Bridging the Maturity Gap: Introducing BIAMM, a Simplified Project Management Maturity Model Aligned with PMI Domains for Developing Contexts [1]

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Abstract

Project Management Maturity Models (PMMMs) are critical tools for assessing and improving project management processes within organizations. However, existing models primarily target organizations with established project management practices, which creates a gap for organizations at the early stages of adopting project management. This study reviews eight prominent project management methodologies (PMMMs) and evaluates their suitability for organizations in the early stages of adopting project management. Using a structured comparative analysis framework based on accessibility, scalability, implementation complexity, and contextual adaptability, the research identifies significant limitations in the applicability of these models for organizations in the early stages of adopting project management practices. The findings reveal that most PMMMs are overly complex, prescriptive, and resource-intensive for novice organizations, limiting their practical adoption. The paper recommends tailoring or simplifying maturity models to better serve the needs of beginners with more inclusive and adaptable frameworks. The paper concludes by proposing a new model, the Basic Intermediate Advanced Maturity Model (BIAMM). BIAMM offers a straightforward yet effective framework with three maturity levels: Basic, Intermediate, and Advanced. Its flexibility in accommodating various methodologies, including Waterfall, Agile, and Hybrid, makes it an ideal choice for organizations seeking to develop strong project management capabilities.

Keywords: *Project Management, Project Management Maturity Models, PMI Standards, Project Management Methodologies, and Organizational Development.*

Introduction

Project Management Maturity Models (PMMMs) are critical tools for assessing and improving project management processes within organizations. However, existing models primarily target organizations with established project management practices, which creates a gap for organizations at the early stages of adopting project management. This study reviews eight prominent project management methodologies (PMMMs) and evaluates their suitability for organizations in the early stages of adopting project management. Using a structured comparative analysis framework based on accessibility, scalability, implementation complexity, and contextual adaptability, the research identifies significant limitations in the applicability of these models for organizations in the early stages of adopting project management practices. The findings reveal

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that most PMMMs are overly complex, prescriptive, and resource-intensive for novice organizations, limiting their practical adoption. The paper recommends tailoring or simplifying maturity models to better serve the needs of beginners with more inclusive and adaptable frameworks. The paper concludes by proposing a new model, the Basic Intermediate Advanced Maturity Model (BIAMM). BIAMM offers a straightforward yet effective framework with three maturity levels: Basic, Intermediate, and Advanced. Its flexibility in accommodating various methodologies, including Waterfall, Agile, and Hybrid, makes it an ideal choice for organizations seeking to develop strong project management capabilities.

Background

An assessment of the concept of project management maturity and existing project management maturity models to suggest an appropriate model for organizations commencing the practice of project management. The Project Management Maturity Model assesses an organization's project management practices and categorizes areas for improvement. Historically, organizations have been reluctant to undergo project management maturity appraisals, fearing they would be deemed less mature. One of the reasons is the lack of formal processes and their optimization. Although projects do get completed successfully, the challenge is to repeat or improve performance over time. Some organizations end up rated at levels two or three on a scale of one to five. These organizations lack a strategic plan for improving their project management maturity level, resulting in an indefinite time frame to attain the succeeding maturity levels.

Research question

The research question is

"Are the prevailing project maturity models appropriate for organizations commencing the practice of project management?"

Objectives and Aims

Understanding the concept of project management maturity, review available project management maturity models and propose a maturity model that is appropriate for organizations commencing the practice of project management.

Specific Aims

Propose a maturity model that is appropriate for the organizations commencing the practice of project management.

Method

A systematic review of peer-reviewed journals and industry publications was conducted using databases such as IEEE Xplore, ABI/Inform, ACM Digital Library, Scopus, and Web of Science. Search keywords included "project management," "IT project management," "project management methodologies," "project management maturity," and "project management maturity models." Evaluation criteria included applicability, scalability, and reliability.

Results

The selected models were compared based on criteria like reliability, reusability, and extensibility. The findings revealed that while OPM3 and P3M3 models provide comprehensive frameworks, they are less practical for organizations starting from scratch.

Organizations require a maturity model that is flexible, easy to implement, and aligned with basic project management practices. Existing models often overlook these requirements, creating a need for a tailored solution. This section presents a specific assessment of the models listed in Table 3 to determine the best maturity model suitable for organizations initiating the practice of project management.

Discussion

Information Technology (IT) is a business segment of computing, encompassing hardware, software, and the transmission of information, as well as the systems that facilitate communication and data exchange. IT refers to the use of computers and infrastructure to process and exchange data. IT comprises enterprise operations, encompassing both computer and telecommunications technology. Project management (PM) is initiating, planning, executing, controlling, and closing a team's work to accomplish explicit goals and meet defined success criteria within a specified time frame. The project management is intended to achieve the project goals within the given constraints. The primary constraints are scope, time, quality, and budget. The secondary and more ambitious challenge is to optimize the allocation of necessary inputs and apply them to meet predefined objectives. The project constraints are typically described in the project documentation, usually at the beginning of the project management (PM) process (Cerdeiral & Santos, 2018).

PM methodologies are tool-agnostic, meaning they can be applied with any project management tool. In reality, most project management tools are specialized to use a handful of methodologies. Below are the three most widely used project management methodologies in the information technology industry. First, the Waterfall methodology is the oldest of the software development methodologies, established as a response to the increasingly complex nature of software development (Binder et al., 2014). Since then, it has become widely adopted. The Waterfall methodology is sequential. It is also heavily requirements-focused. Your intervention needs to have a clear idea of the project demands before proceeding further. The Waterfall method is divided into discrete stages. Each stage in this process is self-contained; complete one stage before moving on to the next. You start with requirements which are analyzed for design, followed by the implementation of the design. Then, you proceed to testing and, finally, deployment. The Waterfall method has several advantages: ease of use, structure, and strong documentation. Some of its disadvantages are higher risk and extensive requirements gathering. The Waterfall methodology is most commonly used in short, simple projects and projects with precise and stable requirements.

Agile is a software development-focused project management (PM) methodology that emerged as a response to the limitations of the Waterfall method for managing complex projects. Although agile ideas had been in use in the industry for decades, they formally emerged in 2001 with the release of the Agile Manifesto by the Agile Alliance (George et al., 2018). In terms of approach

and ideology, Agile is the opposite of the Waterfall method (Soares & de Lemos Meira, 2015). This method favours a fast and flexible approach. There are no heavy requirements for gathering. Instead, it is iterative, with small incremental changes that respond to changing requirements. The agile process begins with an environmental scan for emerging trends and risks, which are analyzed to inform decisions and solutions (George et al., 2018). The analysis leads to responding and influencing change. The agile methodology offers flexibility and freedom, with lower risk, although it lacks a fixed plan, which requires heavy collaboration. It is best for new product development with fewer upfront design details. Scrum is not a fully featured project management methodology. Instead, it describes an approach to agile management with a focus on project teams, short sprints, and daily stand-up meetings. During daily stand-up meetings, attendees typically participate while standing and provide brief updates on their status. The discomfort of standing for long periods is intended to keep the meetings short. Scrum derives its principles and processes from Agile, but it has its specific methods and tactics for managing projects. The team is expected to be self-organizing and self-managing. The team is involved in envisioning, exploring, adapting, and closing the opportunities. Scrum is a fast-paced, team-focused approach that involves regular feedback from stakeholders. It is best suited for highly experienced, disciplined, and motivated project teams who can set their priorities and clearly understand project requirements.

The hybrid approach is a combination of the waterfall and agile methodologies. It combines the best parts of both waterfall and agile methodologies in a flexible yet structured approach that can be applied across various projects. The hybrid methodology initially focuses on gathering and analyzing requirements while also adopting flexibility with an emphasis on rapid iterations. Sometimes, it is referred to as structured agile. The hybrid method is an attempt to reconcile agile and waterfall by integrating a set of agile practices into the waterfall development processes (Bagiu et al., 2020). The hybrid methodology offers increased flexibility (courtesy of agile). It is better structured (courtesy of the features of the waterfall), but it requires compromises on requirements, which may lead to budgeting and scheduling overruns. This methodology is best suited for medium-sized projects with moderate to high complexity but fixed budgets.

Background and Significance

Project management maturity models (PMMM) are a part of the project management development process and a relatively uncommon concept. PMMMs are used to assess and plan strategic improvements in project management within an organization. An additional benefit of these maturity models is their ability to serve as a performance benchmark among different organizations and industries.

Maturity models are particularly important in project-oriented organizations to achieve greater effectiveness and productivity (Salman et al., 2017). Organizations with a high level of maturity in project management are more likely to improve their performance. A high level of maturity may lead to lower costs in project implementation. Maturity models are strategic tools for identifying areas for improvement and prioritizing actions to enhance project management. A maturity assessment is needed to identify the opportunities and draft a continuous improvement plan (Jaleel et al., 2018).

Project Management Maturity

Project Management Institute (PMI) proposed five levels in the PMMM that reflect emerging organizational behaviours (ŽURGA, 2018). These levels are Initiation, Development, Defined, Managed, and Optimized.

Level 1 - Initial Process: The initial level represents a company that operates in a relatively unstructured manner with minimal control and oversight. While success on projects is possible, a company at the initial level is unlikely to reproduce such success consistently.

Level 2 - Structured Process and Standards: Companies operating at this level follow basic project management practices, but typically only at the individual project level. Project success is likely to depend on key individuals or management support rather than on the adoption of wide-ranging standards.

Level 3 - Organizational Standards: Companies operating at this level demonstrate that well-defined project management procedures are documented and consistently applied as a standard of operations. The standards are understood and backed by management. The organization is generally perceived as acting proactively rather than reactively.

Level 4 – Managed: The Managed level reflects an organization that measures project performance using well-defined metrics. Standards are established throughout the organization, and collective metrics are utilized to inform business decisions and processes.

Level 5 – Optimizing: Companies at this level continually seek to improve their project management performance, often employing innovative techniques, which is the highest level of project management maturity a company can achieve.

Several project management (PM) maturity models provide a measure of maturity across various contexts. Kostalova and Tetrevova (2018) congregated 29 distinct PM maturity models and eight specialized PM maturity models (see Tables 1 and 2).

Table 1. Project management maturity models

No.	Name	Acronym	Theoretical base	Author	Type
1	PRINCE 2 Maturity Model	P2MM	PRINCE2	Axelos, 2013	Process Oriented
2	Portfolio Management Maturity Model	P3M3	PRINCE2	Axelos, 2010	Process Oriented
3	P2CMM P.M. Maturity Model	P2CMM	PRINCE2	Lianying et al., 2012	Process Oriented
4	Project Management Maturity Model	PMMM	PMI	Fincher & Levin, 1997	Process Oriented
5	Project Management Assessment 2000	PMA	PMI	Lubianiker, 2000	Organization and Process Oriented
6	Organizational Project Management Maturity Model	OPM3	PMI	Project Management Institute, 2001	Organization and Process Oriented
7	Project Management Process Maturity	PM2	PMI	Kwak & Ibbs, 2002	Process Oriented
8	Kerzner Project Management Maturity Model	KPM3	PMI	Kerzner, 2014, 2001	Competence Oriented
9	Project Management Solution Project Management Maturity Model	PMMMSM	PMI	Crawford, 2015; PM Solution, 2013	Process Oriented

10	ESI's Project Management Maturity Model	*	PMI	ESI International (2016).	Organization and Process Oriented
11	IPMA Delta Standard	IPMA Delta	IPMA	IPMA, 2016	Organization Oriented
12	Project Maturity Model	*	*	Levene et al., 1995	Process Oriented
13	PM Maturity Model by Micro-Frame Technologies, California	PM3	*	Remy (1997).	Process Oriented
14	Project Management Maturity Model	PMMM	*	Jain (1998).	Process Oriented
15	Educational Service Institute's Project Management Maturity Model	PMM	*	Ward (1998).	Process Oriented
16	Project Management Capability Maturity Model	PMCMM	*	Voivedich & Jones (2001).	Process Oriented
17	Project Management Maturity Model	ProMMM	*	Hillson, 2001, 2003	Process Oriented
18	Prado Project Management Maturity Model	P2M3	PMI, IPMA, PRINCE 2	Prado, 2002	Organization and Process Oriented
19	Andersen and Jenssen Project Management Maturity Model	*	*	Andersen & Jenssen (2003).	Organization Oriented
20	Project, Program Maturity Model	Cobweb Model	*	Fuessinger (2006)	Process Oriented
21	IBM Project Management Center of Excellence Maturity Model	WWPMM	*	Harrington (2006).	Process Oriented
22	Model Maturity Increments in Controlled Environments 2	MINCE2	*	Meisner (2007).	Competence Oriented
23	Five-Step and Maturity Level Model by Project Institute Finland	*	*	Project Institute Finland, Haukka (2013).	Organization and Process Oriented
24	Outcomes and Learning-based Maturity Model	OLMM	*	Killen & Hunt (2013).	Organization and Process Oriented
25	Business Management Consultants Management Maturity Model	PMMM-BMC	*	Farrokh (2013).	Organization and Process Oriented
26	Gartner's Program and Portfolio Management Maturity Model	GPPMM	*	Gartner Inc. (2014).	Organization and Process Oriented
27	PM: Road Map Maturity Assessment	*	*	Interthink Consulting (2016).	Organization and Process Oriented
28	Project Maturity Roadmap	*	*	Pcubed (2016).	Organization Oriented
29	Portfolio Management Maturity Model	ELENA	*	Nikkhoua et al., 2016	Organization and Process Oriented

Table 2. Specialized project management maturity models

No.	Name	Acronym	Theoretical base	Author	Type
30	Construction Project Management Maturity Model	CPM3	*	Fengyong & Renhui (2007).	Construction Projects
31	Evolutionary Software Project Management Maturity Model	ESPM3	*	Sukhoo et al., 2007	Software Projects
32	Infra Maturity Tool	IMT	PRINCE 2, EFQM	Hertogh et al., 2008	Infrastructure Projects
33	Project Risk Maturity Model	PRMM	*	Hopkinson (2010).	Project Risks
34	Agile Project Management Maturity Model	AP3M-SW	PMI	Soares & Meira, 2014	Software Development
35	Conceptual Model for Assessing Project Management Maturity	*	*	Spalek (2015).	Industrial Companies
36	Prosci's Change Management Maturity Model	*	*	Prosci (2004).	Change Management
37	Project Management System Maturity Model	*	*	Vandersluis (2017).	PMIS

The research by Kostalova and Tetrevova (2018) describes these models at a preliminary level. Eight of these models are based on the Project Management Institute (PMI) theoretical framework (Table 1: models 4, 5, 6, 7, 8, 9, 10, and 18). PMI is a knowledge-based descriptive project management method. Four of the models are based on the Projects in Controlled Environments (PRINCE2) theoretical framework (Table 1: models 1, 2, 3, and 18). PRINCE2 is a process-based, prescriptive, and structured project management method based on best practices in the project environment. PRINCE2 focuses on dividing projects into manageable and controllable stages. It is structured around an integrated set of themes and processes, along with seven principles (Vaníčková, 2017). Two models are based on the IPMA theoretical base (Table 1: models 11 and 18). The International Project Management Association (IPMA) is a competence-based methodology applicable to all sectors. IPMA distinguishes between complex projects, where project management methodologies are used extensively, and small projects, where customer relationships tend to be more important than the rigorous application of project management theory (Bushuyeva et al., 2018).

The remaining models in Table 1 are unrelated to any specific theoretical base and instead present their research as their theoretical basis, which are attempts by different scholars to develop philosophies that recommend project management maturity concepts (Kostalova & Tetrevova, 2018). Another approach to these models is through their fundamental categorization in the core area for which they are specifically intended. These core areas are industry-oriented, competence-oriented, organization-oriented, process-oriented, and a combination of organization- and process-oriented.

Industry-oriented maturity models are relevant to specific industries, including manufacturing, construction, software development, and fabrication. These models are based on industry best practices and are beneficial for their respective industries (Kostalova & Tetrevova, 2018). Competence-oriented maturity models focus on relevant effectiveness, suitability, fitness, and appropriateness. A competency-oriented maturity model defines the skill and knowledge

requirements. It is an assortment of competencies that define successful performance. It is a model that broadly defines the blueprint for excellent performance within an organization or sector. The organization-oriented maturity models are associated with an organized body of people with a particular purpose, such as a business, society, or association, characterized by the structure or arrangement of related or connected items. The process-oriented maturity models serve as a series of steps to achieve a particular goal. These emphasize processes, systems, or procedures rather than results or underlying causes. A process-oriented approach strives to move and make improvements. It motivates followers to strive to achieve results by following a pattern (De Oliveira Carvalho & Ogasavara, 2017). Lastly, there is a combination of both process- and organization-oriented maturity models. These concentrate on the organization and its relevant processes; therefore, they are classified as more effective than others.

Maturity Models in Review

The elements of selection criteria for the papers selected for review include:

- To avoid influencing the maturity measurement, the PM maturity model must come from a sovereign organization.
- The structure of the project maturity model should not be industry-specific and thus can be adopted by any industry for performing a project management maturity assessment.
- The model should have weights and scales to measure the PM maturity.
- The project maturity model must align with accredited methodologies, such as the Waterfall, Agile, and Hybrid approaches.
- The project maturity model is traceable for the maturity levels.
- The maturity model is at least 5 years old.
- The model should be publicly available to ensure accessibility and transparency.
- The maturity model has distinct levels to represent the stages of maturity.
- The maturity models have defined domains for measurement emphasis.

Based on these criteria, the 37 models from Tables 1 and 2 were assessed. Only eight models remained to be explored in this paper. The following table describes their qualification.

Table 3. Selected project management maturity models for review

No.	Model Name	Independent Source	Industry Specific	Measurement Criterion	PM Methodology	Scales for levels	Tested & tried	Publicly Available	Levels	Domains
1	PRINCE 2 Maturity Model	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Portfolio Management Maturity Model	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	Project Management Maturity Model	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Organizational Project Management Maturity Model	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

8	Kerzner Project Management Maturity Model	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	IPMA Delta Standard	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
18	Prado Project Management Maturity Model	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
34	Agile Project Management Maturity Model	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The remaining 29 models from Tables 1 and 2 partially fulfilled the criteria and, therefore, are not considered for this paper.

Overview of Project Management Maturity Models

Maturity models, such as the Capability Maturity Model (CMM) and Organizational Project Management Maturity Model (OPM3), assess an organization's project management capabilities. Despite their utility, these models cater predominantly to established organizations, making them less applicable to beginners.

Limitations of Existing Models

Eight models, including the PRINCE2 Maturity Model (P2MM) and Agile Project Management Maturity Model (AP3M), were analyzed for their applicability. Common limitations include excessive complexity, high resource requirements, and inadequate alignment with the needs of beginner organizations.

P2MM - PRINCE2 Maturity Model

The P2MM - PRINCE2 Maturity Model (P2MM) is owned by the UK's Office of Government Commerce (OGC) and is primarily derived from the Portfolio, Program, and Project Management Maturity Model (P3M3). Its structure comprises a five-level maturity framework to describe the levels of organizational maturity, seven process perspectives that cover key aspects of organization-wide project management, and attributes for each level of maturity within each of these processes (Vaníčková, 2017).

Maturity Levels: The five maturity levels are Awareness, Repeatable, Defined, Managed, and Optimized.

Process Perspectives: P2MM focuses on the following seven process perspectives, which can be assessed at all five maturity levels: Management Control, Benefits Management, Financial Management, Stakeholder Engagement, Risk Management, Organizational Governance, and Resource Management.

P2MM - PRINCE2 maturity levels are established based on CMMI levels, with minor amendments made among the repeatable and developing stages. P2MM focuses on seven PRINCE-2 domains, with five of these domains similar to PMI domains, differing primarily in benefits management and organizational governance.

Some of the challenges with P2MM are design and definition catastrophes, where the scope of the change and the required outcomes and/or outputs are not clearly defined. There may be decision-making failures due to inadequate levels of sponsorship and commitment to the change. People failures, such as disconnection between the project and stakeholders, and cultural issues. The P2MM model is limited in its application to organizations that are implementing the PRINCE2 methodology; therefore, beginners generally do not fall into this category and find it inapplicable.

Portfolio, Program, and Project Management Maturity Model (P3M3)

The P3M3 is owned by the Office of Government Commerce (OGC) and was developed in 2004 to build program and portfolio maturity elements into an existing project management maturity model. The P3M3 is a set of structured descriptions of approximately 32 processes that span project, program, and portfolio management, e.g., project definition, risk management, and quality management.

Maturity Levels: The five different maturity levels are awareness, repeatable, defined, managed and optimized.

Dimensions: Its seven dimensions are organizational governance, management control, benefits management, risk management, stakeholder management, finance management, and resource management.

Some of the challenges with the P3M3 model include a lack of focus on project management success versus project success, i.e., delivery on time, on budget, and of high quality, rather than the realization of benefits. It is considered inconsistent to emphasize the link between programs and strategy. This model, due to excessive documentation requirements, often surfaces disagreement with top management.

Project Management Maturity Model (PMMM)

The Project Management Maturity Model (PMMM) is a recognized tool developed by PM Solutions. This project management firm assists organizations in implementing, administering, and assessing their portfolios to improve business performance (Crawford, 2015). This model was established in 2006 by J. Kent Crawford, PMP, who was earlier the president of the Project Management Institute (PMI).

Maturity Levels: The five different maturity levels are Initial, Structured and Standards, Organizational Standards, Institutionalized Process, and Managed Process, with the highest level being Optimizing Process.

Dimensions: The nine knowledge areas are integration, scope, time, cost, quality, human resource, communications, risk and procurement.

Some of the challenges with this model include inaccurate or distorted data due to self-assessment. The process is informal and should be used as a guide only. To gain benefit, the assessment must be authentic, and the organization must be running at least one change management program.

OPM3 - Organizational project management maturity model

The Organizational Project Management Maturity Model (OPM3) is a practice standard for assessing and developing capabilities through portfolio, program, and project management,

published by the Project Management Institute (PMI). OPM3 helps organizations develop a roadmap that the company will follow to improve performance. OPM3 is gaining significance due to the increasing need for program and portfolio management in organizations. OPM3 suggests how to grow from project to program and then program to portfolio management by adhering to its maturity levels. The OPM3 is a framework that enables organizations to measure their maturity against a comprehensive set of best practices (Bento et al., 2019). The application of this model brings benefits to organizations, including improved customer retention and satisfaction, operational efficiency, and a closer alignment between strategy and execution.

OPM3 comprises three general elements: knowledge, assessment, and improvement. Whereas knowledge presents the contents of the standard, assessment provides a method for comparison with the standard, and improvement sets the stage for possible organizational changes. OPM3 describes the maturity model within two primary dimensions of domains and levels.

Domains. There are three domains: project, program, and portfolio.

Maturity Levels: There are four stages of OPM3, which are standardized, measured, controlled, and continuously improved.

OPM3 stages are inspired by the stages of the Project Management Maturity Model (Warner et al., 2019). OPM3 is a comprehensive, complex, and challenging model to apply. To fully realize its advantages, an organization must develop a process for comparing its activities with best practices in project management. The high-level steps in its implementation are: Gaining knowledge of what creates best practices for project management. Assessment of the current maturity level of project management in the organization. Identify a path for continuous improvement based on the knowledge of best practices and the current maturity level of project management in the organization.

Some of the challenges in implementing OPM3 include understanding the knowledge, assessment process, and benchmarking (Bento et al., 2019). OPM3 is a broad standard applicable to processes and organizations but not specific to any particular industry. It can be utilized to lay the foundational concepts of maturity, but it predominantly lacks emphasis on a specific industry. Its domains are vague, with the focus hopping from projects to programs to portfolios. Numerous organizations, especially those that are new, often struggle to find programs and portfolios; therefore, the domains need to be further decomposed and rolled out to benefit from this model more effectively. Some of the other challenges in implementing OPM3 include understanding the knowledge and its interpretations. Most of the organizations that initiate this model lack a comprehensive knowledge base, which leads them to avoid it. Further in the process, knowledge encounters the assessment. The significance of the assessment, mainly when carried out without bias, impacts the results generated.

Last but not least, organizations often find benchmarking to be quite demanding. Benchmarking is a widespread process, regardless of project management maturity, and can be overwhelming when conducting maturity measurements. OPM3 is more inclined towards a waterfall and traditional project implementation approach, where the bulk of the requirements are well known in advance.

Kerzner Project Management Maturity Model (KPM3)

Kerzner introduced his Project Management Maturity model in 2002 based on the knowledge areas outlined in the PMBOK (Hartono et al., 2019). KPM3 is more behavioural than quantitative; people manage projects, and methodologies function as supporting tools.

Maturity Levels: KPM3 has five maturity levels, which are Common Language, Common Processes, Singular Methodology, Benchmarking, and Continuous Improvement.

Dimensions: Its dimensions include basic knowledge, process definition, process control, and process improvement.

One of the challenges with KPM3 is its model definition. It is presumed to be a generic model, creating the impression that it could be applied to any organization, although this is not entirely accurate. The model is inflexible in managing change and is inconsistent with quality management principles. Furthermore, it is criticized for being unable to keep pace with the rapid changes that firms implement in new technologies, processes, and strategies.

IPMA – Delta Model

IPMA's Delta model, released in 2011, integrates a 360-degree perspective (comprehensive by incorporating all points of view) of organizational competence in project management. It utilizes the IPMA competence baseline (contextual, behavioural, technical) to assess the competence of selected individuals, projects, and organizations (Bushuyeva et al., 2018).

Competence Levels: IPMA Delta offers five competence classes that describe an organization's current project management competence: Initial, Defined, Standardized, Managed, and Optimized.

Modules: IPMA comprises three modules, named I, P, and O, for individuals, projects, and organizations. The IPMA competence baseline is used to assess the competence of selected individuals (Module I), projects and programs (Module P), and the organization (Module O).

CMMI levels inspire IPMA Delta competence levels. These differ among the defined levels, where CMMI suggests developing prior to defining, and IPMA suggests first defining and then standardizing. P2M3 concepts inspire the IPMA Delta competence assessment. Some of the challenges with the IPMA delta model include a lack of evidence of the relationship between maturity and perceived outcomes. The structure is considered rigid and inflexible, often ignoring the overlapping contexts among the three models with a narrow construal of maturity, as they focus primarily on what organizations and project personnel are doing operationally.

P2M3 – Prado project management maturity model

The Prado Project Management Maturity Model (P2M3) was developed by Darci Prado (IBM Consultant) in 2002, which is considered the simplest of all maturity models, as it begins by answering just 40 questions and produces an index to differentiate and measure an organization's ability to succeed in project management. It applies to any organization or project type to identify areas for improvement. This model is mainly popular in Brazil, Spain, Portugal, and Italy (De Souza Scotelano et al., 2017).

Maturity Levels: It consists of five maturity levels: Initial, Known, Standardized, Managed, and Optimized.

Dimensions: It enables measurement of maturity across seven dimensions: competence in project and program management, competence in technical and contextual aspects, behavioural competence, methodology usage, computerization, utilization of convenient organizational structure, and strategic alignment.

P2M3 Prado project management maturity levels are inspired by CMMI levels, with minor amendments among the known and developing stages. Some of the challenges with the Prado model are related to the questionnaire's construct, survey audience, response validity, and determining an appropriate sample size. Even if the effort is carried out using pre-designed questionnaires, the challenge remains in determining the information processing criterion to derive the results.

AP3M - Agile project management maturity model

The Agile Project Management Maturity Model, abbreviated as AP3M, was developed by Soares and de Lemos Meira in 2015. AP3M is based on PMI, with a focused orientation on the software development process. AP3M describes the maturity model within two primary dimensions (Soares & de Lemos Meira, 2015).

Domains: Planning (establish estimates, develop a project plan); Project monitoring and control (monitor the project plan, manage corrective action); Requirement Management (manage requirements); Risk Management (identify and analyze risks and mitigate risks); Integrated Project Management (collaborate with relevant stakeholders).

Maturity Levels: There are five stages of AP3M, which are vision, speculation, adaptation, exploration, and closure.

AP3M phases are an enriched version of the CMMI model (Salman et al., 2017). The phases are similar between OPM3 and AP3M, as both are based on CMMI. AP3M domains are a decomposed version of OPM3 domains (Project, Program, and Portfolio). Each domain includes an iteration of 5 steps (Envision, Speculate, Explore, Adapt, and Close), incorporating the agile methodology with ample margin for tolerating dynamic requirements. AP3M applies the OPM3 to define the domains of organizational project management (Project, Program and Portfolio) and the stages at which the organization is to be found. AP3M is based on Agile Methods (Crystal, Scrum, FDD, XP, Lean, and Kanban) to define the practices and work products of each process area. The five stages of APM were defined to promote the continuous delivery of value and to facilitate reflection that fosters learning. AP3M discards the anticipatory posture based on the characteristics of traditional project management. It seeks to develop a vision of the future, as well as the ability to perform through situational exploration. AP3M utilizes an empirical process model that incorporates inspection and adaptation to foster exploration, promoting an adaptive culture that enables self-organization and self-discipline. AP3M introduces a new focus on systems development founded on agility, flexibility, practical communication skills, and the ability to deliver new, value-driven products to the market in a short time frame (Soares & de Lemos Meira, 2015).

Some of the challenges with AP3M implementation include detailing all the model's components and validating them. The primary challenge of this validation is related to the feasibility of applying the model and determining which metrics can be collected before and after its implementation. Later, the variables (before and after measurement) were assessed to determine whether the use of the model contributed to the success. Another challenge is to measure the impact of the costs, time, scope, quality, and satisfaction of both the client and the team. The time required for implementation is a significant constraint, as this maturity model must be implemented progressively, which in turn negates the agile concept of rapid delivery. Due to a fundamental difference in implementation, AP3M is more suitable for IT projects, especially software development projects, making it a niche approach for agile-based organizations and projects. Any organization that employs a waterfall or hybrid methodology may prefer not to use this model to avoid confusion and maintain consistency. There are numerous challenges in projects when dealing with lesser-known upfront requirements, especially non-functional requirements.

Comparing the models

Let us review the summary of the discussed models to highlight their similarities and differences. These models from table 3-p.12 have the following levels and domains:

Table 4. Levels of the project management maturity models under review

Model	OPM3	AP3M-SW	P2MM	IPMA	P2M3	KPM3	PMMM	P3M3
Levels	Standardize	Vision	Awareness	Initial	Initial	Common language	Initial	Awareness
	Measure	Speculation	Repeatable	Defined	Known	Common processes	Structured	Repeatable
	Control	Adaption	Defined	Standardized	Standardized	Singular methodology	Institutionalized	Defined
	Improve	Exploration	Managed	Managed	Managed	Benchmarking	Managed	Managed
		Closure	Optimized	Optimized	Optimized	Continuous	Optimizing	Optimized

Table 5. Domains of the project management maturity models under review

Model	OPM3	AP3M-SW	P2MM	IPMA	P2M3	KPM3	PMMM	P3M3
Domains	Projects	Plan	Management Control	Individuals	Project/ Program Management	Basic Knowledge	Integration	Organizational Governance
	Programs	Monitor & Control	Benefits Management	Projects	Technical / Contextual Aspects	Process Definition	Scope	Management Control
	Portfolio	Requirement Management	Financial Management	Organization	Behavioural Competence	Process Control	Time	Benefits Management
		Risk Management	Stakeholder Engagement		Methodology	Process Improvement	Cost	Risk Management
		Integrated PM	Risk Management		Computerization		Quality	Stakeholder Management

Organizational Governance	Organizational Structure	Huan Resources	Finance Management
Resource Management	Strategic Alignment	Communications	Resource Management
		Risk	
		Procurement	

Apart from their domains and levels, another scale for comparing them is established on the attributes chosen by Sorush Niknamian (Niknamian, 2019). Niknamian ranked these attributes in order of their precedence (Niknamian, 2019): reliability, reusability, extensibility, applicability, and maintainability. Let us review these terms concisely. Reliability: The degree to which the result of a measurement can be depended on to be accurate. The quality of performing consistently well. Reusability: Able to be customized quickly out of components that can be adapted to individual needs. Extensibility: The quality of being designed to allow the addition of new capabilities or functionality. Applicability: The usefulness of a particular task refers to how well it suits a given situation. The quality of being relevant or appropriate. Maintainability: The ease with which it can be maintained to make impending maintenance easier or cope with a changed environment.

Table 6 illustrates a self-elaborated comparison of these attributes based on the literature review, results, and discussion of the models in Table 3.

Table 6. Comparison of the project management maturity models under review

Model	Reliability	Reusability	Extensibility	Applicability	Maintainability
OPM3	High	Low	Low	Medium	Low
AP3M-SW	Low	Low	Low	Medium	Medium
P2MM	Medium	Low	Low	Medium	Low
IPMA	Medium	Medium	Low	Medium	Low
P2M3	Low	Low	Low	Medium	Low
KPM3	Medium	Low	Low	Medium	Low
PMMM	Low	Low	Low	Medium	Low
P3M3	Low	Low	Low	Medium	Low

The question remains unanswered about identifying a suitable model that organizations can adopt, especially those commencing project management practices. We need a simple yet influential model for such organizations. The prevailing models, unfortunately, do not provide organizations with the comprehensive benefits they need to initiate project management practices. The discussed models differ in their domains but remain nearly identical in terms of their levels of complexity. The self-identified miscellaneous shortcomings of the studied models are listed in Table 7. After reviewing the eight models in Table 3, this paper advocates the need for an appropriate model for organizations commencing project management practices. The new model should address gaps in existing models by offering a simplified framework that aligns with the needs of organizations new to project management. The model should have a modular structure to allow gradual

adoption, ensuring scalability as the organizations mature. A practical approach would be to develop a model based on PMI's core domains and logical grouping of its knowledge areas as an applied roadmap for continuous improvement. This paper proposes an appropriate model, BIAMM, for organizations commencing project management practices. Let us examine the BIAMM in detail.

Proposed Model: BIAMM

In this paper, a new flexible model is proposed that is suitable for organizations of varying sizes, including small to medium-sized or large-sized organizations, and different types, including departmental, matrix, and projectized organizations. A projectized organization is one where all activities are managed through projects. Employees share their lessons learned, allowing others to benefit from a joint corporate knowledge base. Project managers have full autonomy and complete authority over resources. These organizations are mainly interested in external project work. The proposed model is titled the Basic Intermediate Advanced Maturity Model (BIAMM).

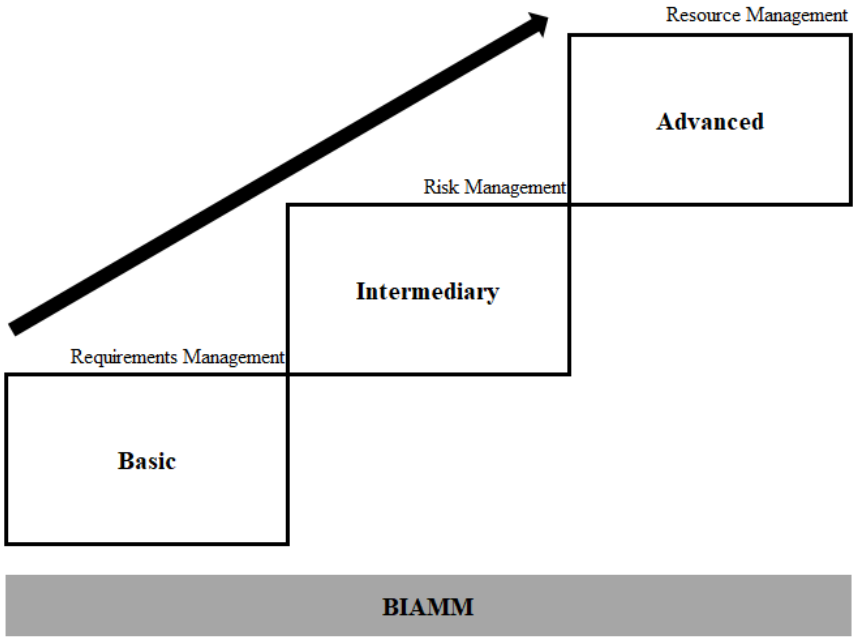

Fig. 1. BIAMM

Structure of BIAMM

BIAMM introduces three maturity levels:

- Basic: Initial adoption of project management with professional project managers and fundamental tools.
- Intermediate: Establishment of a supportive project management office (PMO) and advanced tools.
- Advanced: Deployment of directive PMOs and enterprise portfolio management tools.

Core Domains

BIAMM focuses on three interconnected domains:

1. Requirements Management: Defining project scope, integrating stakeholder input, and ensuring quality.

2. Resource Management: Optimizing time, cost, and human resources.

3. Risk Management: Identifying, analyzing, and mitigating risks throughout the project lifecycle.

Attributes

BIAMM is characterized by high reliability, reusability, and extensibility, making it adaptable to diverse organizational contexts.

To encourage organizations, especially those commencing project management practices, this paper proposes BIAMM with only three levels of maturity (Basic, Intermediate, and Advanced). BIAMM is theoretically based on PMI and can be applied to any methodology, including traditional waterfall, agile, or hybrid approaches. BIAMM focuses on three core domains (requirements management, resource management, and risk management) with a logic of correlated undertakings. The qualifying criteria for each level are based on the principles of people, process, and technology. The qualifying criteria for any organization to be at these levels are as follows:

B1 – Basic Level

People: Have professional project managers instead of accidental project managers. An accidental project manager (PM) is a business professional who, although project management is a secondary duty, is tasked with managing projects with little or no prior experience or training.

Process: Have a formal/informal project management office and/or extensive senior management support.

Technology: Utilizes project management tools (software) and techniques (methodology) for project artifacts.

I2 – Intermediate Level

People: Have a management structure involving senior project managers and other project managers.

Process: Establish a formal, supportive project management office to manage projects and programs. The Supportive PMO generally provides on-demand support for expertise, templates, best practices, and access to information and expertise on projects.

Technology: Utilizes advanced data project management tools (software) and techniques (methodology).

A3 – Advanced Level

People: A management structure comprising project steering committees and a project change control board.

Process: Have a formal, controlling, or directive PMO to manage projects, programs, and portfolios. The controlling PMO oversees the project's activities, processes, procedures, documentation, and other related aspects. It encourages the adoption of specific methodologies, templates, and forms, as well as conformance to governance. The directive PMO takes over projects by providing project management expertise and resources to ensure a high level of consistency in practice across all projects.

Technology: Utilizes enterprise portfolio management tools (software) and techniques (methodology).

BIAMM focuses on three core domains: requirements management, resource management, and risk management. The logic for these domains is correlated activities. This paper suggests three logical groupings of the 10 PMI knowledge areas. The PMI knowledge areas are grouped based on their interrelations. Communication management and stakeholder management are vital for any project's success; therefore, they are retained in each domain. The first domain to focus on is requirements management, which leads to resource management and, ideally, comprehensive quantitative risk management. The sequence of focusing is not level-bound; instead, it is based on industry best practices and experiences. An organization may start focusing on all domains at the basic level, but its perspective will undoubtedly be limited at this level.

PMI
1 Integration Management
2 Scope Management
3 Time Management
4 Cost Management
5 Quality Management
6 Human Resource Management
7 Communication Management
8 Risk Management
9 Procurement Management
10 Stakeholder Management

BIAMM	
1 Requirements Management	Integration Management
	Scope Management
	Quality Management
	Communication Management
	Stakeholder Management
2 Risk Management	Risk Management
	Procurement Management
	Communication Management
	Stakeholder Management
3 Resource Management	Time Management
	Cost Management
	Human Resource Management
	Communication Management
	Stakeholder Management

Fig. 2. BIAMM Domains

Requirements Management

The project management process begins with managing and controlling requirements. Requirements management is the progression of recording, analyzing, outlining, prioritizing, and agreeing on requirements, and then governing change and communicating them to relevant stakeholders. It is a continuous process that spans the entire project. A requirement is a capability that a project should conform to. This domain focuses on defining what you are planning to achieve, identifying the expected outcome, and describing its functionality and value. This domain involves integration management, which encompasses the overall project into a unified whole. This domain encompasses the project scope, which refers to the work involved within the project. Since scope changes are one of the primary causes of project changes and general project issues,

it is crucial that project boundaries be well-defined from the outset and monitored rigorously. Moreover, this domain includes quality management. For better quality, you need to invest more time or incur additional costs. Due to the integral nature of the project's deliverables, the quality level should be well known during project requirements management planning. Effective communication with stakeholders is a crucial factor in ensuring their satisfaction, even in the face of unexpected changes. It is essential to develop a communication plan to keep all stakeholders knowledgeable throughout the project and communicate early and often when unexpected issues arise. There is nothing more important than the project's stakeholders. Stakeholders should be vigorously managed within the requirements management process.

Risk Management

The project management process progressively gears into managing risks and issues related to the requirements. This domain becomes critical from Level 2 onwards, but it is a good practice to consider at any level. Managing project risk is one of the underrated aspects of project management. Risks are rarely identified upfront and analyzed at the initial planning levels. The risks need to be identified, categorized, and prioritized. Once the risks are identified, they are classified as likelihood and impact and then ranked according to priority. For significant risks, response plans are developed to ensure that stakeholders are aware of how to respond if the risk materializes. The cycle does not end here; instead, it involves monitoring the risk frequently and implementing relevant risk responses. This paper ties procurement management to risk management, as procurement faces key constraints such as time, scope, and cost, which are often impacted by the procurement of goods and services. This domain focuses on communication and stakeholder management, like all other domains.

Resource Management

The project management process continually involves managing resources. This paper consolidates the resources, encompassing time, cost, and human resources. Time management is typically the most time-intensive of the resources, as the project manager must create a schedule and establish a schedule baseline for evaluating project performance. The schedule relies on the budget for the activities scheduled; therefore, earned value management is used to determine the project's status. Because most project changes involve changes to the schedule, they must be continuously rebased, provided that due approval is obtained. The project budget is one of the most sensitive parts of a project. The budget must be established through rigorous estimating techniques and monitored against a cost baseline to ensure the project remains within budget. The project team is one of the most crucial factors in a project's success. This domain is associated with acquiring the right team, ensuring their satisfaction, and tracking their performance. This domain focuses on communication and stakeholder management, like all other domains.

Life Expectancy

To help facilitate the organization's BIAMM, I suggest a five-year ideal expectancy from basic to advanced levels. An organization should achieve the basic level within its first year, which is realistic based on the level requirements. Following a successful year-end review, it may take up to two more years to reach the intermediate level, and similarly, it may require up to two more

years to achieve the advanced level. Refining from one maturity level to another will require planning and implementation of the specific requirements of that level.

Conclusion

BIAMM addresses gaps in existing models by offering a simplified framework that aligns with the needs of organizations new to project management practices. Its modular structure allows gradual adoption, ensuring scalability as organizations mature. By focusing on core domains and logical groupings of PMI knowledge areas, BIAMM provides a practical roadmap for continuous improvement.

This paper progresses from the concepts of project management methodologies to the project management maturity model. Afterward, maturity models by Kostalova and Tetrevova (2018) were characterized based on their theoretical foundation, industry, competence, process, and organizational types. Subsequently, eight models (P2MM, P3M3, PMMM, OPM3, KPM3, IPMA, P2M3, and AP3M) meeting the defined research criteria were evaluated to propose an appropriate model for organizations commencing project management practices.

In summary, the P2MM-PRINCE2 maturity model faces challenges related to design and definition failures, decision-making failures, and people-related failures. The P2MM model is limited in its application to organizations that are implementing the PRINCE2 methodology; therefore, organizations that are not implementing PRINCE2 do not generally fall into this category and find it inapplicable. The P3M3 model lacks focus on project management success versus project success, i.e., delivery on time, on budget, and of high quality, rather than the realization of benefits. It is considered inconsistent to emphasize the link between programs and strategy. This model, which involved excessive documentation, had often led to disagreements with top management. PMMM challenges include inaccurate or distorted data due to self-assessment. The process is informal and should be used as a guide only. To gain benefit, the assessment must be authentic, and the organization must be running at least one change management program. The OPM3 model is a broad standard applicable to processes and organizations but not specific to any particular industry. Its domains are imprecise, especially for initiating organizations, which rarely encounter programs and portfolios. Other challenges include understanding the knowledge and interpretations, which require a comprehensive knowledge base, as well as challenges related to knowledge assessment and benchmarking. OPM3 is inclined towards a traditional project implementation approach where the requirements are well known in advance. KPM3 is more behavioural than quantitative; people manage projects, and methodologies function as supporting tools. KPM3 is often regarded as a generic model, with the impression that it can be applied to any organization; however, this is not entirely accurate. The model is considered inflexible in managing change and is criticized for its inability to account for the rapid pace of change. IPMA's Delta model utilizes the IPMA competence baseline (contextual, behavioural, and technical) to assess the competence level of selected individuals, projects, and organizations. The IPMA delta model's challenges include a lack of evidence regarding the relationship between maturity and perceived outcomes.

The structure is rigid and inflexible, often ignoring the overlapping contexts among the three modules (Individual, Project, and Organization), as it focuses primarily on operational activities within organizations and projects. P2M3 – The Prado project management maturity model applies

to any organization or project type to measure and is considered to be the simplest of all maturity models. The challenges primarily concern the questionnaire construct, survey audience, response validity, and the appropriate sample size. Even when utilizing pre-designed questionnaires, the challenge remains in determining the criteria for processing the information to deduce the results. The AP3M model is a decomposed version of the OPM3 domains that incorporates the agile methodology. Any organization that employs a waterfall or hybrid methodology may prefer not to use this model to avoid confusion and maintain consistency. Other challenges include lower upfront requirements, which require detailed information on all model components and their validation. Additionally, segregating variables (before and after measurement) is necessary to assess success. Furthermore, the considerable time needed for implementation negates the agile concept of quick delivery.

After studying these models, the question remains unanswered: to identify a suitable and simple model that project management newcomers can adapt. The prevailing models do not richly benefit such organizations. This concern can be addressed with BIAMM. The idea behind BIAMM is to propose a simple yet influential model that can be adapted by organizations new to project management practices. The prevailing models differ in their domains but remain relatively consistent across maturity levels. Many organizations struggle with transitioning from one level to another, especially when it comes to the framework that defines how the move is to be recognized. How much is the ideal time to move from one level to the other? Is it possible to stay at the same level?

An organization may undergo several changes that are expected to be strategically beneficial, but these changes may cause it to drop in maturity levels. Many reputable and established organizations do not undergo project management maturity assessments because they are already categorized at a higher level of maturity. The agony is not only at the lower level; essentially, it is about how and when they can jump to the next level. The organization may be performing well and achieving its targets, but when measured on maturity scales, it may find itself at a lower level of maturity. Due to these apprehensions, maturity categorization is not so popular, which does not mean that maturity does not exist; maturity exists in a tacit form within the organization, and its deficiency is often realized when a project fails or when the organization strategizes its development and growth prospects. The organizations claim their achievements through standardizations, certifications, and adherence to certain compliances, but you have not seen a maturity index for any company. There is no centralized body to recognize the maturity index of an organization to showcase its achievements. The primary reason is the fear of the complexity of maturity models, which results in lower ratings of maturity. This paper aims to accept the challenge and start distinguishing their maturity successes on a relatively simplified yet meaningful scale.

In order to encourage organizations, especially those commencing project management concepts, this paper proposed BIAMM with only three levels of maturity (Basic, Intermediate, and Advanced). BIAMM is theoretically based on PMI and can be applied to any methodology, including traditional waterfall, agile, or hybrid approaches. BIAMM focuses on three core domains (requirements management, resource management, and risk management) with a logic of correlated undertakings. The qualifying criteria for each level are based on the principles of people, process, and technology. This paper suggests three logical groupings of 10 PMI knowledge areas. Communication management and stakeholder management are vital for any

project's success; therefore, they are retained in each domain. The first domain to focus on is requirements management, which leads to resource management and, ideally, comprehensive quantitative risk management. The sequence of focus is not level-bound; instead, it is based on industry best practices. An organization may start focusing on all domains at the basic level, but its perspective will undoubtedly be limited at this level. The attributes that surpass BIAMM over other models are its high reusability, extensibility, and applicability.

Table 7. BIAMM attributes

Model	Reliability	Reusability	Extensibility	Applicability	Maintainability
BIAMM	**High**	**High**	**High**	**High**	**High**
OPM3	High	Low	Low	Medium	Low
AP3M-SW	Low	Low	Low	Medium	Medium
P2MM	Medium	Low	Low	Medium	Low
IPMA	Medium	Medium	Low	Medium	Low
P2M3	Low	Low	Low	Medium	Low
KPM3	Medium	Low	Low	Medium	Low
PMMM	Low	Low	Low	Medium	Low
P3M3	Low	Low	Low	Medium	Low

This study highlights the limitations of existing Project Management Maturity Models (PMMM) for organizations new to project management. BIAMM provides a simplified yet effective alternative, adaptable to various methodologies and industries. Future research should investigate the application of BIAMM across various organizational sizes and project complexities. In light of the literature review, this paper concludes that prevailing project management maturity models are not suitable for organizations that are just starting to implement project management. Furthermore, the proposed model, BIAMM, with three levels of maturity (Basic, Intermediate, and Advanced), is usable with any methodology and focuses on three domains (Requirements, Resource, and Risk management) established through the logical grouping of PMI knowledge areas. This model is effective for organizations commencing project management practices.

There are several other project management methodologies, including the Prototype Methodology, Rapid Application Development, Dynamic System Development Model, Spiral Model, Extreme Programming, Feature-Driven Development, Joint Application Development, Lean Development, and Rational Unified Process. Future studies need to investigate how BIAMM can be an effective model according to the development scale, i.e., small, medium, and large, and/or easy, challenging, and complex projects. The future study will help organizations adopt an appropriate model tailored to their specific needs and requirements.

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