Inter-dependencies on BPM Maturity Model Capability Factors in Deriving BPM Roadmap

Yogantara Setya Dharmawan

Gerald Genovez Divinagracia

Elliott Woods

Bryan Kwong

The Fifth Information Systems International Conference 2019

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Yogantara Setya Dharmawan[a],*, Gerald Genovez Divinagracia[b], Elliott Woods[c], Bryan Kwong[d]

[a]Universitas Internasional Semen Indonesia, Gresik, 61122, Indonesia
[b]Ateneo de Manila University, Manila, 1108, Philippines
[c, d]Queensland University of Technology, Brisbane, 4000, Australia

Abstract

Business Process Management (BPM) Maturity Model captures the "as-is" condition of the organization's Process Capabilities (PC). Once an organization has defined their "as-is" condition, they are the best positioned to establish their BPM roadmap. The organization can then clearly plot which of the thirty process capabilities they need to improve or enhance to deliver the most overall value to the organization. The analysis determined that particular PC's are not mutually exclusive but rather, interrelates with other process capabilities to drive greater operational maturity in organizations. Thus, this research study aims to provide an analysis in the interrelationship of each process capabilities and leveraging it for the future state of the organization. Each process capability, in the BPM Maturity Model, is analysed by utilising a Dependency Matrix, a dynamic causal model that establishes the relationship between process capabilities. Authors compiled a lexical definition of process capabilities, in terms of what it means for it to be in a state of "achieved". By utilising the lexicon, predecessors and successors of process capabilities were identified and captured in a matrix grid. The result of the research is an identification of interrelationships between Process Capabilities. A Dependency Matrix which represents the interrelationships and contains the Predecessor and Successor to measure the effort for each Process Capabilities. Furthermore, the dependencies among the capabilities will empower organizations implementing BPM Maturity Model by providing them with a richer understanding of where they need to invest their focuses when creating their roadmap.

* Corresponding author. Tel.: +62-856-480-740-76.
  E-mail address: Yogantara.dharmawan@uisi.ac.id

1. **Introduction**

It has been roughly fifty years since organizations first started leveraging a process approach to managing and controlling the way they do business that this discipline evolved into what we now call as Business Process Management (BPM) [1]. The adoption of BPM provides organization-wide transparency and clarity, enabling previously separate business units who are responsible for different sections of work, to understand their shared relationship concerning the business processes [2]. The level of transparency and clarity also provides the organization's business and IT people with a universal language and understanding as to how to achieve organizational objectives. This universal language is essential as IT people are no longer merely support services, but are instead an integral element in the organization's strategy, helping implement business process change [3]. As the significance and adoption of BPM increases within organizations, it also becomes essential to determine what different stage organizations may be in their BPM development. Therefore, the application of Business Process Maturity Model (BPM3) has been proposed to evaluate the state of their 'BPM maturity' and to determine to what extent the above benefits are being realized or can be further realized [4].

Designed as a diagnostic tool, Rosemann and de Bruin's [4] BPM3 supports the evaluation of organizational BPM capabilities, in addition to highlighting opportunities for organization-wide learning. BPM3 was developed through the migration of three previously existing maturity models to provide a rigorous theoretical foundation and subsequent empirical validation through international Delphi studies [5]. As a result, BPM3 is now a globally accepted standard, with a comprehensive scope and is highly applicable to various industries – including Government [6]. Rosemann and de Bruin [4] developed this framework to offer a more holistic management approach for organizations looking to support not only the identification but also the assessment of the BPM maturity of an organizations policies and procedures [6, 7].

In order to understand an organization's current BPM maturity, its "as-is" state must be identified initially. To capture the "as-is" state of the organization, the use of a framework will be required to form an assessment. As identified previously, the Rosemann and de Bruin Maturity Model [4] is a comprehensive framework that captures an entire organization's Process Capabilities (PC). Therefore, the proposed framework is based on BPM3 and adapts several aspects from it into the framework. The six factors from BPM3 has been adapted as a result and includes the following: (1) Strategic Alignment, (2) Governance, (3) Methods, (4) Information Technology, (5) People, and (6) Culture.

Additionally, the five Process Capabilities under each factor has also been adapted into the framework. This ensures that the entire organization's Process Capabilities can be captured when assessing a BPM maturity (See Figure 1, Page 4).

However, the authors have recognized interrelationships between Process Capabilities are not defined, an example of which this is present between two Process Capabilities (Process Design and Modelling - as part of Methods; and Process Education and Learning - as part of People). To fully benefit from Process Design and Modelling, it is essential that employees within the organization are adequately educated. Therefore, the interrelation among process capabilities needs to be discovered in order to derive a holistic BPM Roadmap. The roadmap then could be used to determine the future state plan for the organization.

2. **Methodology**

The paper used qualitative research on a dependency matrix analysis based on each capabilities' lexicon, which was developed through a thorough literature review [21]. Seventy relevant sources were studied and analysed in developing the lexicon. Credible sources were taken from Scopus journals, databases and books related to BPM, Maturity Models, and Process Capabilities. Subsequently, the analysis of each capability resulted in definitions for each of the process capabilities. Once the definition is clear, the organization can leverage this to determine which capability to achieve first and which to achieve afterwards. The analysis conducted includes characteristics, nature,

and how to achieve each capability and also how they relate to other capabilities. Table 1 below explains the step-by-step research process, which was employed.

Table 1. Methodology.

Input	Process		Output
70 relevant sources on BPM3	1.	Conducting Literature Review on each capability factors' definition.	Literature review on capability factors
Literature review on capability factors	2.	Creating *Lexicon* for the definition of each factor and capability in the BPM3 Maturity Model	Lexicon definition of each capability in each factor as a reference for achieving each capability factor
Lexicon Definition of each capability	3.	Analysis on dependency matrix among capability factors	Conceptual dependency matrix

The conceptual dependency matrix for each capability was developed through a clear structure on how dependency and independence are related based on each definition (See Fig. 3). The matrix helps organizations create their BPM roadmap, which is the added value resulting from this paper.

3. Literatures

3.1. What is BPM and how does it provide value?

Business Process Management (BPM) is emerging as an essential management practice, which allows organizations to achieve increased competitiveness and sustainability, despite continually changing business conditions [7]. BPM has been around for several decades, yet the concept of BPM amongst academics and practitioners still varies [3, 8]. Whether a practitioner or an academic, the lack of clarity in terms of the application of Business Process Management (BPM) is apparent [9].

However, de Bruin and Doebeli [9] recognise three common interpretations of BPM:

- as a solution for a business using software systems or technology to automate a process;
- as a broader approach to managing and improving processes that focus on the process lifecycle, and;
- as an approach to managing an organization by taking a process-view or orientation.

The third interpretation of BPM is considered by many to be the most appropriate. As when assessing these interpretations, a critical distinction must be understood between 'process management' (an activity, focusing on the process itself) and 'business process management' (a management approach characterised by process orientation) [10]. Reiter et al., [10] acknowledges that process management is limited to the operation and management of business processes on an operational level, whereas BPM is "a management discipline which supports enterprise goals, spanning organizational and system boundaries, and involving employees, use of modern tools and techniques, customers, and partners within and beyond the enterprise borders" [11]. This distinction identifies BPM as an enterprise-wide perspective and does not consider processes to exist in isolation, instead of acknowledging that organization-wide process co-dependence exists and managed accordingly [9]. As a result, the authors choose to accept this definition of BPM in an organization-wide perspective.

The adoption of BPM provides organization-wide transparency and clarity, enabling previously separate business units who are responsible for different sections of work, to understand their shared relationship concerning the business processes [2]. The level of transparency and clarity also provides the organization's business and IT people with a universal language and understanding as to how to achieve organizational objectives. As IT people are no longer merely support services, but are instead an integral element in the organization's strategy, helping implement business process change [3].

After an organization has gained an understanding of their processes and how they can best manage them, then they can begin developing highly optimised end-to-end processes which transcend the organizational boundaries.

These processes provide lower operating costs, increased speed, effectiveness and efficiency, better accuracy, reduced asset overhead, and better flexibility [12, 13].

BPM supports and optimises the return of many commonly used management tools and techniques (e.g., Lean Six Sigma and Total Quality Management). It is also integral in supporting the clarity of strategic direction, precise execution, a positive culture, and enabling structure, all of which are critical to organizational success [14, 15].

Lastly, BPM allows organizations to respond better to periods of change, as conventional organizations typically do not recognise the change until it has already impacted their financial performance, often this is too late [13].

Some additional value provided by an organization-wide BPM approach includes:

- Increases the opportunity for innovative approaches to enhance organizations performance [12];
- Allows for effective implementation of modern process-orientated systems and software [12], and;
- Other areas of value (however difficult to quantify) may include benefit realisation, standardisation, compliance, improved alignment to processes with strategic business drivers [7].

As the significance and adoption of BPM increases within organizations, it also becomes essential to determine what different stage organizations may be in their BPM development. Therefore, the application of BPM3 has been proposed to evaluate the state of their BPM' maturity' and to determine to what extent the above benefits are being realised or can be further realised [4].

3.2. BPM Maturity Model Framework (BPM3)

The thirty capabilities were identified by Rosemann and de Bruin [4] through prior research as being integral to progressing BPM within an organization [7]. (See Fig. 1).
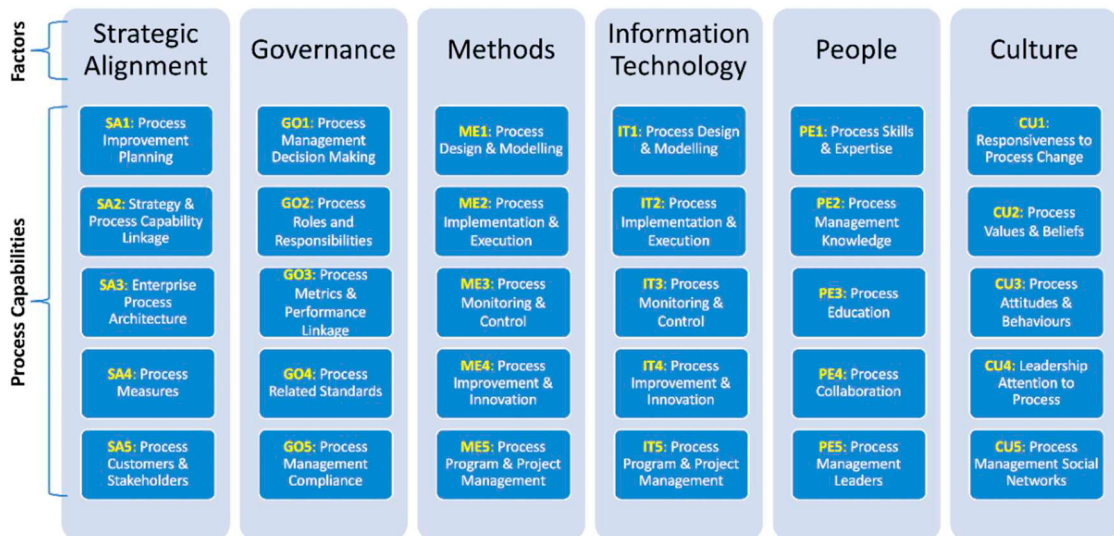

Fig. 1. BPM maturity model (BPM3) with the corresponding thirty (30) process capabilities.

The BPM3 helps organizations to determine how well their processes are managed. By assessing processes using BPM3, organizations can understand their 'as-is' capabilities regarding their existing processes before eventually making plans to improve their capabilities into 'to-be' states in order to gain better outcome within an organization. Achieving a successful process assessment are achieved through a structured-step (See Fig. 2) approach, starting from analysing current process management into scoring their process capabilities using capability areas parameter. The parameters are defined from pre-defined questions how specific capabilities are achieved defined in the Lexicon. The assessment will benefit the organization to progress their process improvements.
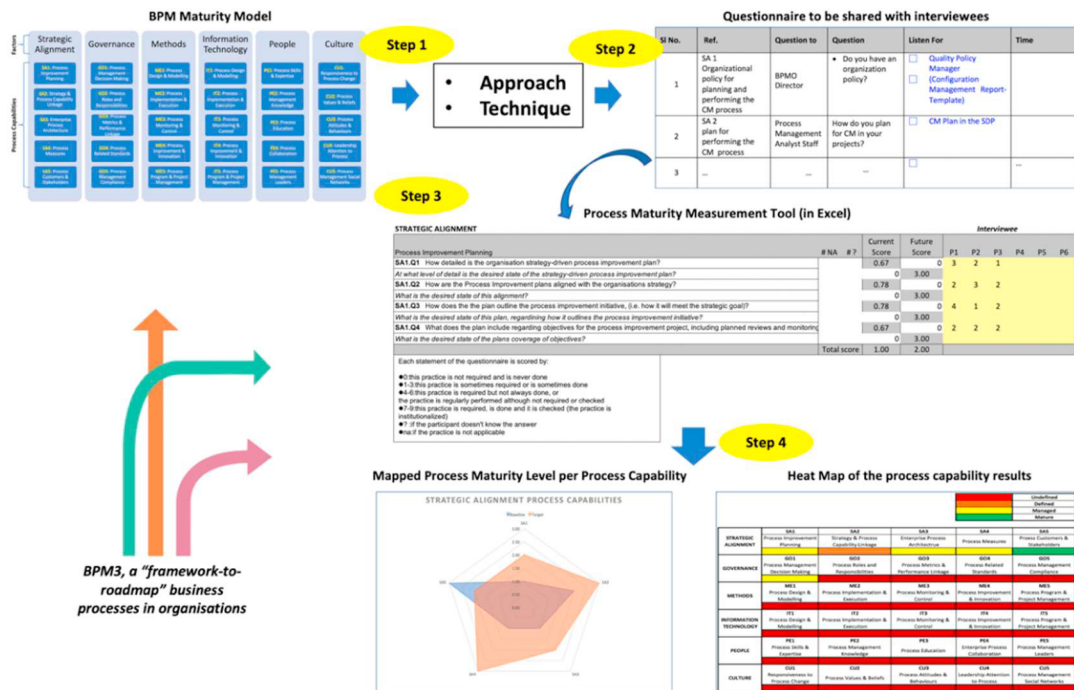
Fig. 2. BPM3 Application in a Process Capability assessment.

3.3. Limitations of the framework

However, BPM3 is not without some limitations; the maturity model offers no specific criteria in assessing how capabilities can be achieved. Compared to other maturity models and frameworks (i.e., Open Management Group Maturity Model) [16], there is a noticeable absence of hierarchical steps on how to apply the maturity model. This is possibly by design, as it offers greater flexibility to BPM practitioners applying this model. However, it confuses since organizations could start to achieve random capability first. Besides, there is no precise sequencing amongst capabilities, which begs the question if there are causal relationships in the process capabilities.

Hence, the authors have recognised that this model fails to identify the interrelationships between Process Capabilities. An example of this is present between two Process Capabilities (Process Design and Modelling-as part of Methods; and Process Education and Learning -as part of People). To fully benefit from Process Design and Modelling, it is vital that employees within the organization are adequately educated. However, despite these limitations, this model still offers the most value to the Government and public sector alike, in support of BPM progression.

4. **Result and discussion**

4.1. Dependency matrix

In response to the limitations of the Business Process Management Maturity Model, the authors provided a mechanism where one can relate process capabilities and map them out in a footprint map, called the dependency matrix. Fig. 3(a) shows the dependency footprint matrix, where it captures the "natural" interrelationships of process capabilities, a standard causal model in newly established organizations. Codifying the interrelationships of process capabilities can be established from the business process maturity assessment and will depend on various factors, namely: (a) strategic vision and mission of organizations, (b) baseline business process maturity, and (c) company appetite for process change.
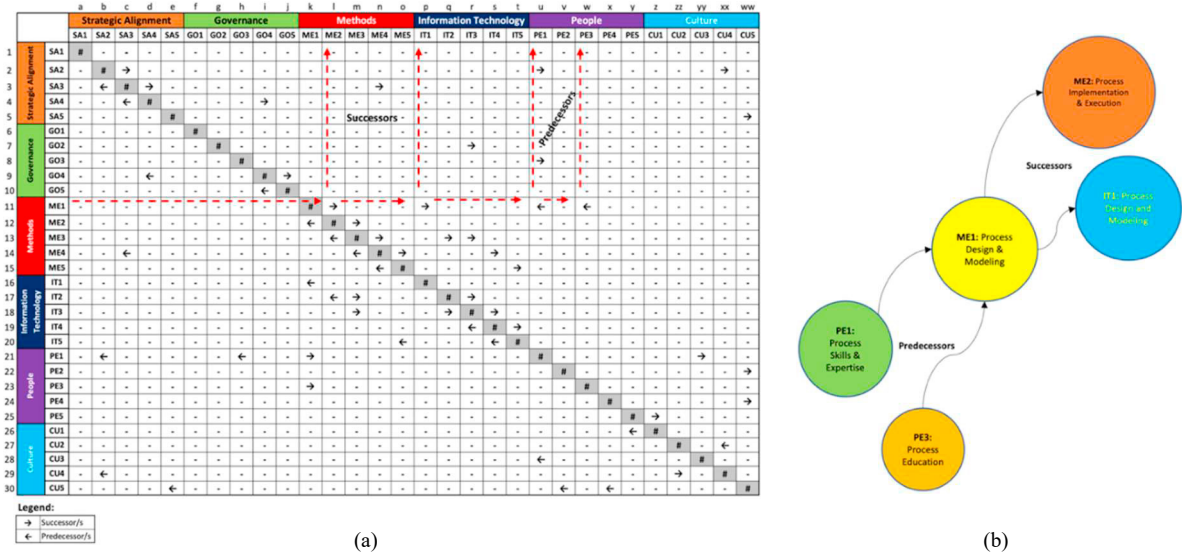
Fig. 3. (a) Dependency footprint matrix; (b) Predecessor vs successor relationship.

Furthermore, the dependency 'footprint' matrix shows two types of notations: successor and predecessor connection:

- Successor connection ($\rightarrow$): denotes the process capability/s that will be implemented next.
- Predecessor notation ($\leftarrow$): denotes the pre-requisite process capability/s that needs to be implemented first.

For example, Figure 3(b) shows that for process capability ME1 (Process Design and Modelling), is has two successors: ME2 (Process Implementation & Execution) and IT1 (Process Design and Modelling); and two predecessors: PE1 (Process Skills and Expertise) and PE3 (Process Education). ME1 cannot proceed in designing and modelling processes without the necessary skills and education needed. Also, if ME1 failed to execute, processes cannot be implemented sufficiently, even levering information systems. The chain of process capabilities means that the PC in question, ME1, cannot be achieved sufficiently without assessing and addressing its predecessor/s and successor/s respectively.

The dependency 'footprint' matrix is a causal model that creates a path for organizations to plan and execute the process capabilities needed to achieve higher maturity in the way it does its business. There are various ways in building a causal model and for this paper, the authors leveraged the approach by Judea Pearl [17], which is the visual diagram used in the creation of his proposed "inference engine", a process by which answers to queries of ainterests are answered through causal knowledge and available data.

Building the dependency footprint matrix starts by understanding the causal relationship of each process capabilities in organizations. Factors such as strategic vision, organization and people culture play a crucial role in establishing a baseline model, which is the "knowledge" aspect shown in Fig. 4. Once the causal relationships of PC's are captured, assumptions are made and explicated through a "causal diagram", which becomes the basis for the predecessor and successor relationship (Fig. 3(b)). However, assumptions and baseline organization knowledge changes with time and thus, a process of continuous elaboration and refinement of the causal model is needed. Steps 4 to 9 tests and validates the relevance of the causal model and whether it reflects the organizations' way of working. In other words, the strength and value of the dependency footprint matrix depend upon the established causal model of the process capabilities as defined specific to the organization.
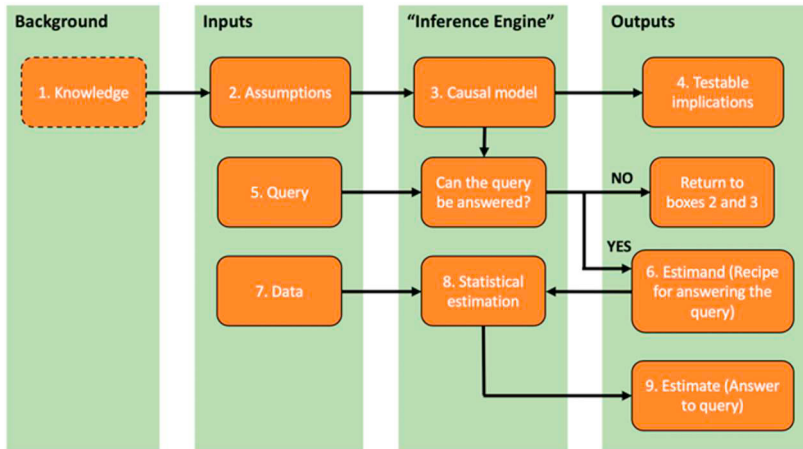
Fig. 4. "Inference engine" process to answer queries of interest.

4.2. Usage of the dependency diagram to derive a BPM roadmap

Once the baseline "as-is" and target "to-be" process maturity levels are determined from the interview assessment, the next step is to map the execution plan utilising a roadmap. However, which route that we need to focus on first could be determined by prioritising it. Prioritisation is a stage where it entails listing all the identified process capabilities between the difficulty (e.g., easy or hard) in implementing it against the payoff (e.g., high or low) it provides to the organization. This type of prioritisation technique is called a PICK Chart, where the acronym is plotted in a quadrant with the following definition [18]:

- Possible – process capabilities in this quadrant are easily implemented but with low payoff.
- Implement – process capabilities in this quadrant are easily implemented with a high payoff.
- Challenge – process capabilities in this quadrant are difficult to implement with high payoff once done.
- Kill – process capabilities in this quadrant are difficult to implement but with a low payoff.

An example of a PICK Chart that will be leveraged in this project is shown in Fig. 5.
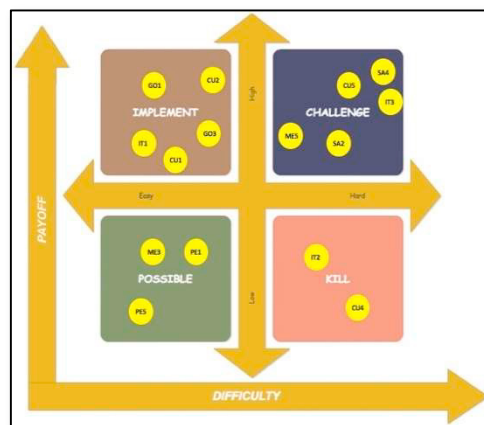

Fig. 5. Pick Chart.

In the example provided, five process capabilities in the "Implement" quadrant can quickly be executed, resulting in high payoff for the organization. In contrast, for the "Kill" quadrant, there are two process capabilities (e.g., IT2 and CU4) that provide less payoff and yet challenging to implement, an example of initiatives not worthy of spending

time on. A PICK Chart is a powerful tool in prioritizing the process capabilities that need to be addressed for the organization to reach the targeted process capability maturity level and once identified, the next steps are documentation and dissemination in the organization. With regards to communicating the roadmap in the organization, the dashboard is a powerful tool and can be leveraged in various channels to disseminate the status and goal of the process capability maturity initiative.
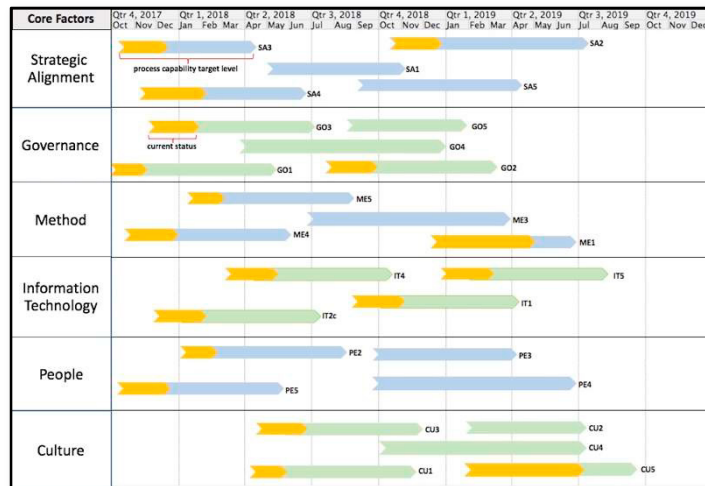

Fig. 6. Capability roadmap.

The following are high-level techniques or recommendations to communicate the roadmap in the organization:

- If the organization has an "enterprise-wide project management" platform (e.g., Microsoft Project Online, Primavera, etc.), the roadmap design in Fig. 6 can easily be created and published in the platform's portal [19], [20]. The advantage of this approach is the tight linkage between portfolio, program, and projects. Every time there is an update in the implementation of each process capability and reflected in the project status, the overall program and portfolio will capture that update. However, the cost is a significant constraint in implementing the enterprise platform approach.
- Leverage the roadmap dashboard as a "communication radiator" and post on walls in the organization. Similar to the agile methodology approach, some communication radiators practised are sprint timelines, work backlogs, team composition, burndown, and burnup charts. The advantage of this approach is its simplicity and does not require a software platform to create. One major limitation in applying this approach, though is when it involves a large and complex project, program, and portfolio. Although in agile methodology, specifically SCRUM, there is a new approach in managing multiple agile projects, the practice is not yet mature and robust [21].

Various communication techniques and channels can be leveraged in delivering and disseminating the roadmap; the team will adjust the communication strategy based on the needs of the organization.

5. Conclusions

Realising the benefits of BPM, there is a need for organizations to determine the current and future stage of their BPM development with the use of a Business Process Management Maturity Model (BPM3). In other words, BPM3 is an effective way of enabling organizations to evaluate their "as-is" state against the desired "to-be" state and help prioritise improvement activities to ensure that the implementations are monitored and controlled accordingly. Of the plethora of framework available, the authors focused on Rosemann and de Bruin's BPM3 due to its comprehensive process factors and capabilities that help organizations map their business process management journey. However, the analysis showed that there are causal relationships between process capabilities and implementing one may have

prior or subsequent consequences. Moreover, one limitation from Rosemann and de Bruin's BPM3 was that the model does not offer interrelationships between process capabilities (PC's) and does not provide any guidelines for its implementation. The author showed a way how to establish the process capability interrelationships based on a causal model, which can be designed and built from explicated organizational knowledge and strategic requirements. After creating the causal model, a dependency diagram was constructed and used as the process capability map that organizations traverse in their business process maturity journey. Future research can focus on establishing a causal model that is agnostic to a specific organization, thereby, ensuring that if the external environment changes, the causal model still applies and in effect, the same dependency matrix applies accordingly. Finally, the next step in the guidelines is regarding documenting and communicating the BPM roadmap, where the team decided to leverage the concepts of the Portfolio, Program, and Project from the Project Management Institute as a way to document the BPM roadmap.

Acknowledgements

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