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Literature Analysis of Existing Maturity Models for Project Management in Public Administration

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ABSTRACT

This study aims to evaluate Project Management Maturity Models to determine if they can meet the specific needs of Public Administration (PA). The analysis focuses on the most widely known maturity models, assessing their distinctive characteristics to determine their suitability for meeting the complex requirements of government projects. The methodology used is a Structured Literature Review (SLR), following a systematic approach to identify, evaluate, and synthesize existing academic literature. Paoloni and Demartini (2016) highlight the importance of utilizing well-established models to ensure a thorough and accurate exploration of the topic. The results show that while some models could be applied to public administration, substantial modifications are necessary to make them operational and effective in the public sector. Specifically, the analysis reveals that regulatory complexity and specific transparency requirements in managing public funds require significant adaptations to ensure compliance and transparency management within these models. The study's limitations include challenges in adapting models initially designed for the private sector to PA needs, where resistance to change and limited resources may hinder the dissemination and implementation of these models. This review, limited to the Scopus database, does not encompass the complete range of available studies. In conclusion, the study emphasizes the need to develop maturity models specifically designed for the public sector, identifying areas for improvement in the existing literature and suggesting further research to bridge these gaps.

Questo studio mira a valutare i Maturity Models del Project Management per determinare se possono soddisfare le esigenze specifiche della Pubblica Amministrazione (PA). L'analisi si concentra sui Maturity Models più noti, valutandone le caratteristiche distintive per determinarne l'idoneità a soddisfare i complessi requisiti dei progetti governativi. La metodologia utilizzata è una Structured Literature Review (SLR), che segue un approccio sistematico per identificare, valutare e sintetizzare la letteratura accademica esistente. Paoloni e Demartini (2016) sottolineano l'importanza di utilizzare modelli consolidati per garantire un'esplorazione approfondita e accurata dell'argomento. I risultati mostrano che, sebbene alcuni modelli possano essere applicati alla pubblica amministrazione, sono necessarie modifiche sostanziali per renderli operativi ed efficaci nel settore pubblico. In particolare, dall'analisi emerge che la complessità normativa e gli specifici requisiti di trasparenza nella gestione dei

fondi pubblici richiedono adeguamenti significativi per garantire la gestione della conformità e della trasparenza all'interno di tali modelli. I limiti dello studio includono le sfide nell'adattare i modelli inizialmente progettati per il settore privato alle esigenze della PA, dove la resistenza al cambiamento e le risorse limitate possono ostacolare la diffusione e l'implementazione di questi modelli. Questa revisione, limitata al database Scopus, non comprende l'intera gamma di studi disponibili. In conclusione, lo studio sottolinea la necessità di sviluppare modelli di maturità specificamente progettati per il settore pubblico, identificando le aree di miglioramento nella letteratura esistente e suggerendo ulteriori ricerche per colmare queste lacune.

Keywords: maturity models, public administration, project management, transparency, structured literature review (SLR).

1 – Introduction

Project management maturity models are crucial for organizations because they allow them to evaluate and improve their management abilities (Nikolaenko & Sidorov, 2023). Their application is crucial for optimizing project management processes. In public administration, projects are essential in improving public services, efficiently managing resources, and achieving the strategic objectives outlined in the Single Programming Document (D.U.P) (Danesi, 2022). Therefore, adopting and understanding these models is vital for achieving strategic goals and delivering real value to citizens (Morris, 1994). Maturity models typically have five levels: level 1 is an initial process, while level 5 is an optimized process (Fabbro & Tonchia, 2021). A high level of maturity in project management is closely linked to adequate risk assessment. Organizations with a high maturity level possess advanced processes, skills, and approaches for effective risk management, ensuring positive project outcomes (Kerzner, 2017). In the future, the success of public administration will increasingly depend on its ability to manage high-level projects while improving risk management. It is essential to create a structured, customized model to evaluate these projects and enhance their efficiency and effectiveness (Marovic *et al*., 2014).

The objectives of a maturity model are threefold:

(i) to assess an organization's current status against specific criteria, providing a clear understanding of its capabilities and identifying strengths and weaknesses in project management;

(ii) to establish a strategic path for improving the current maturity level, which may include developing detailed action plans and setting milestones and progress indicators;

(iii) to conduct benchmarking by comparing the organization's competencies and practices with those of others, identifying best practices, industry trends, and areas for potential improvement (Fabbro & Tonchia, 2021).

Within public administration, a maturity model can help understand project management capabilities clearly, highlighting areas of strength and weakness (Young *et al*., 2014). Once the current state has been assessed, the model can support the definition of a growth path to elevate the organization's level (Brookes *et al*., 2014). An organization's maturity is about meeting internal needs and addressing external stakeholders' needs. The required level of maturity depends on the complexity of stakeholders' needs and vice versa. Thus, the optimal maturity level adequately addresses the complexity of the entity's operations environment. Despite the

significant impact that maturity models could have on public administration, they are mainly applied within the private sector. This limited use in the public sector is primarily due to the greater availability of financial resources in private companies compared to public ones. Implementing a maturity model requires substantial time and resource investments, often limited in public administration (Mullaly & Thomas, 2008).

Furthermore, the context in which private companies operate is characterized by high competitiveness, which drives efficiency and technological innovation. Public administration operates within a framework marked by considerable regulatory and bureaucratic complexity, where the main objective is citizen satisfaction (Jugdev & Thomas, 2002). Additionally, private companies tend to have a more change-oriented organizational culture than public administrations (Crawford, 2021). The analysis by Seelhofer *et al*. (2018) highlights the existence of numerous maturity models, underscoring the diversity of approaches available in this field due to the growing complexity of organizational needs within application contexts. Each model has a distinct approach to assessing and improving project management skills, which includes specific characteristics, metrics, and procedures. While providing organizations with numerous options, this variety can also be challenging when selecting a suitable model and interpreting the results.

It is crucial to critically evaluate the validity and applicability of each model in the organization's context (Seelhofer *et al*., 2018). Despite the wide range of maturity models, the literature focuses on six essential models due to their international recognition, adaptability across various sectors, and robust structure, facilitating implementation and alignment between strategic objectives and project management (Baars *et al*., 2016).

In addition to the six main models, analyzed in the following sections, this study includes two additional models: the Total Project Management Maturity Model (TPM), developed by Zurga Gordana to address the needs of Slovenian public administration, and the Italian ISPM-PRADO (Italian Software Project Management – Advanced Project Management and Software Project Development). The latter, in particular, proves effective for private companies and public and nonprofit entities, with a specific focus on software project management.

Given the lack of a maturity model exclusively dedicated to public administration, this study conducts a detailed analysis of the six most relevant and widely used models, identifying through the literature those that could potentially be adapted to meet the needs of the public sector. This paper aims to answer the following research questions:

RQ1: *What is the current state of the art in Project Management Maturity Models?*

RQ2: *According to current scientific literature, which models could be applied to assess the maturity level of project management in public administration?*

To answer these questions, a systematic literature review was conducted to identify and synthesize existing project management maturity models. In the end, the applicability of each model to the context of public administration was assessed.

The study's main limitation is the use of a single database (Scopus), which limits access to the full range of available research and may limit the representativeness of the results. The analysis only focuses on the six main maturity models recognized and widely used, leaving out other potentially relevant and lesser-known models. The methodological choices made in this study are justified by the need to focus the analysis on well-established and recognized maturity models to ensure an accurate and relevant assessment within the public administration context.

This study aims to bridge the gap between adapting maturity models to public administration and considering municipalities' unique characteristics. It achieves this goal by systematically analyzing the existing literature on maturity models and evaluating their applicability. The paper is divided into four parts: the first explores the literature on the most common maturity models and their evaluation and improvement methods; the second details the methodology and research protocol adopted; and the third is dedicated to mapping internationally studied maturity models and discussing the results. The conclusions are in the fourth part.

2 – Theoretical Background

The literature on project management maturity models provides a valuable framework for organizations seeking to assess and improve their capabilities in this field. However, it also reveals significant challenges, such as resistance to change and implementation complexity. The first project management maturity model was proposed by Watts Humphrey, a pioneer in software engineering. In 1986, Humphrey, working at the Software Engineering Institute (SEI) at Carnegie Mellon University, introduced the Capability Maturity Model (CMM), which was widely adopted in software development to assess and enhance project management competencies (Kubicki, 1993). Michael Porter, a leading management theorist, emphasized the importance of competitive advantage as a crucial factor in business success. His work emphasizes the importance of project management maturity in enabling organizations to deliver high-quality products and services on time and within budget. This can result in competitive advantages, such as increased customer satisfaction, enhanced corporate reputation, and higher profitability (Stonehouse & Snowdon, 2007).

The Project Management Body of Knowledge (PMBOK) was created by the Project Management Institute (PMI) to formalize project management practices. First published in 1983 and updated in 1996, it outlined the five fundamental phases of a project life cycle: initiation, planning, execution, monitoring and control, and closure. These phases provide a clear, systematic structure that supports professionals in managing activities more effectively and efficiently (Takagi & Varajão, 2020). In the 2000s, maturity models evolved rapidly in response to the growing needs of organizations operating in increasingly complex and competitive environments. In 2001, Harold Kerzner introduced the Kerzner Project Management Maturity Model (KPMMM), while in 2003, PMI launched the Organizational Project Management Maturity Model (OPM3). Both models aim to integrate project management with organizational strategic objectives, emphasizing areas of improvement through best practices and structured approaches (Kerzner, 2002; Bento *et al*., 2019).

Within a decade, additional models were developed, including the ProMMM (Project Management Maturity Model) by Peter Hill and the PRINCE2 Maturity Model (P2MM) (Hillson, 2003; Bentley, 2012). Although these models were primarily designed for private sector organizations, the concept of maturity in project management also began gaining significance in public administration. However, it was not until 2007 that the European Commission introduced the PM² Maturity Model, specifically designed for the public sector, recognizing the importance of such models in improving project management practices within public administration (European Commission, n.d.).

The first author to address project management maturity in public administration was James P. Lewis. His research focuses on project planning and control practices within corporate

settings but also includes the application of maturity concepts and models in public administration (Lewis, 2001). Another significant contribution was made by Harold Kerzner in 2017, where he examined the value of these models in assessing a public organization's capacity to manage projects effectively and efficiently, identifying potential areas for improvement (Kerzner, 2017). The shared principles between private and public sector project management maturity models connect them.

The literature review shows that both sectors are committed to fundamental project management principles like *planning*, *execution*, *monitoring*, and *reporting*. In this regard, models such as the Capability Maturity Model Integration (CMMI) or the PM2 Maturity Model could serve as helpful reference frameworks (Ding & Ding, 2016). Certain maturity models, although developed for the private sector, possess characteristics that make them adaptable to the public sector, such as the Project Management Maturity Model (PMMM) and the Kerzner Project Management Maturity Model (KPMMM) (Kerzber, 2005).

However, implementing maturity models in public administration presents specific challenges inherent to these organizations, which are often complex and highly hierarchical with multiple levels of decision-making, potentially hindering the adoption of new practices and approaches (Tembo & Rwelamila, 2008). Public administration's complexity and resistance to change could make it hard to implement models that necessitate significant cultural and structural changes (Hobbs *et al*., 2008). McLaughlin *et al*., 2005 note that the allocation of adequate funding to support these models effectively is hindered by limited budgets and human resources. Another challenge involves performance evaluation, as the objectives and outcomes of public administration are often harder to quantify compared to the private sector.

The lack of clear, measurable key performance indicators (KPIs) can hinder assessing maturity model success (Fettke *et al*., 2015). In light of the challenges identified in the literature, existing maturity models require significant adaptations, which may entail the active involvement of leaders and stakeholders to facilitate adoption and ensure effectiveness (Irfan *et al*., 2020). Ultimately, a strategic and inclusive approach to implementing maturity models could represent a crucial step forward in improving the performance and effectiveness of public administration (Seelhofer *et al*., 2018).

3 – Methodology

3.1 – *Data Collection*

This article follows the systematic literature review (SLR) protocol established by Paoloni and DeMartini (2016), and the PRISMA model proposed by Moher *et al*. (2010) is used to select students. These approaches ensure the systematic and rigorous process of collecting and analyzing relevant literature, facilitating a thorough and reliable research evaluation on project management maturity models.

The research was conducted exclusively through the Scopus database, selecting academic articles, books, and other relevant publications. Scopus was chosen as the sole source due to its extensive international coverage, the scientific quality ensured by stringent selection criteria, and the availability of advanced bibliometric tools that facilitate independent data extraction. The research was conducted at various levels. Initially, a general analysis was performed using the main keyword "Project Management Maturity Models" to ensure a comprehensive collection of relevant studies. Subsequently, a more in-depth analysis was conducted on the eight main

maturity models selected for their relevance and prevalence: Capability Maturity Model Integration (CMMI), PM2 Maturity Model, Organizational Project Management Maturity Model (OPM3), Kerzner Project Management Maturity Model (KPMMM), ProMMM, P3M3, the Total Project Management Maturity Model (TPM) developed by Zurga Gordana to support SloveSupport administration, and the Italian ISPM-PRADO, which focuses on advanced project management and software development. The analysis focused on the specific characteristics of each model to determine if any of them would be particularly appropriate for use in public administration. The adopted methodology allowed for comparing the different models and assessing their adaptability to the public sector.

The research spans thirty years, from 1993 to 2023, chosen to monitor the evolution and latest developments in project management maturity models. The selected research areas—Business, Management, Accounting and Economics, Econometrics, and Finance—were chosen for their relevance to studying maturity models in project management, especially in the public sector. Research articles, reviews, book chapters, and conference proceedings were allowed because no filters were applied regarding document type.

Data management and synthesis of study results are done using a qualitative approach to summarize information on maturity models used in project management in public administration. Data were organized around key themes, such as maturity model type, geographical area, publication year, and research area. This structure facilitates comparison between applications and results of different models in various contexts, allowing for a comparative evaluation among the studies.

The results were synthesized narratively, highlighting each model's distinctive characteristics and benefits of project management maturity within the public sector. To optimize searches within the Scopus database, Boolean operators were used: "AND" to combine necessary terms in results, such as results Management" and "Maturity Models," and "OR" to include terminological variations, such as "Maturity Models" or "Capability Models."

3.2 – *Preliminary Data Analysis*

The preliminary analysis based on the keyword "Project Management Maturity Model" (PMMM) identified a corpus of 57 relevant articles published between 1993 and 2023. These contributions cover various topics, including critical analysis and evaluation of different maturity models, their applications in various contexts, and the challenges associated with implementation, particularly in the public sector. Geographically, a predominance of publications from China stands out, followed by other regions with a significant body of literature in this field, such as the United States, Canada, and Australia.

A temporal analysis of the literature revealed noteworthy trends in evolution. Specifically, between 1993 and 2002, no relevant contributions emerged, while from 2002 onward, a steady increase in publications was observed, with significant peaks in specific years, such as 2014. These peaks can be attributed to essential developments in project management practice and the broader adoption of maturity models in public and private organizations.

From a methodological perspective, the analyzed studies primarily adopt case study analysis and quantitative methodologies. Case studies allow for an in-depth analysis of specific situations, providing detailed and contextual insights into applying maturity models. Quantitative approaches, on the other hand, enable systematic data collection and analysis, facilitating a comparative statistical evaluation that helps highlight general trends and

significant variations in the results. The preliminary findings of this review are summarized in Table 1.

Table 1 – Project Management Maturity Models (PMMM) (Source: Scopus 1993-2023, author's elaboration for PMMM)

Years	No. of Articles
2023	1
2022	3
2021	5
2020	1
2019	4
2018	5
2017	7
2016	4
2015	5
2014	10
2013	1
2012	1
2011	1
2010	3
2009	1
2008	0
2007	2
2006	1
2005	0
2004	0
2003	1
2002	0
2001	0
2000	0
1999	0
1998	0

1997	0
1996	0
1995	0
1994	0
1993	0
Total	**57**

An in-depth analysis of this initial group of studies highlights how project management maturity models propose various approaches to enhance strategic and operational management within organizations. Hillson (2017), for example, introduces the ProMMM, a model structured across four maturity levels – *Naive*, *Novice*, *Normalised*, and *Natural* – that guides organizations along progressive paths for improving project management capabilities (Hillson, 2017). The primary goal of these models is to enhance management performance, facilitating project completion within the expected time and budget, reducing the risk of failure, and maximizing the overall value generated (Brookes *et al*., 2014).

However, a significant issue emerges: the discrepancy between the standardized design of the models and the broad variability of project contexts (Mullaly, 2014). Many organizations report the overly rigid approach to implementing these models is excessively mechanistic, limiting project management effectiveness (Görög, 2016). Each project is unique and takes place in an environment influenced by multiple variables, such as available resources, stakeholder expectations, and specific local community needs, which hinder the universal and standardized application of maturity models. To overcome these limitations, organizations need to adopt a flexible approach that integrates the principles and best practices of maturity models with a deep understanding of each project's specific requirements and characteristics (Mullaly, 2014).

This adaptability becomes particularly relevant in projects managed by public administration, which presents unique challenges, objectives, and requirements compared to the private sector. Project management in the public sector requires customized solutions that address specific needs, such as regulatory compliance, public stakeholder involvement, and the need to ensure transparency and accountability. In this light, a maturity model specific to the public sector is needed, one that incorporates essential elements like regulatory compliance and is aligned with the policies and bureaucratic complexities unique to the sector. Defining such a model is a priority to improve the efficiency and effectiveness of project management within the public sector while also promoting the achievement of institutional objectives and maximizing value for citizens and the community (Zurga, 2018).

Identifying the most suitable maturity model and determining the appropriate maturity level for Public Administration (PA) is essential. This approach allows project management practices to be effectively adapted to the specific needs and challenges of the public sector. Abdul Rasid *et al*. (2014) developed a maturity model designed explicitly for PA to evaluate the ideal maturity level a public agency should achieve. According to the study results, the optimal level for a public organization is level 3, which requires a particular focus on project integration, quality, and risk management – essential elements for sustainable improvement in public project performance.

Identifying the maturity level is crucial for several reasons. First, it allows strengths and weaknesses to be identified, facilitating a process of continuous improvement. Additionally, assessing the maturity level provides a solid foundation for benchmarking, as it enables PA to compare itself with other public institutions or private sector organizations, fostering the adoption of best practices. Finally, an accurate maturity level analysis supports optimal resource allocation by highlighting the areas in which to invest to enhance project management capabilities and generate maximum value for the citizens and communities served (Fraticelli *et al*., 2016).

The literature review has shown that the scientific community has focused on six internationally relevant maturity models: Capability Maturity Model Integration (CMMI), PM2 Maturity Model, Organizational Project Management Maturity Model (OPM3), Kerzner Project Management Maturity Model (KPMMM), ProMMM, and P3M3. The "Total Project Management Maturity Model" (TPM) and ISPM-PRADO, an Italian model developed to meet the specific needs of the Italian context, were also included. All these models were examined in detail through an in-depth literature analysis to better understand their specific characteristics and the contributions of various authors on the subject. The results of this analysis are summarized in Table 2, which presents a synthesis of each model's name, the respective reference author, and the maturity level associated with each model, as derived from the literature.

Table 2 – Project Management Maturity Model (Source: Author's elaboration)

Project Management Maturity Model	Author	Maturity Level
Capability Maturity Model Integration (CMMI)	Carnegie Mellon University (CMU) (USA)	1. Initial 2. Managed 3. Defined 4. Quantitatively Managed 5. Optimized
Maturity Model PM2	Kwak e Ibbs (2000)	1. Based 2. Intuitive Process 3. Use of Methodology 4. Controlled Process 5. Refined Process
Maturity Model OPM3	Project Manager Institute (PMI)	1. Initial 2. Structured 3. Institutionalized 4. Managed 5. Optimized
Kertzer Project Management Maturity Model (KPMMM)	Kertzer (2002)	1. Common Language 2. Common Process 3. Singular Methodology 4. Benchmarking 5.Continuous Improvement

Project Management Maturity Model	Author	Maturity Level
Maturity Model ProMMM	Hilson 2003	1. Naïve 2. Novice 3. Normalized 4. Natural
Maturity Model P3M3	Axelos	1. Awareness 2. Repeatable 3. Defined 4. Managed 5. Optimised
Total Project Management Maturity Model (TPM)	Gordana Žurga	1. Ad Hoc 2. Initiated 3. Implemented 4. Managed 5. Improved
ISPM-PRADO	Istituto Italiano di Project Management	1. Initiated 2. Repeatable 3. Defined 4. Managed 5. Optimized

3.3 – *Definition of the Framework*

Table 2 highlights significant differences among the maturity models analyzed. A structured and valid framework is essential to ensure a comprehensive literature review. In this study, the framework proposed by Paoloni and Demartini (2016) was used and is detailed in Table 3. As shown in Table 3, the SLR method classifies documents based on four criteria: (A) the main focus of the article, (B) the research area, (C) the geographical context, and (D) the research methods employed.

Table 3 Framework

Table 3 – Framework
(A). Article Focus 1. Capability Integration Maturity Model (CMMI) 2. Maturity Model PM2 3. L'Organizational Project Management Maturity Model (OPM3) 4. Kerzner Project Management Maturity Model (KPMMM) 5. Maturity Model ProMMM 6. Maturity Model P3M3 7. Total Project Management Maturity 8. ISPM-PRADO

(B). Research Area

1. Business, management and accounting
2. Economics, Econometrics and Finance

(C). Geographical Area

1. Middle East
2. Central and South America
3. North America
4. Northern Europe
5. Sud Europa
6. Africa
7. United Kingdom
8. Oceania

(D). Research Methods

1. Quantitative
2. Qualitative
3. Metodi Misti
4. Literature Review

(A). Article Focus

The focus of the article highlights the main topics addressed by the authors.

A1 – The Capability Maturity Model Integration (CMMI) primarily aims to improve the quality of production processes and the organization's overall performance. This model focuses on three key areas: (i) process development, oriented towards the continuous improvement of procedures necessary to achieve organizational goals and support the development of products or services; (ii) service management, which includes the definition, implementation, and management of services provided by the organization, covering aspects such as human resources management, contracts, and client relationships; (iii) product and service acquisition, which supports business operations through activities like supplier selection and contract negotiation. CMMI proposes a structured and progressive approach that enables organizations to increase the maturity of their processes in these three areas, providing tools for gradually assessing and improving operational capabilities. This model facilitates the adoption of targeted corrective actions to optimize overall business performance (Liberato *et al*., 2016).

A2 – The PM² Maturity Model, developed by Kwar and Ibbs in 2000, is a maturity model designed to analyze an organization’s level of project management and its position relative to competitors or industry benchmarks. Widely used by European institutions and other international organizations, PM² evaluates various aspects of project management, including processes, competencies, tools, and organizational culture, to determine the organization's maturity level. Through this evaluation, the model provides insights and suggestions for improvement. The ultimate goal of the PM² Maturity Model is to support organizations in developing a more effective and efficient project management capacity, enabling them to achieve their strategic goals and compete more effectively within their industry (Marques *et al*., 2023).

A3 – The Organizational Project Management Maturity Model (OPM3), developed by the Project Management Institute (PMI) between 1998 and 2013, is a model that aims to assess and enhance the level of project management within organizations. This model focuses on three fundamental dimensions: processes, people, and technology. Specifically, it examines the methodologies used for project management, the skills and organizational culture of the personnel involved, and the use of technology to support project management activities. Through an in-depth evaluation of these three dimensions, OPM3 identifies strengths, areas for improvement, and suggestions for targeted interventions, supporting organizations in developing more robust project management capabilities and maximizing the generated value (Guangshe *et al*., 2008).

A4 – The Kerzner Project Management Maturity Model (KPMMM), developed by Dr. Harold Kerzner in 2002, was designed to evaluate and improve project management maturity within organizations. Like the Capability Maturity Model Integration (CMMI), the KPMMM is based on multiple maturity levels and examines project processes, organizational structure, human resources, and technology. Like other maturity models, KPMMM identifies necessary areas of improvement to progress toward higher maturity levels. Organizations can then implement targeted corrective actions to optimize their project management capabilities (Khoshgoftar & Osman, 2009).

A5 – The ProMMM Maturity Model, developed by D. Hillson in 2003, provides a structured framework to assess and increase project management maturity within organizations. Like other models, ProMMM examines project processes, organizational structure, human resources, and technologies adopted for project management. This model enables an assessment of the organization's project management maturity level, identifying areas of improvement that allow advancement toward higher maturity levels. This way, organizations can set clear goals and implement targeted corrective actions to optimize their project management capabilities. However, adopting ProMMM remains limited within organizations (Hillson, 2003).

A6 – The Portfolio, Programme, and Project Management Maturity Model (P3M3), developed in 2006 by the UK Office of Government Commerce (OGC), is a model aimed at assessing and improving organizational maturity in three fundamental areas: portfolio management, program management, and project management. Through an evaluation process structured on a maturity scale from 1 to 5, P3M3 reflects the progressive evolution of organizational capabilities in these areas. The model analyzes processes, competencies, resources, and organizational culture, highlighting areas needing improvement to advance to higher maturity levels. Widely adopted in the UK public sector and various international organizations, P3M3 provides a detailed view of organizational capabilities, promoting a gradual and targeted improvement path for management practices (Young *et al*., 2014).

A7 – The Total Project Management Maturity Model (TPM3), created by Gordana Zurga in 2018, is designed to evaluate and enhance overall project management maturity within organizations. TPM3 adopts an integrated approach considering processes, people, technology, and organizational culture. Its purpose is to provide a detailed assessment of an organization's project management maturity, highlighting areas of improvement necessary to advance to higher maturity levels. The model analyzes specific project management processes, including planning, execution, monitoring, and control, evaluates the skills and capabilities of the personnel involved, and assesses the use of technologies and tools supporting project

management. Organizations can set improvement goals through this approach and implement targeted strategies to strengthen their project management practices (Zurga, 2018).

A8 – The ISPM-PRADO model, developed by the Italian Institute of Project Management (ISPM), adopts an integrated approach that considers both the technical and methodological aspects and the organizational and behavioral aspects of project management. This model evaluates project management methodologies, covering planning, execution, control processes, and behavioral aspects such as team members' skills and abilities, effective communication, leadership, conflict management, and team motivation. By combining these different elements, ISPM-PRADO provides a comprehensive framework for analyzing and enhancing project management maturity within organizations (Italian Institute of Project Management).

(B). Research Area

Two research areas (Business, Management, Accounting and Economics, Econometrics, and Finance) are considered of economic interest.

(C). Geographical Area

The geographical area of reference is determined by the research's location rather than the author's nationality (Paoloni & Demartini, 2016).

(D). Research Methods

The methods used to study the various models are analyzed to identify those most commonly adopted by different authors.

4. – Results

(A). Article Focus

The analysis was conducted on works published in the Scopus database between 1993 and 2023. The results, illustrated in Figure 1, were obtained by extracting data through a targeted search using the names of the examined models as keywords: Capability Maturity Model Integration (CMMI), PM2 Maturity Model, Organizational Project Management Maturity Model (OPM3), Kerzner Project Management Maturity Model (KPMMM), ProMMM Maturity Model, P3M3 Maturity Model, Total Project Management Maturity, and ISPM-PRADO. The analysis produced a total of 90 articles (output).

Interestingly, the Capability Maturity Model Integration (CMMI) (A1) emerges as the most frequently cited project management maturity model in the analysis, representing 69.6% of the analyzed documents with 68 articles. This figure suggests the relevance of CMMI and its broad applicability in assessing and improving organizational process maturity. Second is the Organizational Project Management Maturity Model (OPM3) (A3), which accounts for 18% of the total, with 18 articles indicating significant interest in this model for evaluating organizational maturity.

The Kerzner Project Management Maturity Model (KPMMM) (A4) follows, focusing on the quality of an organization’s project management capability, representing 6.5% of the sample, with 6 publications. In contrast, the PM2, ProMMM, P3M3, and Total Project Management Maturity models show marginal percentages, indicating a limited presence in academic

research. Regarding the ISPM-PRADO model, no related articles were identified in the Scopus database. This absence may reflect limited interest, perhaps due to the model's regional or sector-specific nature. However, the lack of citations does not necessarily imply the model's lack of validity or relevance.

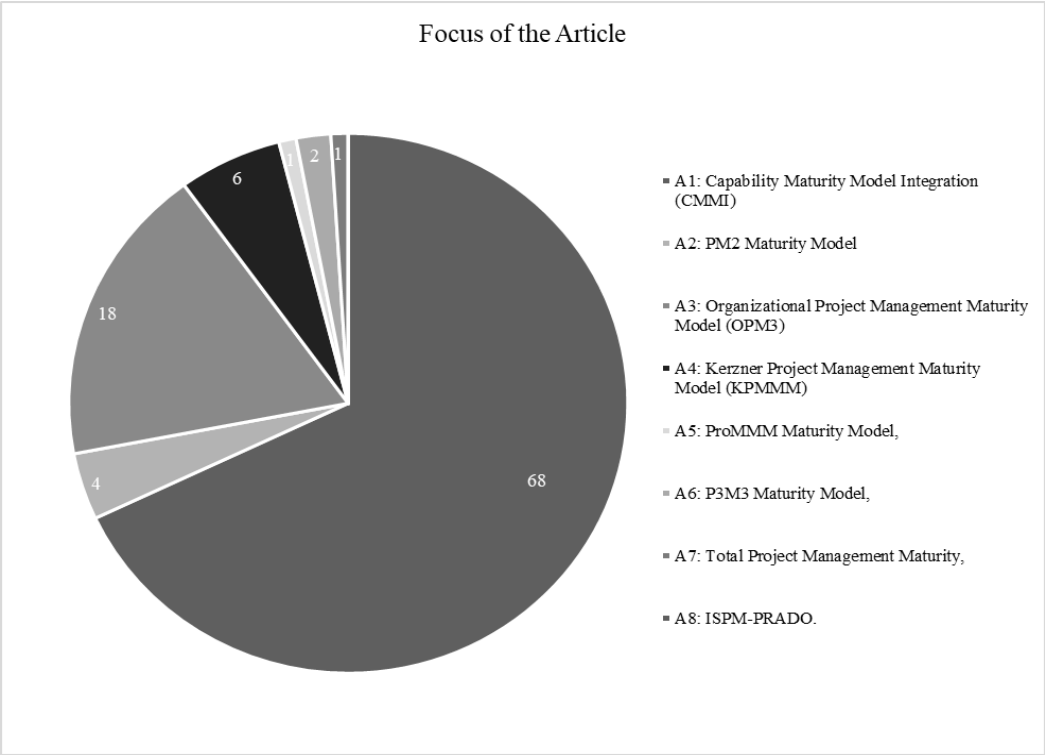

Fig. 1 – Article Focus (Source: Author' elaboration)

(B). Research Area

Figure 2 shows the research area in which the extracted works are categorized.

Fig. 2 – Research Area (Source: Author' elaboration)

Interestingly, most of the examined articles fall within Economics, Management, and Accounting (A2) categories, representing 84.04% of the total. This figure suggests a strong connection between research on project management maturity models and business and organizational management principles, emphasizing project and internal process management within organizations. The area of Economics, Econometrics, and Finance (A1) constitutes the remaining 15.96% of the sample. Although less represented than economics, management, and accounting, this category nonetheless reflects the interest of scholars in the economic and financial fields regarding project management maturity models. In this way, the importance of project and organizational process management is also evident in financial and economic contexts.

(C). Geographical Area

Figure 3 shows the geographical distribution of the extracted works.

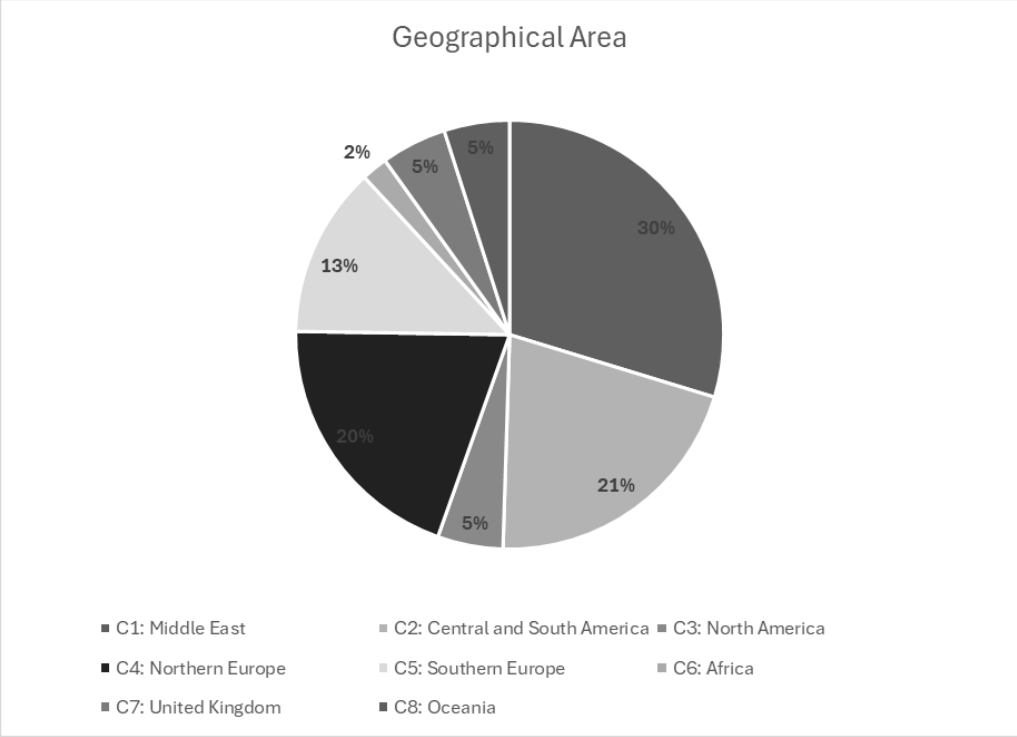

Fig. 3 – Geographical Area (Source: Author' elaboration)

Interestingly, the Middle East (C1) is the region with the highest scientific production on maturity models, accounting for 30% of published works. This data suggests a strong interest from local institutions, organizations, and the academic community in evaluating and improving the maturity of project management processes. This interest may be attributed to a growing awareness of the importance of effective project management in supporting the region's economic and social development. Additionally, specific challenges and opportunities in the region necessitate a methodical approach to project management. Research initiatives, training programs, or public policies promoting adopting and implementing maturity models in project management may exist in this region. This context highlights the importance of considering regional characteristics when evaluating research trends on maturity models, as priorities and challenges vary from one region to another.

The Middle East's focus on best practices in project management reflects a commitment to sustainable and prosperous development in critical sectors such as infrastructure, energy, and construction, where effective project management is essential to ensure lasting outcomes. In developing countries like those in the Middle East, specific challenges require a disciplined and structured approach to project management, adopting techniques that allow continuous evaluation and improvement of organizational capabilities (Tsai, 2021).

The regional analysis reveals a diverse distribution of scientific production on project management maturity models: (i) Central and South America (C2) represent 21% of publications, indicating significant interest from researchers and project management professionals. This may be related to the growing emphasis on project management in emerging economies, where the adoption of best practices is crucial for supporting economic and infrastructure development; (ii) Northern Europe (C4) contributes 20% of published articles, indicating a strong interest in research and application of maturity models. This result can be attributed to a culture of innovation and the significant presence of high-tech industries, which require advanced project management skills; (iii) the United Kingdom (C8), North America (C4), and Oceania (C9) each account for 5% of publications on maturity models, reflecting consistent interest and active participation in research and implementation of these models; (iv) finally, Africa (C7) contributes 2%, the lowest percentage, suggesting that scientific production on this topic in the region is still limited. However, the growing interest in adopting maturity models may be associated with ongoing economic and infrastructure development processes.

This analysis reveals a widespread global interest in maturity models for project management, with regional differences reflecting specific socio-economic, cultural, and industrial factors.

(D). Research Methods

Figure 4 shows the various research methods used in the scientific articles.

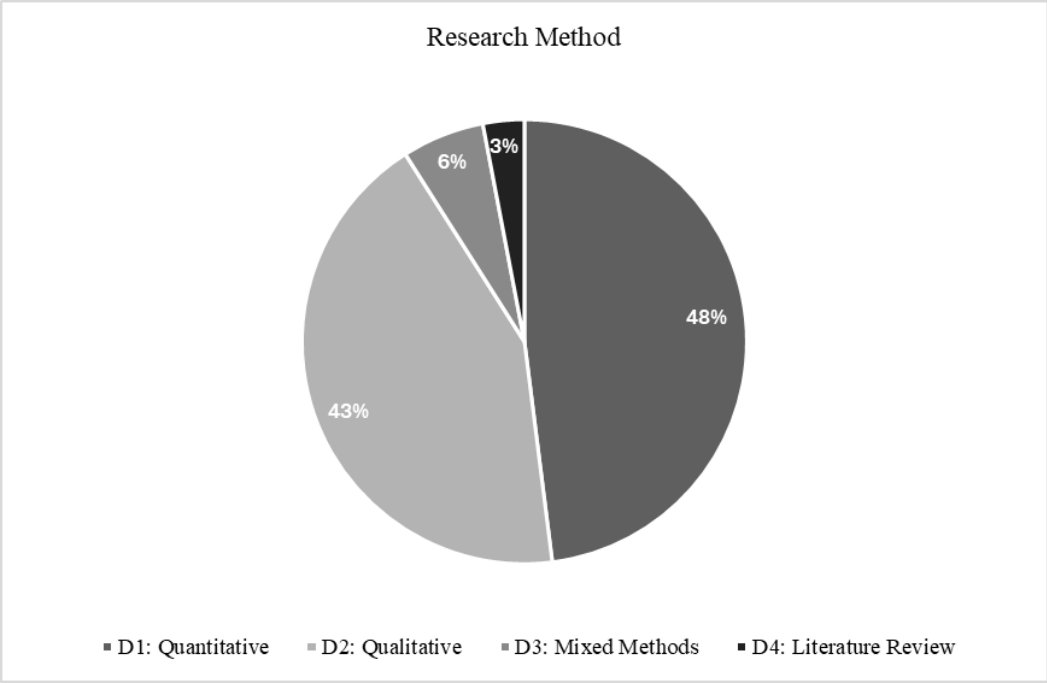

Fig. 4 – Research Methods (Source: Author' elaboration)

Interestingly, the most common research methodology in the analyzed works is quantitative, representing 48% of the articles. This suggests a widespread preference among researchers for using quantitative approaches to analyze and assess maturity models, reflecting the need for numerical and measurable data to evaluate the effectiveness and applicability of these models within organizations. In particular, it is observed that work on the Capability Maturity Model Integration (CMMI), known for its mathematical approach to evaluating product development processes, often employs quantitative methodologies. This may be due to the very nature of CMMI, which is based on measurements and quantitative analysis. On the other hand, qualitative methods account for 43% of the total, indicating a considerable interest in using qualitative approaches to study maturity models. The remaining percentages are distributed among mixed methods and literature reviews (SRL), suggesting the presence of studies that combine quantitative and qualitative approaches or rely solely on a critical evaluation of existing literature. This variety of methodologies indicates a comprehensive and multidimensional approach to studying these models, considering different perspectives and research approaches.

4.5 – *Preliminary Results*

The document's analysis shows that the most widely used maturity model in project management for public administration is the Capability Maturity Model Integration (CMMI). The literature shows that CMMI is highly cited, representing around 69.6% of the analyzed documents. This model is appreciated for its flexibility and adaptability across various sectors, including public administration, where it effectively enhances process quality and organizational performance through structured levels that facilitate process improvement. The Organizational Project Management Maturity Model (OPM3) follows, representing 18% of the studies, indicating significant interest in its structured approach to evaluating and enhancing project management capabilities at the organizational level. OPM3 is mainly utilized in sectors that require complex coordination and optimal resource management, aligning well with the needs of public administration.

Other models, such as the Kerzner Project Management Maturity Model (KPMMM) and PM², although less frequently cited, retain some relevance. The KPMMM is valued for its unique characteristic of risk assessment at each maturity level, making it useful for organizations aiming to identify and prioritize critical areas for improvement based on associated risk levels. The PM², developed by the European Commission, offers a practical and simplified approach adaptable to various contexts, including public administration, although it represents a smaller portion of the literature. Geographically, there is notable interest in adopting maturity models in public institutions in the Middle East, followed by Central and South America, Northern Europe, North America, and Oceania to a lesser extent. This regional interest suggests that these areas recognize the importance of maturity models to support structured and efficient project management, especially in the public sector, where transparency, resource constraints, and regulatory requirements are key factors. The analysis of maturity models in public administration reveals a growing recognition of their importance for enhancing efficiency and organizational competitiveness within the public sector. However, the adaptation of these models, originally designed for private sector use, remains a challenge due to the specific requirements of public administration. Complex regulatory environments, limited resources, and transparency obligations call for tailored models.

5 – Discussion

5.1 – *What is the state of the art of Project Management Maturity Models?* (RQ1)

The main research question investigates the state of the art in the scientific literature on project management maturity models from 1993 to 2023. The discussion is therefore oriented towards answering this question by analyzing the selected articles in detail. By analyzing the selected articles, we examine the individual maturity models to understand their specific characteristics, current state of development, and applications. This detailed review allows us to evaluate not only the peculiarities of each model but also the degree of development and the contexts in which they have been implemented, providing a comprehensive view of the current landscape of project management maturity models.

(A1) – Originally conceived to assess and improve the processes of development, management, and software maintenance, the Capability Maturity Model Integration (CMMI) has demonstrated remarkable flexibility and adaptability across various fields, including energy and environmental sustainability (Jovanovic & Filipovic, 2015). This model is a complementary tool for evaluating and enhancing the quality of internal processes within organizations. Despite its detailed guidelines, CMMI does not provide specific instructions on how to apply these principles. This aspect can create ambiguity or uncertainty among project teams, making translating CMMI principles into concrete and measurable actions challenging. Teams may need to interpret and adapt the model's recommendations to their specific organizational needs, transforming general suggestions into operational practices. As a result, developing methodologies complementary to CMMI has gained increasing interest, as these solutions enable teams to overcome the model's application limitations and significantly improve their processes (Sreenivasan & Kothandaraman, 2019). Another noteworthy element is the influence of organizational culture on the practical implementation of CMMI. The project teams' ability to understand and integrate CMMI principles significantly depends on the level of internal cultural alignment within the organization, which can profoundly influence the success of the model's adoption (Nguyen et.al, 2021). This observation underscores the importance of a solid and well-defined organizational culture as a foundation for achieving the best results from CMMI application, as a favorable cultural context facilitates the adoption and implementation of the improvements suggested by the model.

(A2) – The PM² Project Management Methodology, developed by the European Union, has gained increasing international relevance, standing out for its practical and simplified approach, which makes it easily applicable in various contexts. This framework provides project managers with a structured guide to effectively manage projects, divided into four fundamental phases: initiation, planning, execution, and closure, covering the entire project life cycle. A distinctive feature of PM² includes two transversal activities, monitoring, and control, which allow project managers to promptly detect deviations from the plan and take corrective measures. The simplicity and practical orientation of the PM² methodology make it exceptionally versatile and suitable for a wide range of projects, regardless of complexity. Consequently, PM² represents a valuable resource for project managers, offering a structured approach that facilitates effective project management and contributes to achieving successful results (Novo et.al, 2023).

(A3) – The Organizational Project Management Maturity Model (OPM3) is designed to assess and estimate the management capabilities of organizations, providing a structured

roadmap that supports the implementation of improvement processes, staff competency development, and the adoption of appropriate technologies. This model allows organizations to achieve their business objectives by offering an in-depth analysis of key performance indicators (KPIs) and results (Silva *et al*., 2019). The importance of OPM3 for the construction sector is particularly significant due to the operational complexity of this sector, which involves large-scale projects, often limited resources, and numerous stakeholders (Derenskaya, 2017). In this context, OPM3 provides a clear structure for enhancing management capability, identifying best practices specific to construction companies and targeted development areas such as resource optimization, cost control, and risk management. In conclusion, the adaptability of OPM3 to the needs of the construction sector suggests that this model offers a solid foundation for improving project management and achieving positive results (Machado *et al*., 2021).

(A4) – The Kerzner Project Management Maturity Model (KPM) is a valuable tool for assessing and improving organizational project management efficiency. As highlighted by Hutabarat *et al*. (2021), one of the distinctive features of KPMMM is assigning a risk factor to each maturity level. This aspect is particularly relevant as it allows organizations to understand their maturity level and the associated risk level. This approach provides a deeper insight into the challenges and implications of different maturity levels. For example, maturity levels characterized by a low-risk factor indicate greater stability and more established organizational capacity, while levels with medium-to-high risk factors may highlight vulnerable areas and potential risks. This risk assignment enables organizations to prioritize improvements, directing efforts towards identified critical areas (Holck & Jørgensen, 2003). In conclusion, KPMMM, with its unique feature of risk assignment to each maturity level, provides a detailed and practical framework for evaluating and improving project management efficiency. Through this approach, organizations can proactively manage risks and maximize project success (Hutabarat *et al*., 2021).

(A5) – The ProMMM Maturity Model, as described by Nikolaenko and Sidorov (2023), provides a detailed analysis of a company's position in project management compared to its competitors. This model stands out for its division into four maturity levels: Naive, Novice, Normalized, and Natural (Nikolaenko & Sidorov, 2023). Each level is examined in detail across four key dimensions: culture, processes, experience, and application. This approach enables a comprehensive assessment of the organization's project management capability. In summary, prom is an effective tool for assessing a company's maturity in project management relative to its competitors, structuring the analysis across four distinct levels and evaluating them in terms of cultural, procedural, experiential, and application aspects. This model enables organizations to identify specific areas for improvement and develop targeted strategies to advance their project management maturity (Hillson, 2003).

(A6) – The P3M3 Maturity Model was developed to assess and enhance maturity in managing projects, programs, and portfolios (Project, Programme, and Portfolio Management - P3M) within organizations. It is structured into three main sub-models, each focused on a specific aspect of management: (i) Project Management (PjM3), which concentrates on the management of individual projects; (ii) Programme Management (PgM3), which addresses the management of programs comprising related projects that contribute to a common objective; and (iii) Portfolio Management (PfM3), which deals with managing the entire portfolio of projects and programs, enabling the organization to select and prioritize projects in line with

strategic objectives. Each sub-model is evaluated across seven key subprocesses, including organizational governance and management control. Effective management in these areas also includes managing risks, stakeholders, financial and human resources. Through this detailed analysis of subprocesses, P3M3 offers a comprehensive overview of the organization's overall maturity in managing projects, programs, and portfolios, identifying strengths and weaknesses to develop targeted improvement plans (Silva *et al*., 2019). Considered one of the most comprehensive models, P3M3 evaluates crucial aspects such as professional competencies, information management, and resource and financial management.

(A7) – The Total Project Management Maturity Model (TPM), proposed by Gordana Zurga in the study "Project Management in Public Administration: The Case of Slovenian Public Administration," highlights the value of project management in public administrations and how it can contribute to achieving a competitive advantage in governmental development (Zurga, 2018).

(A8) – The ISPM-PRADO model has no scientific publications in the Scopus database.

5.2 – *According to current scientific literature, which models could be applied to assess the maturity level of project management in public administration?* **(RQ2)**

Project management maturity models are becoming increasingly popular, as good organizational maturity is key to improving competitiveness. Public administrations also adopt this perspective, recognizing the importance of achieving high maturity levels in project management. However, studies like that of Huang *et al*. (2008) highlight the need to develop specific models to assess maturity within government agencies accurately. Public agencies face regulatory complexities, resource constraints, transparency, and public accountability requirements unlike private organizations. Consequently, maturity models designed for the private sector may not be immediately transferable or effective in measuring project maturity within public agencies. This difference emphasizes the need to create maturity models that address the unique challenges of public administration.

Increasing research and development in this area could yield significant benefits by fostering collaboration among researchers, public sector professionals, and project management experts. Such collaboration could create a specific and reliable model for assessing project maturity within public agencies, thereby improving their project management capabilities and enabling them to provide more effective and efficient public services.

Within the sample of 90 articles analyzed, few studies focus on applying maturity models in project management in the public sector. Although limited in number, these articles will be discussed in the next section to answer the second research question, delving deeper into the application and suitability of these models within the context of public administration.

The evaluation of project maturity in public administration uses specifically designed models, as shown in the analysis (Xiao *et al*., 2015). Among the models mentioned in the study, the Kerzner Project Management Maturity Model (KPMMM), Organizational Project Management Maturity Model (OPM3), Total Project Management Maturity, and ISPM-PRADO have been identified as comprehensive and intelligent tools for assessing and improving project maturity in public agencies. These models provide a holistic approach that considers the specificities and needs of public administrations, enabling them to assess and enhance their ability to manage projects effectively and efficiently.

Interestingly, according to the conducted analysis, the models used to assess project maturity in public administration are distinct from those applied in process or software engineering. This suggests that public agencies use models specifically designed for the public sector's project management context rather than more generic models developed for other sectors or disciplines (Bouer & Carvalho, 2005).

The study conducted by Young *et al*. (2014) on the maturity level of the Australian federal government, applying the P3M3 approach, provided a detailed overview of project maturity across various subprocesses of the three sub-models of the P3M3 method. The main findings can be summarized as follows: in the project management sub-model (PjM3), the lowest maturity level (1) was observed in the project benefits management subprocess, while the risk management subprocess achieved the highest maturity level (3). In the portfolio management sub-model (PfM3), maturity levels ranged from 2 to 3 across all seven subprocesses, indicating a generally higher maturity level than the project management sub-model. Finally, in the program management sub-model (PgM3), maturity levels uniformly varied between 1 and 2 across the subprocesses, indicating an overall lower maturity level than the other two sub-models.

Young *et al*. (2014) also suggest that organizational size could influence project maturity, with smaller organizations tending to exhibit higher maturity levels, while larger organizations may demonstrate lower maturity levels. This finding highlights how organizational size can impact project management and the development of project management skills. The analysis also indicates that the P3M3 model may not fully capture the specificities of each project, thus providing only a general approximation of the organization’s project maturity. Although helpful in assessing overall maturity, the model may not completely capture the nuances and particularities of each project. These observations underline the importance of considering various factors in assessing project maturity, including organizational size and the specific characteristics of projects, as indicated by Young *et al*. (2014).

The Prado Project Management Maturity Model was used to assess the maturity level of federal government institutions in Brazil, resulting in a score of 2.47, reflecting an intermediate level of maturity but with significant room for improvement. A critical aspect highlighted by Neves *et al*. (2013) concerns the institution's employees' limited knowledge of project management practices, which can pose a significant obstacle to increasing project maturity. This finding underscores the need to invest in staff training and enhancing project management skills. In summary, Neves’ (2013) analysis emphasizes the importance of increasing project maturity in Brazilian government institutions. This goal can be achieved through targeted investments in project management training and skill development and implementing effective project management practices and processes.

The Total Project Management Maturity Model, developed by Gordana Zurga for the Slovenian government, represents an innovative model that identifies six key areas for evaluating project management maturity. These areas include project management, program management, portfolio management, organizational support for project management, human resource management for project management, and the integration of project management and strategic management. Each area is assessed on a five-level maturity scale, ranging from Ad Hoc (level 1) to Optimized (level 5), outlining a path of progressive growth towards higher maturity and efficiency in project management.

The application of this model within the context of the Slovenian government highlighted varying maturity levels across the different areas examined. For example, portfolio management, organizational support for project management, and integration of project and strategic management achieved a maturity level of 3, indicating effective implementation and management. In contrast, project management, program management, and human resource management for project management recorded a maturity level of 2, suggesting the need for further improvements to fully develop competencies in these specific areas. These findings provide valuable insights into where the Slovenian government could focus its efforts to enhance overall project management maturity, thereby improving the outcomes of its projects and programs regarding effectiveness and impact.

6 – Conclusions

This study's analysis of project management maturity models in public administration reveals an increasing recognition of these tools' importance in enhancing organizational efficiency and competitiveness within the public sector. Reviewing literature from the Scopus database highlights the most widely adopted models, their specific applications, and evaluation methodologies, with the Capability Maturity Model Integration (CMMI) emerging as a reference model due to its flexibility and positive impact on project management processes.

While the adoption of maturity models in project management is growing, it remains uneven across geographic and sectoral lines; maturity models are more commonly applied in the private sector and industrialized settings, with limited use in public administration. Yet, this area presents a significant opportunity, as implementing maturity models could enhance public project performance, providing tangible benefits to citizens and improving decision-making transparency and effectiveness. A critical finding is adapting these models to meet public administration's unique requirements, where regulatory complexity, resource limitations, and transparency obligations pose additional challenges. Maturity models initially developed for the private sector may not directly apply to the public context without appropriate modifications.

The analysis underscores a notable gap in the literature: the absence of maturity models specifically tailored to the public sector, which considers its distinct challenges and requirements. This gap is further emphasized by the limited academic focus on the ISPM-PRADO model and the relatively low application of maturity models in public project management, underscoring the need for models designed to meet public sector needs.

A public administration-specific maturity model would allow for a more accurate assessment of project maturity and help implement practices that enhance project management effectiveness, ultimately benefiting public organizations. It is also essential to acknowledge that this analysis is limited to the Scopus database, suggesting that extending research to other databases could provide a more comprehensive view of the development and effectiveness of project management maturity models.

This study thus lays a strong foundation for further research focused on refining and adapting maturity models for the public sector. Such a targeted approach could significantly improve public project management, fostering greater efficiency, transparency, and optimal resource use, positively impacting the quality of services provided to citizens. The theoretical implications emphasize the need for maturity models explicitly designed for the public sector, while practical applications highlight how these models can strategically enhance public project

management through capability assessments, benchmarking, and optimized resource allocation. In conclusion, this study highlights the challenges and opportunities in applying maturity models within public administration and sets the stage for developing customized tools to improve project management efficiency and transparency in the public sector.

In conclusion, this study highlights the challenges and opportunities associated with applying maturity models in public administration and paves the way for further research and the development of customized tools to improve project management effectiveness and transparency in the public sector.

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