These reviews focus essentially on the application of process mining in agile software development methodologies. In this literature review, we not only identify articles that use agile or other methodologies in IS project management but also go deeper into the analysis by relating project performance domains defined in the Project Management Body of Knowledge (PMBoK) with the use of process mining techniques. In this way, it is possible to determine which performance domains are most covered by the articles selected in the review and to identify some gaps in research.

This paper is organized as follows: the next section introduces the main concepts related to IS project management and process mining. The third section presents the research method. The fourth section reveals the results of the literature review related to the project performance domains. The fifth section describes a critical analysis of the results based on the objectives set for this literature review and identifies the main gaps in the literature. Finally, the sixth section presents a conclusion and suggestions for further work.

IS PROJECT MANAGEMENT

The development of IS has become more complex, requiring advanced planning, scheduling, and control processes, as they justify high costs. Project management is fundamental to ensuring that these systems are delivered on time, within budget, and to expectations (Avison & Torkzadeh, 2009). According to the Project Management Institute, this management "involves the application of knowledge, skills, tools and techniques to fulfil project requirements" (2021). In recent decades, the importance of these skills has been recognized in IS curricula, and they are essential for team leaders who must ensure the delivery of efficient and functional systems.

An information system is essential for organizations and society, as it collects, processes and distributes crucial information to ensure easy access for managers, employees, customers, and citizens. Rooted in human activities, it relies heavily on information and communication technologies (ICT), as Takagi and Varajão (2019) state in their work, where participants use technology and resources to produce information products and services for stakeholders, promoting operational efficiency and innovation.

Today, IS use ICT such as hardware, software, and networks. Their effectiveness comes from integrating ICT with organizational and human processes, driving innovation and improving operational efficiency (Avison & Torkzadeh, 2009). In research, their specific domains of application vary from healthcare (for instance, e-Health initiatives such as the ones in Ilahi et al. [2014] and

Pellison et al. [2017]) to heavy industry manufacturing digital platforms such as the ones recently reported in Céu et al. (2024) and Silva et al. (2024).

In the context of IS project management, a project usually represents a temporary effort undertaken with specific objectives aimed at implementing or improving IT systems, software, or infrastructures in an organization, i.e., focused on creating a product (Project Management Institute, 2021).

The PMBoK is a widely recognized guide that outlines the best practices, terminology, guidelines, and standards for project management. Published by the Project Management Institute, it standardizes project management processes, ensuring they are collaborative and adaptable to industry changes. It also focuses on planning, executing, and monitoring activities to achieve project goals within defined scope, quality, time, and cost constraints. It emphasizes eight project performance domains crucial for project success (Project Management Institute, 2021):

- The *stakeholder* domain deals with people: managing expectations, needs, and communication with all project stakeholders to ensure their involvement and ongoing support.
- The *team* domain focuses on the project team: training, developing, and leading the project team to foster collaboration, motivation, and efficiency, ensuring the project's objectives are achieved.
- The *development approach and life cycle* domain concerns how we develop things: selecting and implementing the development approach (agile, predictive, hybrid, etc.) and establishing the project life cycle to effectively address the project's requirements and constraints.
- The *planning* covers all aspects of plans: formulating and updating plans that manage the project's execution and management, encompassing scope, timeline, budget, quality, resources, communication, risks, and procurement.
- The *project work* domain focuses on doing the work: coordination and execution of the work required to deliver the project's products, services or results as planned.
- The *delivery* domain concerns meeting expectations: delivering project outcomes that comply with acceptance criteria and add value to stakeholders.
- The *measurement* domain deals with measuring performance: monitoring and evaluating project performance compared to plans, along with using metrics and indicators to identify variations and implement corrective actions.
- The *uncertainty* domain focuses on uncertainties: identifying, analyzing and responding to risks and uncertainties that may impact the project, with a goal of minimizing threats and maximizing opportunities.

Process Mining

According to the manifesto by Van Der Aalst et al. (2012), process mining can be defined as an important bridge between data mining, business process modeling, and analysis. It is a discipline whose focus is on discovering, monitoring, and improving real business processes. Process mining techniques enable the extraction of knowledge from business processes through ad hoc stored data or events supplied by IS of the organizations (Gupta, 2014). These records are commonly known as event logs, and, quite often, there are numerous event logs of several business processes, often loose and unrelated. In IS project management processes, these logs are gathered in particular project management tools/repositories, including Jira, Trello, text files, and committed code updates and documentation in version control systems.

There are three types of process mining (Van Der Aalst et al., 2012): discovery, conformance checking, and improvement.

Discovery consists essentially of building a process model based only on an event log. The second type, conformance checking, compares process execution data registered in an event log with a process model and checks whether the discovered real process from this execution data conforms to the model and vice versa. It is common to look at conformance from four main perspectives:

- The *control-flow perspective* focuses on the sequence and flow of activities within the process.
- The *organizational* perspective analyzes the roles, resources, and organizational structures involved in the process. It looks at how different actors (e.g., employees, departments) contribute to the execution of activities.
- The *case* perspective addresses individual cases (instances) of the process, examining how each case progresses through the process. This includes the path each case takes, the originators working on it, and other relevant data elements (e.g., supplier details, number of products ordered).
- The *time* perspective describes temporal aspects of the process, such as the timing, duration, and frequency of activities.

The third and last type of process mining essentially refers to process improvement. That is, it uses the results of the previous tasks to generate a (new) improved process model to be then further used by the organization to conduct its business processes.

Process Mining Applied to IS Project Management

Process mining establishes a significant relationship with IS project management by providing tools to map, analyze, and optimize processes along the IS project life cycle. This technique helps managers understand the actual execution of activities, identify discrepancies from what was planned, and propose improvements by transforming real data extracted from system event logs into valuable insights. Its application is particularly relevant in agile methodologies such as Scrum and Kanban, which require flexibility and constant adaptation. Techniques such as process discovery are frequently used to map sequences of activities, identify work patterns, and monitor team performance, contributing to the continuous improvement of workflows.

Studies such as Mendes et al. (2018) explore the combination of Kanban with process mining to improve task management, control delivery times, and diagnose performance problems, demonstrating the ability of this integration to optimize workflow and improve efficiency. Furthermore, process mining allows for a more detailed analysis of team efficiency. Caldeira et al. (2019), for example, demonstrate how logs extracted from integrated development environments (IDEs) can be used to assess the effectiveness of teams, comparing processes in terms of efficiency and identifying the impacts of human variability.

The application of process mining to IS project management provides important benefits, such as the identification of bottlenecks, high rework rates, and communication failures, offering practical solutions to improve efficiency and quality. Through an analysis based on real data, it is possible to detect inefficiencies and propose improvement strategies. The use of decision support tools, as suggested by Salmani et al. (2022b), helps to select the best solutions to mitigate problems in software development processes. The area of process mining facilitates alignment between stakeholders and development teams, promoting greater transparency and predictability, which contributes to project execution that is more aligned with organizational objectives.

Therefore, process mining enables more efficient management of IS projects, providing a detailed view of performance, identifying failures and offering solutions to optimize its management processes. With the support of tools based on this technique, it is possible to make timely, informed decisions, predict risks, and improve alignment between all the parties involved, resulting in more effective management and better results.

IS project managers are confronted with numerous decisions daily, many of which are multifactorial and multicriteria in nature, with the aim of increasing the project's success. In this context, the use of process mining techniques in combination with a decision support system can provide valuable support for decision-making.

The proposed decision support system operates based on inputs, such as a project event log and information related to the critical success factors (CSFs) to be analyzed. After processing this data, the system presents the manager with a set of strategic decisions.

For example, by selecting the *time management* CSF for decision support of an ongoing current IS project, the system will automatically retrieve process event logs (historical data) of similar projects made within the organization, run a *trace* alignment process mining algorithm to perform a comparison analysis of the sequencing of activities with the best time performance and, after analysis, propose decisions such as:

- adjusting estimated durations for each future task
- optimizing the sequencing of activities C and D by making them parallel

This automated process aims to support the manager in implementing targeted improvements and optimizing project performance, increasing the likelihood of success.

RESEARCH METHOD

For this study, a literature search was conducted based on the PRISMA statement (Page et al., 2021). The PRISMA statement allows the literature review to be described and identified in a simple, concise, complete, and transparent way, through the available flowchart.

Objectives

To conduct this research for the study in question, three initial objectives were defined:

- O1: identify which project performance domains are most supported by process mining in IS project management
- O2: to interpret how process mining techniques are being applied in IS project management
- O3: to identify research gaps in process mining for IS project management

Research Strategy

After analyzing the research objectives, the following keywords were identified to search for related work: “process mining”; “information system development”; “project management”; “agile”; and “software development”.

Through the combination of the identified keywords, the following search strings were constructed:

- “process mining” AND “project management”
- “process mining” AND “software development”
- “process mining” AND “agile”
- “process mining” AND “information systems development”

The expressions were, essentially, submitted in three research databases: 1) Scopus; 2) Web of Science and 3) Institute of Electrical and Electronics Engineers (IEEE). In the Scopus research database, the search was carried out by title, abstract, and keywords. In the Web of Science database, the search was performed by topic, which refers to the title, abstract and keywords, in a similar manner as the Scopus database. For the IEEE database, the search was conducted by metadata, which includes abstract, title text, and indexing terms, as in the previous databases.

While the PRISMA methodology ensures a systematic and transparent review process, it does have some limitations. It primarily focuses on the quantitative inclusion and exclusion of studies, which may overlook qualitative nuances. Additionally, the results depend heavily on the selected databases and search strategies, which can inadvertently exclude relevant studies. Finally, in rapidly

evolving fields, such as project management and IS, PRISMA's structured approach may have limited flexibility to capture emerging topics or grey literature.

According to the PRISMA statement and the first step of its flowchart (see Figure 1), a total of 383 articles were identified, according to the following inclusion criteria:

- articles that are aligned with the research objectives
- articles that have been published in journals or conference proceedings
- articles that focus on a combination of process mining, project management, agile, IS development, or software development

No time limit was set as a criterion for our literature review, enabling us to include studies from all periods to ensure thorough and comprehensive analysis.

Next, all duplicate articles in the search were removed, with 199 articles remaining. In the PRISMA second stage, we performed an analysis of the abstracts and titles for the resulting papers to eliminate those not related to the research objectives.

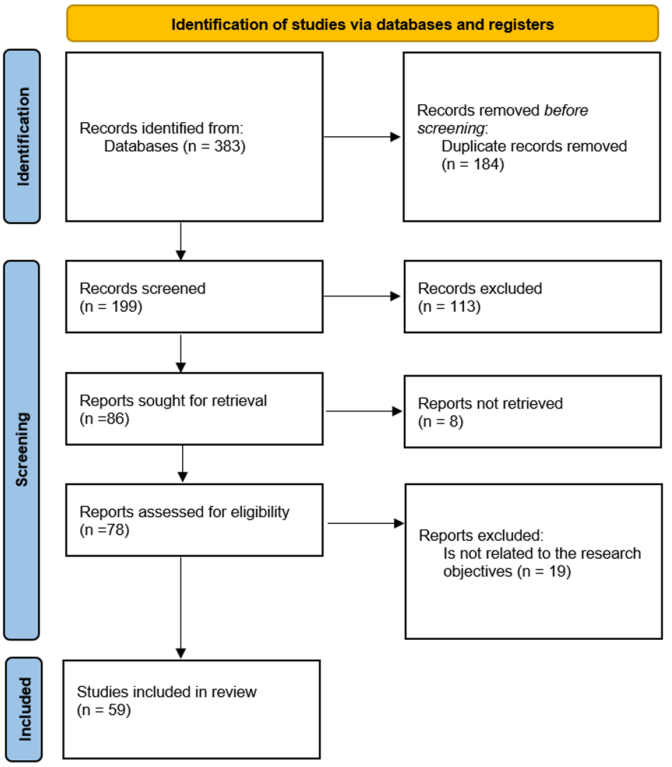
After the end of this analysis, 86 articles were considered for a full reading, and the 113 that did not qualify were removed.

Of these 86 articles, eight were excluded because they were not available or not retrieved.

In the penultimate stage of PRISMA, 78 articles were read in full, of which 19 needed to be excluded because they did not align with the research objectives, particularly in the context of project management.

After this reading, the literature review was completed with a total of 59 articles related to the research objectives. This entire review process can be seen in Figure 1 with the analysis of the PRISMA flowchart.

Figure 1. PRISMA flowchart with results obtained for our literature review



In the next section we will analyze in more detail each of these resulting 59 studies to be included in our literature review.

RESULTS

In this section, we present the findings from the literature review concerning the project performance domains and the application of process mining techniques. The selected articles were related with the eight domains described in the PMBoK, as illustrated in Table I. The table shows that an article can address one or more project performance domains, meaning that the process mining techniques referred are used to discover, conform, or improve one or more of these domains when applied to IS project management.

Table 1. Project performance domains of the project management body of knowledge by article

Article Reference	Stakeholder	Team	Development Approach & Life Cycle	Planning	Project Work	Delivery	Measurement	Uncertainty
Archanjo et al., 2018		X			X			
Arias et al., 2016		X						
Arias et al., 2018			X					

continued on following page

Table 1. Continued

Article Reference	Stakeholder	Team	Development Approach & Life Cycle	Planning	Project Work	Delivery	Measurement	Uncertainty
Astromskis et al., 2013			X			X		
Astromskis et al., 2014			X			X		
Bala & Mendling, 2018			X					
Baskoro & Sunindyo, 2019							X	X
Blum, 2016			X				X	
Caldeira & Brito e Abreu, 2016		X		X				
Caldeira et al., 2022							X	X
Chhor et al., 2022					X	X		
Coremans et al., 2023		X						
Dumbach et al., 2020			X		X		X	
Erdem & Demirörs, 2017			X					
Erdem et al., 2018			X					
Fauzi & Andreswari, 2022		X			X		X	
Feres et al., 2023			X					
Gupta et al., 2015		X	X		X			
Gupta et al., 2017						X		
Gupta, 2014		X		X	X			
Joe et al., 2016			X		X			
Keith & Vega, 2017							X	
Kregel et al., 2021						X		
Krismayer et al., 2019			X				X	
Lemos et al., 2011			X					
Marques et al., 2018		X	X					
Mendes et al., 2018					X			X
Mittal & Sureka, 2014		X	X		X		X	
Nogueira & Zenha-Rela, 2021			X				X	
Nogueira & Zenha-rela, 2024							X	
Oberhauser & Stigler, 2018			X					
Pedrosa et al., 2021						X		
Poncin et al., 2011					X			
Razi et al., 2019					X	X	X	
Caldeira et al., 2019		X			X		X	
Rubin et al., 2007			X				X	
Rubin et al., 2014			X				X	
Salmani et al., 2022a		X		X				
Salmani et al., 2022b		X		X				
Šamalíková et al., 2009				X	X	X		
Samalikova et al., 2011			X				X	
Santos et al., 2015					X			

continued on following page

Table 1. Continued

Article Reference	Stakeholder	Team	Development Approach & Life Cycle	Planning	Project Work	Delivery	Measurement	Uncertainty
Saylam & Sahingoz, 2014			X					
Schidek & Timinger, 2022			X					
Schönig et al., 2015		X						
Sebu & Ciocârlie, 2014		X			X		X	
Sebu & Ciocârlie, 2015					X			
Shani et al., 2019			X	X	X			
Thomson & Gheorghe, 2009			X				X	
Urrea- Contreras et al., 2020			X					
Urrea- Contreras et al., 2021		X		X	X			
Urrea- Contreras et al., 2024	X	X	X	X	X			
Urrea- Contreras, Flores-Rios, González- Navarro, Astorga-Vargas, et al., 2022		X	X		X			
Urrea- Contreras, Flores-Rios, González- Navarro, Pacheco, et al., 2022		X		X	X		X	
Vasilecas et al., 2014			X					
Vavpotič et al., 2022	X	X					X	
Yu & Wang, 2017		X			X			
Zayed & Farid, 2016			X		X			
Zebro & Timinger, 2022					X			

ANALYSIS

This section presents a critical analysis of the results obtained by applying PRISMA. The selected publications were reviewed to answer and associate with our research objectives O1, O2, and O3.

O1) To Identify Which Project Performance Domains are Most Supported by Process Mining in IS Project Management

As mentioned above, this literature review shows an interesting mapping between the selected articles and the PMBoK project performance domains.

So, analyzing the treemap shown in Figure 2, we can conclude that:

- Approximately 50% (29 articles) of the selected papers were related to the *development approach and life cycle* domain. This was the most relevant domain in studies applying process mining to IS project management.

For example, Rubin et al. (2014) was one of the selected articles that could be characterized as related to the *development approach and life cycle* domain, as its focus was on integrating process mining into the agile development cycle using a bottom-up approach.

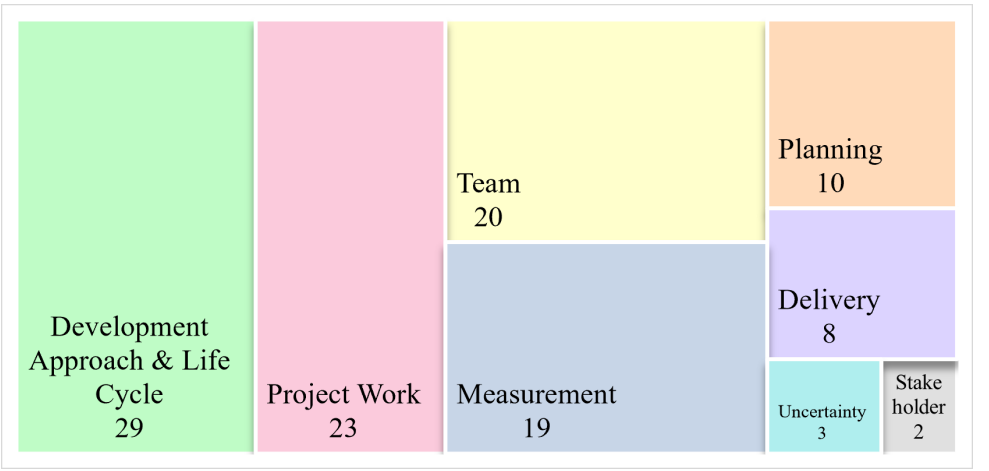
Similarly, Feres et al. (2023) discussed how process mining approaches could be applied to improve the efficiency and quality of agile software development processes.

It is important to note that many of the articles in this field explored and integrated process mining techniques into the software development life cycle. The authors used several different approaches to optimize software development:

- Around 39% (23 articles) of the articles selected in the literature review addressed the *project work* domain.
- Only 20 of the 59 articles included in this review were associated with the *team* domain, corresponding to around 34% of the research carried out.
- In the *stakeholder* domain, only two articles were identified.

An example of the *planning* domain was the work of Mendes et al. (2018), which aimed to improve task management, control delivery time, and identify performance problems. In this article, the authors explored the application of the Kanban methodology combined with process mining techniques.

Figure 2. Tree map with the distribution (in quantity) of papers per project performance domains



Furthermore, it was noted that one article could cover several project performance domains at the same time. For example, Urrea-Contreras et al. (2024) covered five domains: *stakeholders*, *team*, *development approach and life cycle*, *planning* and *project work*. There were also two articles that covered four domains, Urrea-Contreras, Flores-Rios, González-Navarro, Pacheco, et al. (2022) and Mittal and Sureka (2014). This shows how the different aspects of project management are interconnected, offering a complete overview of the challenges and practices in small and medium-sized software development companies.

However, most of the publications selected in this study focused on just one project performance domain, such as Coremans et al. (2023), Keith and Vega (2017), Lemos et al. (2011), Sebu and Ciocârlie (2015), and others.

O2) To Interpret How Process Mining Techniques are Being Applied in IS Project Management

The literature review revealed that process mining began to be applied in project management approximately 10 years ago. Although the first articles in this review dated back to 2009, the largest increase in interest came in 2014. In that year, more researchers began to explore the application of

process mining techniques to aid and facilitate project management processes, especially in the context of agile development.

Naturally, the application of process mining in most of the studies was essentially centered on data/event extraction, i.e., the discovery technique, as the systematic literature review developed by Arias et al. (2018) on the application of process mining in agile software development methodologies showed. They concluded that, in the six selected studies, process discovery was the most relevant type and that the Disco tool was the most used for analyzing processes. In the studies that the authors analyzed, agile methodologies indicated that the Scrum methodology was the most frequently applied.

There are significant process mining applications in software projects, namely for the discovery of processes and their improvement in agile projects.

Marques et al. (2018) applied the potential of process mining techniques to assess what agile practices a particular organization was implementing by collecting event logs from case handling systems.

Both studies conducted by Erdem and Demirörs (2017) and Erdem et al. (2018) aimed to explore the areas in which process mining was applied in agile software development. Although it was found that there were some challenges in applying process mining in agile contexts, namely in collecting structured event logs, the paper concluded that process mining could be considered a valid option for extracting processes followed by agile teams, as it could help in the visualization of consistency and/or problems.

The behavior of team members and the efficiency of the team can be analyzed and evaluated using process mining techniques.

Recently, Urrea-Contreras et al. (2021) aimed to present, through a systematic literature review, the state of the art regarding the perspectives of process mining over a 10-year period in the area of software engineering.

Chhor et al. (2022) presented a rules-based decision support model to enable process improvement. They used process mining techniques to support data analysis and the extraction of performance indicators. The authors considered this assistance tool to be an asset for the continuous improvement of digitized processes.

Salmani et al. (2022b) highlighted in their work the importance of using process mining techniques to discover deficiencies in the software development process. In this study, they also proposed the development of a decision support tool. This tool aimed to provide experts to select the best solution based on the process data in such a way as to help in the planning of the software release. They also presented interesting results and indicated that, in the analysis performed, several deficiencies in the software development process were verified, such as high rates of rework, lack of mutual understanding among team members, and, sometimes, changing requirements.

Caldeira et al. (2019) stated that the discovery of software development processes allowed, then, the evaluation of the efficiency of teams and comparison of the processes in terms of efficiency and effectiveness. The events emerging from the use of an IDE will be used as input, with a view to providing support to software developers when recommending which activity, resource, or action is best.

Caldeira and Brito e Abreu (2016) also could draw important conclusions about process efficiency through the IDE event logs. The approach allowed the identification and proof that the human factor can have a strong impact on process variability and consequently on process efficiency and effectiveness.

Joe et al. (2016) developed an application that used the discovery technique of process mining to optimize the software development life cycle. From the flow diagram generated by the software, it was possible to identify the sequence of activities, the roles in the organization, and several efficiency parameters.

Keith and Vega (2017) presented several case studies illustrating potential applications of process mining in software development. Additionally, the authors highlighted significant challenges in

applying process mining to software engineering, including process knowledge, data quality, tool integration, results evaluation, and usability.

O3) To Identify Research Gaps in Process Mining for IS Projects Management

This systematic literature review identified some important gaps and concluded that there is still knowledge to explore and research to perform in the area of process mining and project management. The three main gaps identified are:

Lack of Research Into Process Mining Improvement/Enhancement Techniques

Of the three process mining types of techniques mentioned by Van Der Aalst et al. (2012) in the manifesto—*discovery*, *conformance checking*, and *enhancement*—most of the studies selected in this review applied discovery techniques for analyzing and extracting data. Although less commonly, conformance checking techniques were also used, which were mainly applied to verify the conformity of a process, analyzing its fitness and precision in comparison with the intended model, as exemplified in Urrea-Contreras, Flores-Rios, González-Navarro, Pacheco et al. (2022).

On the other hand, research into enhancement techniques was still limited. Although some of the papers in this review applied these techniques, such as Caldeira and Brito e Abreu (2016), it was still rarely used. This was confirmed by Arias et al. (2018) in his systematic literature review which stated: "...and enhancement have only one primary study that reports its use".

Lack of a Standard Format for Registering Data (Event Logs)

We could not find any research work that defined a standard and identified strategies for handling logs for further use in process mining applied to project management. According to Erdem and Demirörs (2017), collecting data and obtaining structured event logs to extract the processes is a challenge. Given the nature of their research focused on agile methodologies, the authors confirmed a research gap not only in the event logs but also in the analysis of agile processes. According to the authors, agile approaches sometimes had non-formalized development processes. Marques et al. (2018) also highlighted the same gap in relation to agile approaches—namely, the difficulty in obtaining some relevant data from the Jira software tool. They also emphasized the importance of having the information about Scrum meetings and roles in the system to analyze the whole process more precisely.

That is, although the previous authors focused on agile methodologies, the same challenges apply to IS project management. For process mining, event logs are one of the most important parts, and their inexistence or the lack of a standard format to register project management activities in the development of IS becomes a problem. Consequently, the application of process mining techniques in a more recurrent, concrete, and correct way is also affected, as well as the possibilities of automation or decision-making support for managing these projects, meaning that the information on project management activities registered in IS is not oriented so as to be used directly by process mining tools. Therefore, a crucial additional human intervention is required, which consists of pre-processing these logs and then converting them into a format compatible with process mining techniques (Urrea-Contreras, Flores-Rios, González-Navarro, Pacheco, et al., 2022; Vavpotič et al., 2022).

Lack of Studies Associating Process Mining in IS Project Management With the Success of These Projects

Although the PMBoK does not directly define project success, nor does it determine any project performance domain, the issue of project success has a very important role for organizations, due to the costs usually involved in IS projects.

According to Varajão (2018), it is important that success in organizations is properly evaluated and that success management becomes a systematic process. In this context, Varajão (2016) initiated a study in which he proposed that success management is a new knowledge area of project

management; he later expanded on this work (Takagi & Varajão, 2020; Varajão et al., 2022). The approach presented a process composed of two stages—namely, a stage that identifies success factors and defines performance and a stage that evaluates success.

Though some of the articles in this review covered the quality and analysis of software development processes to assess their efficiency, or even that of teams (for example Caldeira et al. [2019]), it was still a fairly limited research area.

For Freeman and Beale (1992), project success could be defined based on the perspective of each stakeholder (customers, developers, the project team, and the end-users). Shenhar et al. (1997) indicated that success can be seen from four dimensions: 1) project efficiency; 2) impact on the customer; 3) business success; and 4) preparation for the future.

Previous research developed by the authors of this paper has demonstrated an approach that involves relating the performance of project management processes to CSFs in IS projects. This approach allowed diagnosing and forecasting a certain IS project's success through process mining, focusing on providing project managers with useful monitoring and decision-making information towards improving project success (Pedrosa et al., 2021).

CONCLUSION

This paper presented a literature review of process mining applied to the IS project management and analyzed 59 papers studying process mining and project management.

Several works already addressed process mining applications in IS project management. The process mining area is starting to obtain some relevance and to be increasingly a choice, essentially, for the extraction of event logs and the respective discovery, conformance, and improvement of the organization's business processes.

The application of process mining in IS project management processes can be a crucial help for organizations, as it will allow both the project manager and each member of the development team to analyze the state of the real development process when compared to an ideal model (for instance, the one advocated in Scrum).

In the search conducted, 59 articles were identified for analysis, without any time filter. It was found that most of the identified studies were concentrated in the period from 2014 onwards.

When analyzing the articles selected for the review under the eight project performance domains mentioned in the PMBoK, most articles were related to the *development approach and life cycle* domain. This was followed by the *project work* domain, which focuses on the coordination and execution of the tasks required to achieve the planned results of the project, with 23 articles. It was also found that the domain with the lowest number of process mining papers in IS project management is the *stakeholder* domain, with only two articles out of a total of 59.

Regarding research gaps, we observe that it is essential to develop a standard for registering data in organizations, containing information from meetings, task definitions, and committed code updates. This standardization is essential to facilitate data extraction by process mining techniques.

Some research guidelines can be identified, such as the development of an approach to improve project success through the extraction and management of CSFs through process mining. This will enhance IS project managers' decisions towards providing CSF information to reduce risks and failures in IS projects' execution. This can be achieved by first discovering and analyzing the processes behind IS project management through process mining, considering registered logs regarding the project management events performed.

Then, the influence of IS project management practices on organizations' CSFs' knowledge base can be determined to enhance real-time decision-making for future IS project management tasks, considering real project data associated with previously registered success metrics for similar projects.

It is also observed that the evaluation of success in organizations still requires some automation and ease, so that project managers can make the most appropriate and correct decisions for the project, the organization, and the resources.

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CONFLICTS OF INTEREST

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

PROCESSING DATES

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CORRESPONDING AUTHOR

Correspondence should be addressed to Joana Pedrosa**;** joana.npedrosa1993@gmail.com

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