

# DEFINING A ‘MATURITY MODEL’ IN THE CONSTRUCTION CONTEXT: A SYSTEMATIC REVIEW

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## ABSTRACT

*A maturity model is critical in analysing an entity as it evaluates the current situation and provides insights on enhancing the capabilities to reach higher maturity. Maturity models are being used in many industries and proven to have a positive impact on organisational development. Definition of a context specific maturity model is vital as it brings clarity to the model identification and better understanding relevant for a respective industry. Even though several construction maturity models exist, a clear and a comprehensive definition is not noticeable. A comprehensive definition for maturity models in construction sector would assist industry stakeholders to understand the components and key areas of construction maturity. Consequently, it would provide accurate and impactful results for construction firms to achieve higher maturity levels. Thus, the main aim of this paper is to establish a new definition for construction maturity models. In the process, the methodology included a systematic literature review adopting PRISMA literature review method and a content analysis using thematic analysis. The study analysed fifteen construction maturity models and identified nine overarching themes which were fundamental in developing the definition. The proposed definition would facilitate a better understanding among end users of construction maturity models, and it would assist the readers to distinguish it from other various models. Therefore, the derived definition would promote application of the concept of construction maturity in the industry. Further research could be conducted for diverse types of construction to enhance the effectiveness of the maturity models.*

**Keywords:** Construction Maturity; Maturity Models; PRISMA; Systematic Review.

## 1. INTRODUCTION

Maturity models (MMs) describe gradual improvement paths toward the development of good practices, to the point of achieving a desirable state in any organization (Lacerda and Wangenheim, 2018). Maturity also explains what the higher levels can be achieved and therefore it enables to identify shortcomings and ways to correct or preclude (Schlichter, 1999). MMs are significant as they assist organisations to understand their existing capabilities and provide a systematic pathway to improve organisation’s capabilities to reach higher maturity levels (Facchini, et al., 2020). Moreover, a maturity

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model is vital for organisations related to construction as it provides ability to reach the desired strategic position by continuously improving its desired outputs in a predictable, controllable and a reliable manner (Machado, et al., 2021). MMs in Information Technology (IT), Continuous improvement and Software development sectors have presented comprehensive definitions (Software Engineering Institute , 2006; Liu and Zhang, 2019). On the other hand, majority of maturity models relevant for construction sector are an extension of conventional maturity models thus, there is a lack in comprehensive and construction specific definitions. For example, maturity models like Construction supply chain maturity model (CSCMM), Construction industry macro maturity model (CIM3), Standardised Process Improvement for Construction Enterprises (SPICE), Change Management Maturity Model (CM3) are all based on the Capability maturity model (CMM) (Nesensohn, et al., 2015). Since these models are developed based on the CMM, they lack comprehensive and industry specific definitions (Finnemore and Sarshar, 2002; Vaidyanathan and Howell, 2007; Sun, Vidalakis and Oza, 2009; Willis and Rankin, 2012).

In the search of definitions, Capability maturity model integrated (CMMI) which is the upgraded version of CMM, provides a comprehensive definition. CMMI defines itself as a model with proven set of best practices organized by critical business capabilities which improve business performance. It is designed to be understandable, accessible, flexible, and integrate with other methodologies such as agile (Software Engineering Institute, 2006). The definition provides a detailed idea covering all the related aspects. Similarly, MMs in software development sector like Capability Maturity Model (CMM) (Brotby, 2009), MMs in service industry like Logistics 4.0 Maturity in Service Industry (Werner-Lewandowska and Kosacka-Olejnik, 2019) or Maturity model for product development information (Sinnwell, Siedler and Aurich, 2019) have defined and outlined the models which are specifically catered for the respective industries. Even though there are definitions in MMs in industries like manufacturing and IT, such definitions do not fully comply to construction firms since the industries have fundamental differences. Since factors like nature of the final product, time factor, variations and attention on defects are fundamentally different in manufacturing and construction, it is not viable to adapt a manufacturing or IT related maturity model definition in its original form to a construction maturity (Fernández-solís, 2008). However, construction industry has been using several project management maturity models in their practices but there is a dearth of literature specifically in construction maturity model definitions. This is evidenced by analysing models like Project Management Process Maturity Model (PM)<sup>2</sup>, where project management attributes were taken in to consideration however, the model does not define its parameters nor a clear definition was provided specifically relevant for construction (Kwak and Ibbs, 2002). In Sri Lankan context also, there is a deficiency in literature trying to define a construction maturity model. Therefore, considering the construction industry, there is a clear need to establish a comprehensive maturity model definition as it directly assists to comprehend and enhance the maturity in construction sector.

There are models that provide definitions which can be related to construction sector to a certain context. Models which provide a reasonable idea about a definition, i.e. Berkley Project Management Process Maturity Model (Kwak and Ibbs, 2000), Portfolio, Programme and Project Management Maturity Model (Office of Government Commerce (OGC), 2010), Project Management Process Maturity Model (Kwak and Ibbs, 2002) are more concerned on definitions which are suitable for any industry relative to project

management but not specifically rendered the construction industry, Therefore, it is difficult to identify a definition for the construction related maturity models. Inversely, some available models provide definitions that are only relevant for a specific, narrowed down area itself, however not in the context of construction. For example, Off-site construction readiness maturity model is only concerned in offsite construction related practices (Bendi, et al., 2021). Therefore, considering the lack of a construction maturity model definition, the study attempts to contribute to the body of knowledge on construction maturity models by reviewing the literature carried out by various scholars and by generating a definition for construction related maturity models.

The aim of this paper is to propose a definition for the construction maturity models. The paper starts with an introduction and followed by a comprehensive systematic literature review using the PRISMA systematic review method on existing maturity models and their definitions. Next, the research method, comprising of data collection techniques, is explained. Then the data collected from literature would be presented and analysed through a thematic analysis in order to identify the themes in developing the definition for construction maturity model. Finally, the findings would be discussed and the final definition for construction maturity model is presented. The research is significant as it contributes to the body of knowledge of construction maturity models and therefore will promote the application of construction maturity in the construction industry.

## **2. LITERATURE SYNTHESIS**

Maturity Models originated within the practices of Total Quality Management systems where the continuous improvement is considered a main aspect through analysing the current status and the capabilities of the organisation compared to the future goals (Brookes and Clark, 2009). CMM is considered one of the prominent maturity models which was initially developed with the goal of improving software process and later, due to the success of the model, US defence department and other entities adapted it (Nesensohn, et al., 2015). With the success of the maturity models mainly in software development, other industries like manufacturing management and IT, adopted maturity models to enhance their business capabilities (Santos-Neto and Costa, 2019). Currently, the maturity models have been extended to different domains such as education, health, energy, finance, construction, industrial sector, government and general use (Tocto-cano, et al., 2020).

In defining maturity models, it is imperative to comprehend the idea behind the word “maturity”. As per the Oxford English Dictionary (2021) maturity means the state of being fully grown or developed and this can be designated to a person, organisation, plant or for a principle even. The maturity itself defines the idea that how advanced or ripened any entity is. A maturity model can be defined as a tool with structured set of elements that describes and progressive path towards improvement from immature processes to mature and effective processes (Facchini, et al., 2020). A maturity model mainly facilitates a pathway or rather a framework which benchmarks and improve the performance on a continuous scale (Demir and Kocabaş, 2010). Maturity models help organisations to critically analyse their activities and identify the inefficiencies that halts organisation from achieving their objectives. The basis of the maturity model is the fact the people, organisation, functional areas, process etc. could evolve and develop through a process of growth to an advanced or enhanced maturity level (Vásquez, et al., 2021).

In compare and contrast of maturity models relating to construction industry, it is visible that a considerable number of models have similarities. A noticeable similarity is belongingness to the CMM family. Models like CSCMM, Organisational Project Management Maturity Model (OPM3), Berkley Project Management Process Maturity Model, CIM3, SPICE, CM3, Portfolio, Programme and Project Management Maturity Model (P3M3) all are developed considering CMM as a fundament (Eadie, Perera and Heaney, 2011). On the contrary, a model like Off-site construction readiness maturity model has followed a different approach where it is developed using empirical studies to suite specifically offsite construction (Bendi, et al., 2021). Another fact that is seemed to be common is having distinct maturity levels and the idea is visible in analysing their respective definitions as well. On the same note important aspect is that, most of these models provide a gradual and progressive pathway towards higher maturity assisting organisations to grow (Khoshgoftar and Osman, 2009). Maturity models are beneficial in many ways for organisational enhancement as emphasised by several scholars. Maturity Model can be equipped as a tool assisting organisations to analyse their core areas with their existing capabilities (Silva, et al., 2021). Creating awareness of current situation and discovering potentials and requirements for improvement (Wendler, 2012), providing directions and actions of improvement and evaluating complexities and areas of improvement to a new cultural change (Pennypacker, 2005), analysing strengths and weaknesses to plan out the transformations (Perkins, et al., 2010), serving as reference point or benchmark to implement a change or improvement approach in a systematic and well-directed way (Cooke-Davies, 2007), providing the platform to a common communicating tool (Klimko, 2001), embedding change through cultural excellence and sustained embedment of business processes (Eadie, Perera and Heaney, 2011) are few highlights of the benefits of maturity models.

There are numerous MMs related to construction sector that are being used in the industry for a reasonable time. The term maturity is being used in several sectors and provide different definitions. In the field of management, maturity is an idea that explains the progressive improvement in project management systems and processes that can be used to assess an organization's capabilities and to provide an improvement path (Pennypacker, 2001). In the field of IT and software development, the idea of maturity stands off as a process management device which streamline all the procedure (Toctocano, et al., 2020) indicating that maturity models and their definitions tend to be industry specific. On the same note since construction industry is unique and different to other industries in technological, economic, cultural aspects, same definitions of other industries would not be compatible to construction. This suggests the idea that even though there are fundamental similarities in maturity models, their definitions vary and provide different meaning considering the context. Therefore, there is a clear need to research on the area of construction maturity models to develop a definition for construction maturity models.

### **3. METHODOLOGY**

A comprehensive literature review helps gaining valuable insights from the prior studies carried out through analysing and understanding of the respective subjects (Saunders, Lewis and Thornhill, 2016). Systematic reviews such as PRISMA are rigorous studies used to collate all available evidence that conforms to a predefined set of eligibility criteria, to address a specific matter of interest (Sohrabi, et al., 2021). A systematic review

collects all possible studies related to a given topic and design, and reviews and analyses their results (Ahn and Kang, 2018). Adopting a method like PRISMA is ideal for literature review since it captures all relevant evidence as it provides check lists which covers all the relevant aspects related to the area of research (Page, et al., 2021). Therefore, the study adopted the PRISMA systematic review in search of the relevant literature for the study. One crucial component of a systematic review is the literature search. The literature search, or information retrieval process, not only informs the results of a systematic review; it is the underlying process that establishes the data available for analysis (Rethlefsen, et al., 2021). Figure 1 illustrates the research process followed.

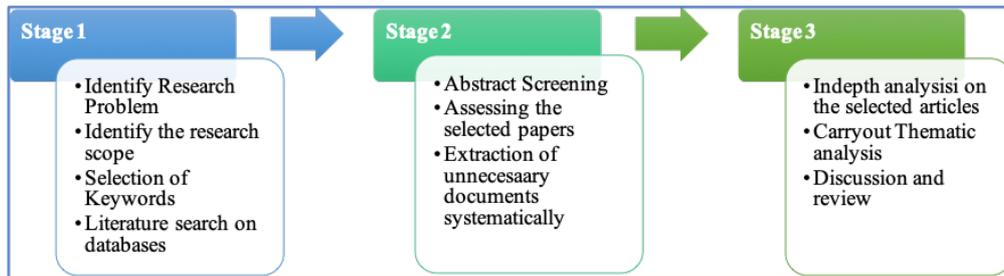


Figure 1: PRISMA Research Process

As shown in Figure 1, the study was carried out in 3 main stages. Firstly, key words were determined for the search which are imperative for the systematic search as shown in Figure 2. To begin with, the authors selected 175 articles from a scientific data search from leading databases. The three main data bases used for the study were ‘Science Direct, Google Scholar and Emerald Insight.

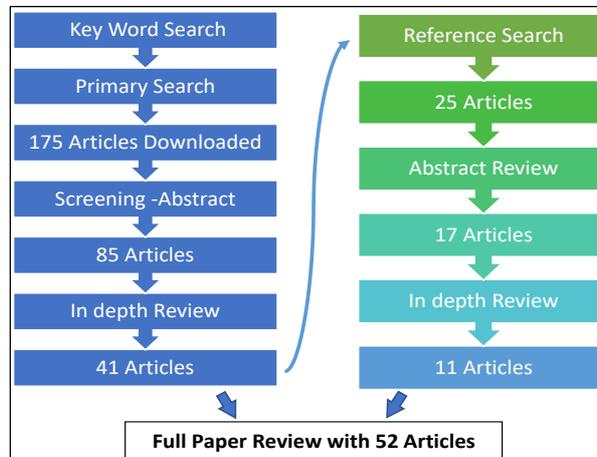


Figure 2: Stages of Prisma Systematic Literature Review

After identifying the key words (*Maturity, Maturity Models, Modern Maturity Models, Construction Maturity, Construction Maturity Models, Project Management Maturity Models, Construction Management Maturity Models, AEC industry maturity model*), 175 articles were discovered through PRISMA systematic analysis. Subsequently, the articles were screened through the abstract as an initial collection. 85 articles were stored and later these articles were critically analysed for further screening. From those, 41 articles were selected as directly relevant for the study and used for the review. Furthermore, 25 articles were further identified through the references from the selected 41 articles. Similarly, they were firstly screened from the abstract and later comprehensively screened and reduced to 11 articles. Ultimately 52 articles were selected for the final

review and analysis of the study. The study scrutinised 15 maturity models that were selected according to the two main criteria of 1) relevancy for construction sector and 2) visibility of basic concepts of a definition of a maturity model.

## 4. FINDINGS

### 4.1 THE IDENTIFIED MATURITY MODELS

Through the PRISMA systematic literature review conducted, 15 maturity models were identified as appropriate and directly relevant for the discussion and presented them in Table 1. These models were selected after rigorously following the PRISMA review and identifying the models which fulfilled the two criteria mentioned in Methodology section. Further, the definitions of the identified models were determined as direct definitions and derived definitions as shown in Table 1.

Table 1: Maturity models

Key Model	Direct Definition	Derived Definition	Related Industry
1	✓		IT/Adopted for Construction related MMs
2	✓		IT/Construction
3		✓	Construction
4		✓	Construction/Project Management
5	✓		Construction/Project Management
6		✓	Construction/Project Management
7	✓		Construction/Project Management
8		✓	Construction
9		✓	Construction/Project Management
10		✓	Construction/Project Management
11		✓	Construction/Project Management
12	✓		Construction/Project Management
13		✓	Construction/Project Management
14		✓	Lean Construction
15		✓	Construction/Project Management

[1]CMM, [2] CMMI, [3] Standardised Process Improvement for Construction Enterprises (SPICE), [4] Change Management Maturity Model (CM3), [5] Organizational Project Management Maturity Model (OPM3), [6]Maturity Assessment Grid (MAG) from the Strategic Forum for Construction, [7] Projects In Controlled Environments off-site construction readiness maturity model (PRINCE2), [8] Off-site construction readiness maturity model, [9] OMG Business process maturity model (BPMM), [10] Construction supply chain maturity model CSCMM, [11] construction industry macro maturity model (CIM3), [12]Berkley Project Management Process Maturity Model, [13] Portfolio, Programme and Project Management Maturity Model -P3M3, [14]Lean Construction Maturity Model (LCMM), [15] Project Management Process Maturity Model (PM)2

Above listed fifteen MMs were taken for consideration in developing a definition for the construction maturity models and methodical of presentation of data collected from the systematic literature review are summarised in Table 2.

Table 2: Analysis of maturity model definitions

Key Maturity Model	Direct Definition	Derived Definition	Source
Capability Maturity Model (CMM)	A reference [process] model of mature practices in a specified discipline, used to improve and appraise a <b>group’s capability</b> to perform that discipline		(Brotby, 2009)
Capability Maturity Model Integrated (CMMI)	CMMI model is a proven set of best practices organized by critical business capabilities which improve <b>business performance</b> . It is designed to be <b>understandable, accessible, flexible</b> , and integrate with other methodologies such as agile.		(Software Engineering Institute, 2006)
Standardised Process Improvement for Construction Enterprises (SPICE)		SPICE provides an <b>evolutionary framework</b> for <b>business process improvement</b> and also an <b>assessment tool</b> for organisational maturity	(Hutchinson and Finnemore, 1999; Finnemore and Sarshar, 2002)
Change Management Maturity Model (CM3)		CM3 defines <b>five levels of maturity</b> – ad hoc, informal, systematic, integrated, and continuous improvement. Measurement is carried out on six key <b>process areas</b> – management process, risk management, communication, management information, collaboration, and leadership/objectives.	(Sun, Vidalakis and Oza, 2009)
Organizational Project Management Maturity Model (OPM3)	OPM3 is a <b>standard to understand and measure organisational</b> project management maturity against a comprehensive and broad-based set of organisational project management <b>Best Practices”</b>		(Project Management Institute (PMI), 2003)
Maturity Assessment Grid (MAG) from the Strategic Forum for Construction		MAG measures <b>cultural maturity</b> and to guide both individuals and an organisation in how to introduce a <b>change of culture</b> and behaviours towards better ‘integration’ within the <b>construction industry</b>	(Strategic Forum for Construction (SFC), 2003).

Projects IN Controlled Environments (PRINCE2)	PRINCE2 is a standard provides a framework which organizations can assess their current adoption of the PRINCE2 project management method and put in place <b>improvement plans</b> with measurable outcomes based on <b>industry best practices</b> .	(Williams, 2010))
Off-site construction readiness maturity model	A <b>structured process</b> to enable organisations to <b>assess</b> their Off-Site Construction readiness in the market enabling to <b>evaluate and benchmark processes</b> through the strategic and operational phases. The maturity model identifies the areas of concern and the scope for further <b>development or change to secure the optimal</b> advantage of Off-Site Construction methods.	(Bendi, et al., 2021)
OMG's business process maturity model (BPMM)	The BPMM is a <b>process</b> model by itself, or it can be used as a <b>framework for improvement</b> efforts based on other models. It is containing of <b>five maturity levels and 30 process areas</b>	(Gardiner, Weber and Curtis, 2008)
Construction supply chain maturity model (CSCMM)	Provides a <b>framework</b> to both assess where a company is today along the <b>maturity curve</b> , and how they can go to more <b>advanced maturity levels</b> . It integrates the efforts of the various efforts of the tool vendors, process experts, and interoperability research and allows for companies to adopt some or all of them as part of their strategy	(Vaidyanathan and Howell, 2007)
Construction industry macro maturity model (CIM3)	A <b>structured model</b> , providing leading indicators of project performance, providing a context in which to interpret project performance; enable comparisons between various regions; and provide <b>guidance with respect to construction industry performance improvement initiatives</b>	(Willis and Rankin, 2012)
Berkley Project Management Process Maturity Model	A <b>fully integrated maturity</b> model to measure, locate and compare an organisations' <b>current</b> project <b>management</b> level in a <b>systematic and an incremental approach</b> .	(Kwak and Ibbs, 2000)
Portfolio, Programme and Project	A <b>structured model</b> with <b>Maturity Levels</b> , Process Perspectives and <b>Attributes</b> providing a snapshot of <b>where an organisation is now</b> with	(Office of Government

Management Maturity Model (P3M3)	respect to any of the Process Perspectives in all or any of their portfolio, programme, and project management capabilities. Further providing, <b>knowledge of where the organization needs or wants to be in the future</b> , offers the basis for an improvement plan to be devised and for progress towards the target to be tracked.	Commerce (OGC), 2010)
Lean Construction Maturity Model (LCMM)	LCMM provides organisations with crucial information of their <b>current position in the maturation process</b> ("in the fog"). Furthermore, the LCMM provides <b>businesses a tool</b> to plan and direct organisations with <b>support and guidance</b> in their <b>LC maturation Process and embedded change</b>	(Nesensohn, et al., 2015)
Project Management Process Maturity Model (PM)2	(PM)2 model provides a means for <b>identifying and measuring</b> different PM levels by integrating nine PM knowledge areas with five <b>project processes</b> under a quantified scheme. It is well suited to assess an organizational <b>project management level</b>	(Kwak and Ibbs, 2002)

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Through the systematic literature review, 15 key models were identified for further examination, which fitted the criteria, as they were directly relevant for the scope of the study as well as considering the value given by the previous scholars. The identified models were further analysed using the thematic analysis method and the findings of the analysis are discussed in the following section.

## 4.2 IDENTIFYING THE KEY THEMES AND WORDINGS

The paper studied fifteen maturity models which are identified through the systematic literature review. Subsequently, the identified models were critically analysed using a thematic analysis method. Thematic analysis is identified as a method of identifying, analysing, and reporting patterns (themes) within data (Braun and Clarke, 2008). Thematic analysis is commonly adopted in situations where wide variety of data is available (Castleberry and Nolen, 2018). Since there were variety of data the study requires analysing data of various themes thus, a thematic analysis was carried out in order to identify the overarching themes and wordings in developing the definition for the construction maturity.

The thematic analysis identified nine key themes and wordings as shown in Figure 3, that are critically important in defining a maturity model which is catered for the construction sector. Figure 3 shows the frequency of the themes evidence in the elected maturity models of the study.

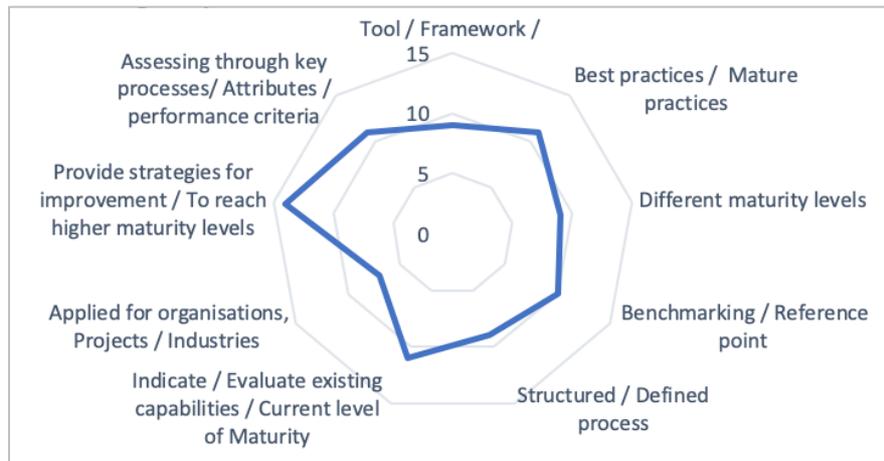


Figure 3: Identified themes from existing maturity models

As Table 2 portrays many themes were identified through analysing the definitions. The identified key themes and words are bolded in Table 2. Since several wordings and themes were identified a frequency analysis was carried out to group and summarise the identified themes and wordings which have similar meaning. This allows to comprehend all the key aspects related to each individual model and aggregate them under overarching themes. Accordingly, nine overarching themes and wordings were identified as imperative to the proposed definition as shown in Figure 3. Analysis of the themes and words clearly depict that all the models have identified these nine key overarching themes as important in defining the models. Therefore, each of these themes were considered in the proposed construction maturity model definition. A critical analysis of how each of these themes were used in developing the new definition is explained step by step next.

In defining construction related maturity models, many models are defined as tools that consist of a framework including construction industry related performance criteria and related attributes. SPICE (Finnemore and Sarshar, 2002; Hutchinson and Finnemore, 1999), PRINCE2 (Williams, 2010), BPMM (Gardiner, et al., 2008), CSCMM (Vaidyanathan and Howell, 2007) evidence throughout the analysis that the idea of a framework is crucial in defining the model.

*“A construction maturity model is a tool with a defined framework consisting of construction related performance criteria and attributes.....”*

A considerable number of models investigated in the study have used the word ‘process’ or similar interest of a process in defining the models. Models like SPICE, CMM, CMMI, CM3, OCRMM, BPMM, CSCMM, P3M3, (PM)2, have used the theme of a process in defining the respective models. Several authors (Bendi, et al., 2021; Willis and Rankin, 2012; OGC, 2010), in defining the respective models, OCRMM, CIM3, P3M3 have indicated that models have to be structured in order to provide uniformity in the evaluating process.

*“A construction maturity model is a tool with a defined framework consisting of construction related performance criteria and attributes providing a structured process.....”*

Most of the models investigated directly or indirectly embraced the idea of ‘evaluating and indicating’ suggesting that the models assist to investigate and measure the current level of capabilities. It is evidenced in most of the definitions. For instance, CSCMM (Vaidyanathan and Howell, 2007) defines, ‘..... a framework to both assesses where a company is today along the....’. This idea is highly relevant for maturity models as prior for higher development it is crucial for entities to understand the current level.

*“A construction maturity model is a tool with a defined framework consisting of construction related performance criteria and attributes providing a structured process offering indicators of the existing capabilities.....”*

A key theme highlighted in defining the maturity models was the idea of distinct levels of maturity in their respective fields. CM3 - The model defines five levels of maturity – ad hoc, informal, systematic, integrated and continuous improvement (Sun, Vidalakis and Oza, 2009). Further OMG’S business process maturity model in defining itself stresses that BPMM is a process model containing of five maturity levels and 30 process areas (Gardiner, Weber and Curtis, 2008).

On a different note, to where the model should be applied was not clearly indicated. Several models indicated that the model could be utilised to assess organisations or an entire industry (Bendi, et al., 2021; Vaidyanathan and Howell, 2007 ; SFC, 2003). On the contrary, some of the models have declared that the application is suitable only on project-based works (Willis and Rankin, 2012). Therefore, to cover all the aspects of construction it is vital to incorporate both these entities into the definition of the model.

*“A construction maturity model is a tool with a defined framework consisting of construction related performance criteria and attributes providing a structured process offering indicators of the existing capabilities of an organisation / project through evaluating the current level of maturity.....”*

In the definitions of the models, it is evident that the future state of the organisation is also considered with respect to what the particular entity intends to achieve. P3M3 elaborates in its definition that the model would provide, knowledge of where the organization needs or wants to be in the future and offers the basis for an improvement plan to be devised (OGC, 2010). Fostering the idea further, the models provide areas for further development and enhancement by comparing the existing practices of the organisation with benchmarked best practices in the industry (Vaidyanathan and Howell, 2007).

Thus, considering these themes and ideas which were supported by the studied models, the final definition of the model is presented as below.

*“A construction maturity model is a tool with a defined framework consisting of construction related performance criteria and attributes providing a structured process, offering indicators of the existing capabilities of an organisation / project through evaluating the current level of maturity and providing strategies for further improvement through industry best practices to reach higher maturity levels by comparing the existing level to the desired level.”*

The proposed definition covers the essential areas identified through models and provide a more holistic and in-depth definition which can be used in in the construction sector with a more pragmatic approach.

## **5. DISCUSSION**

The definition developed for construction maturity model is fundamentally established through identifying the key themes discovered among the reviewed fifteen maturity models proving that there are substantial similarities among them. However, the final model definition has modest variations from few of the models. For instance, A key model like Maturity Assessment Grid from the Strategic Forum for Construction (SFC, 2003), mainly focuses on the premise of cultural maturity. The definition of the said model clearly outlines that it emphasises how the cultural differences to be managed through various means. Whereas the new model definition explains about a broader theme of evaluating current self and reaching for higher maturity. Moreover, models like Off-site construction readiness maturity model (Bendi, et al., 2021), are defined to address a very specific part of construction. On the contrary the newly founded definition for construction maturity model covers the full spectrum of the construction sector.

Evaluating models and their definitions contemplating to other industries apart from construction industry, there are notable differences. A model which initially measured only the capability of software, CMM, defines maturity as Software process maturity is the extent to which a specific process is explicitly defined, managed, measured, controlled, and effective (Fraser, Moultrie and Gregory, 2022). The fact is that the definitions is mainly focusses on the process itself only. In contrast, the construction maturity model definition considers not only the practices but the entire lifecycle of a construction procedure. It is important to note that even though there are differences in the model definitions, several similarities exist as well. Existence of distinct maturity levels, consideration of evolutionary pathways and guidance for improvement (Issa, et al., 2018; Stachowiak and Oleśków-Szłapka, 2018; Werner-Lewandowska and Kosacka-Olejniak, 2019) are key similarities observed in definitions.

## 6. CONCLUSIONS

The necessity for a comprehensive definition for maturity models in the construction sector was identified after recognising the absence of such a definition. Thus, the aim of the study was to propose a new definition to construction maturity models. A systematic literature review was carried out in identifying the existing models that assisted establishing the new definition using PRISMA systematic analysis. Fifteen models which have a direct relationship to construction sector were identified during the process. Later a thematic analysis was conducted in order to identify the overarching themes in determining the definition from the said models. Through the analysis, nine key themes were developed and wordings were extracted from existing maturity models and finally, a comprehensive definition was proposed. The key idea behind the developed definition is that the model should provide a systematic, structured set of guidelines to analysis the existing strengths and weaknesses of the point of interest and to provide an evolutionary guide for improving the current maturity level.

The impact of the study is twofold. From a theoretical perspective this study contributes to the existing knowledge base of construction maturity models by establishing a more specific definition to construction maturity. Further it provides a platform for future studies on maturity models. From an industry perspective, the proposed model definition enables organisations in construction sector to comprehend what construction maturity means and it enables firms to evaluate themselves in the interest of maturity and improve. Moreover, it enables organisations to conduct industry specific and relevant maturity evaluations in order to get more accurate and impactful results to reach higher maturity levels. The scope of the research was limited to maturity models related only to construction and construction related sectors. Future research can be conducted in customising the definition for diverse types of constructions as well as for novel industries in developing industry specific models.

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