

# Towards successful establishment of a project portfolio management system: business process management approach

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**Abstract:** Linking structures, processes and resources with corporate strategies is a key requirement of today's organizations, bringing about integration toward achieving long-term objectives. Organizations can no longer rely on traditional practices since advanced systems and management approaches are being applied by their competitors. The project portfolio management (PPM) is a tool that plays a key role in collecting information from operational levels and consolidating them at the portfolio level for strategic decision-making. The establishment of this approach in organizations requires robust information systems, analytical software, decision-making structure, and governance framework to be in place. Primarily, a systematic perspective needs to be adopted to define, design and model all the necessary components of a PPM system. Business process management (BPM), as a systematic approach, can be effectively applied for this purpose. The aim of this study is to introduce one of the specific applications of the BPM approach in facilitating the systematic implementation of PPM in organizations. This theoretical study is exploratory in essence and tries to theorize the relationship between BPM and PPM to develop a conceptual framework highlighting the role of BPM in embedding all the necessary features of a PPM system. We found key functions of BPM that contribute to three aspects of PPM system namely; structure, infrastructure, and process. The findings introduce one of the important application of BPM in the management of project portfolios and also provide professionals with practical insight into how the BPM should be applied to facilitate the implementation of this system.

**Keywords:** Business Process Management, Project Portfolio Management System, Management Systems.

## 1. Introduction

Nowadays, organizations are facing the challenge of investing in the best combination of projects considering their limited resources. In a multi-project setting, this process has its complexities that need to be dealt with by applying competent management systems. The application of project portfolio management (PPM) approach, as a method for screening and selecting the right projects in organizations, has been on the rise to help an enterprise in addressing complexities in dealing with strategic priorities ([Petro, Ojiako, Williams, & Marshall, 2020](#)). The PPM approach, as a necessity for the systematic management of projects, leads to better strategic alignment by linking operations to the business direction. Considering recent developments in different industries, especially information technology (IT) sector, leading firms increasingly require project portfolios to be strategically aligned with pursuing their long-term goals ([Hoffmann, Ahlemann, & Reining, 2020](#)). They seek advanced methods to maximize effectiveness while minimizing costs and risks. The number of organizations that adopt this approach is on a steady rise due to its proven benefits in practice. The advantages encompass risk-reward balance in business areas ([Paquin, Gauthier, & Morin, 2016](#)), ability to drive better business decisions based on operations, optimized budget allocation ([Oostuizen, Grobbelaar, & Bam, 2018](#)), real-time collaboration between line and functional managers ([de Medeiros, de Moura, & Oliveira, 2019](#)), and appropriate use of the resources ([Bhatia, Chakraverty, Nagpal, & Kumar, 2020](#)). It also contributes to systematic problem solving by identifying the root causes of performance-related issues in certain business areas. The PPM approach helps firms, which run their business based on projects, to invest their resources in the projects that support the strategic direction and bring them competitive advantages in the long term. In the absence of a PPM system, there are ambiguities on sharing the resource pool with the projects which are competing over limited resources. In some cases, the undertaken projects may exceed the overall capability of the organization; while in others there are a lot of idle or unproductive resources due to the inappropriate planning at the portfolio level. Optimum allocation of resources at the portfolio level is one of the common concerns of executives, which can be achieved through implementing an effective PPM system.

The implementation of a PPM system has its challenges, such as the necessity for importing data from other systems, the ambiguity of roles, and the validity of performance information for decision-making purposes ([Jonas, 2010](#); [S. Moore, 2009](#)). To overcome such challenges, first, we need to clarify the dimensions of this system to define all the corresponding components

that should be clarified before the system design stage. For example, from the perspective of the decision-making framework, the responsibilities and authorities need to be determined in accordance with the organization's hierarchy. Determining the role boundaries and area of responsibilities are among the other vital elements ([Dezhkam, Xue, & Liu, 2019](#)). This system also requires robust tools and techniques to analyze performance data and act as a decision support system (DSS) ([Ko & Kim, 2019](#)). The IT infrastructure which is needed for the implementation of this approach depends on several variables such as organizational complexities, size and geographical distribution of projects ([Hosseini, Shakouri, Kazemi, Zareayan, & Mousavian, 2019](#)). The sequence of activities that need to be done from the project reporting and data accumulation to portfolio performance analysis should be also mapped out in relation to other relevant procedures. Since the PPM processes have close interactions with other business processes, their input and output should be clearly specified ([Volkov & Kraynov, 2014](#)). Altogether, a holistic overview of the systems, organizational structure and processes of the organization is needed for the proper implementation of a PPM system.

The importance of integration implies that a broader perspective should be adopted to study this system and take into account its boundaries with the rest of enterprise systems. In this regard, a business process management (BPM) can help to map out the bigger picture in which the PPM system is part of a bigger platform. This approach is quite helpful in clarifying the systems which provide inputs or need output from such a system. Xiang et al examined the application of the PPM system and found that it can boost the process and governance ability of aviation complex products development ([Ma, Du, Zhang, & Le, 2012](#)). The application of system thinking in the study of project portfolio management has been considered in some studies in the energy sector ([Hosseini et al., 2019](#)), aviation industry ([Ma et al., 2012](#)), and engineering and consultancy firms ([Alberto Arauzo-Arauzo, Manuel Galan-Ordax, Pajares-Gutierrez, & Lopez-Paredes, 2009](#)). Methods such as system dynamics have also applied to the study of the evolution of PPM within an enterprise. However, more theoretical research is still needed to apply system thinking based on the BPM method to the effective implementation of PPM in organizations. There is a need for further research in accordance with a systematic approach to determine the components for PPM implementation. Therefore, this research applies the concept of BPM to bridge this research gap. This study seeks to answer two questions; 1) what are the components of a PPM system in organizations, and 2) what is the role of BPM in the implementation of these components. In this regard, we undertake a theoretical study to

identify the requirements and components of a PPM system and then propose a framework to meet them through the lenses of BPM.

## 2. The theoretical background

### 2.1 The concept of PPM

The concept of PPM is well-established in the literature, and its purpose is to collectively oversee current or proposed projects on the basis of several criteria. It has been defined as an effective tool for executing strategies through aligning projects with the organization's capabilities and also focusing on long-term and positive financial results ([Paquin et al., 2016](#)). It involves using a set of knowledge, skills, instruments, and techniques in a number of projects to fulfill the actual needs and objectives of the organization ([Ma et al., 2012](#)). This approach is also known as the systematic management of portfolios via identification, screening, prioritization, planning, authorization and monitoring to achieve business objectives ([Hosseini et al., 2019](#); [Ma et al., 2012](#)). The portfolio management targets achieving the best combination of projects and programs despite limited resources and a set of capabilities to be built upon ([Volkov & Kraynov, 2014](#)). This management approach also attempts to balance portfolios for maximizing the benefits while minimizing the risks. It can be implied that PPM is beyond integrated management of various projects but focuses on keeping track of the components in portfolios to ensure that corporate objectives are supported. PPM plays a significant role in providing executives with a wide range of streamlined options to deal with strategic decisions on projects. These decisions include stopping the execution of specific projects, transferring their resources to other projects, giving higher priority to projects in a specific business domain, and sharing resources between multiple projects in a portfolio ([Archer & Ghasemzadeh, 2007](#); [Bhatia et al., 2020](#); [Kaiser, El Arbi, & Ahlemann, 2015](#)).

### 2.2 BPM motivation

BPM is a set of practices and technologies that follows a management-by-process (MBO) approach. It provides a pattern focusing on designing, establishing, directing and optimizing the business processes in order to increase the core capability of firms ([C. Moore, Benedict, Bilodeau, & Vitkus, 2013](#)). Previous research asserts that BPM brings agility and maturity to organizations by identifying bottlenecks in the intersection of processes, structures and systems. It is a process-centric approach to organizing resources that target boundaries of

processes and tries to link their inputs and outputs properly. The reactivity and operational flexibility of enterprises can be promoted based on this method. Another primary objective of BPM is to improve the effectiveness and efficiency via the automation of activities and the elimination of bottlenecks ([Enríquez, Troyano, & Romero-Moreno, 2019](#)). Regarding numerous benefits of applying this systematic approach, previous studies attempted to introduce BPM concept in the implementation and development of enterprise systems such as enterprise risk management ([Chapman, 2011](#)) and enterprise knowledge management ([Ramadhani & Er, 2019](#)). In this study, we focused on the special application of BPM in establishing PPM as an enterprise system for the oversight of project portfolios across an organization. Although these two management approaches intrinsically do not appear to be interrelated, BPM as a general management framework can be a platform for the effective establishment of PPM system.

### 2.3 Elements of BPM

BPM, as a means of optimizing processes, enhances efficiency and effectiveness and creates sustainable and agile organizations. To identify the contribution of this approach to the implementation of a management system such as PPM, it is needed to explain its core capabilities in an organizational context. BPM deals with the following concepts in relation to a management system ([Enríquez et al., 2019](#)):

- **Process:** this component explains the sequence of activities throughout organizational levels to achieve business objectives.
- **Case:** it is created whenever a given process is initiated. Cases are indeed examples of a process coupled with its specific data and actors.
- **Tasks:** they are particular steps in a process that are carried out either by humans (human tasks) or certain codes (script tasks).
- **Organization:** it is the integrator of the other elements through defined groups (departments, units, teams), users in each group (everyone that interacts with the system), and specific roles of different users.

From another perspective, it is argued that BPM capabilities should be clarified to determine how to deal with these concepts. There are a number of prior studies on the capabilities of this approach. Niehaves ([Niehaves, Plattfaut, & Becker, 2013](#)) identified six capabilities for BPM as follows:

- **Strategic alignment:** It refers to a close linkage of business processes and organizational priorities. This relationship drives improvement and evolution of an enterprise through changes in processes and practices.
- **Governance:** It is a framework pointing to accountability and decision-making and is related to the responsibilities required for the governance of information technology infrastructure.
- **Methods:** They include techniques for enabling process actions all over the process lifecycle.
- **Information technology:** They support business processes and improve the flow of data and information between groups.
- **People:** This area of capability refers to the expertise of human resources that benefit the organization for modeling and optimizing processes.
- **Culture:** The organizational culture needs to support the development of business processes and the proper application of BPM techniques.

A number of models have been introduced in the literature to explain how such capabilities should be promoted. Fisher proposed a five-level maturity model for Business Process Management in which it was mentioned that the capability of BPM should be evolved in terms of 5 key aspects including IT, people, process, controls, and strategy (Fisher, 2004). He asserts that these are five fundamentals levers of change in an enterprise that explains the sophistication of a BPM-based system in an organization. The strategy reflects enterprise-wide decision-making to be supportive of corporate objectives. Controls also point to the management of actions focusing on the measurement indicators. The process incorporates methods, policies and procedures under which actions are being taken. The other two levers of change, people and technology, are enablers that support the proper implementation of business processes across the organization. In this maturity model, five levels have been explained.

- **SILOED:** It is the default position of BPM Maturity in an enterprise. In this level, individual systems are established separately to optimize their own functional domain. However, these systems are not integrated based on a single governance framework to provide end-to-end solutions. Such system architecture is slow to respond to various changes in the business environment.
- **Tactically Integrated:** In this level of maturity, organizations have begun the effort to integrate the systems. The functional boundaries are determined and there is a good

potential for cross-functional collaboration between departments and teams. A primary level of data integration is enforced towards operational improvement in initiatives. Decisions are partly being made based on data, but, still there is a lack of alignment in business processes to achieve optimal outcomes.

- **Process-driven:** The enterprise-wide leadership is in place covering functional domains. The mindset that each system should be organized only around a specific function does not apply to this level of maturity. The controls and a solid governance framework bring functions together and provide the initial requirements for end-to-end process optimization.
- **Optimized enterprise:** The mindset shift of human resources elevates the BPM maturity from process-driven to the optimized enterprise. This level is characterized by a commitment to continuous improvement and enforcing performance metrics. The resistance to change is minimized and system changes can be implemented more smoothly. The primary principles of BPM concepts are embedded and accepted by the whole enterprise.
- **Intelligent operating networks:** This state is achieved when all five levers are completely intertwined to provide optimal performance throughout the value chain. This situation results in higher productivity for all involved teams in business processes. The free-flow of real-time information make informed decision making effective and efficient.

In another spectrum of capabilities, Hammer introduced the BPM maturity level from the perspective of enterprise and process ([Hammer, 2007](#)). From an enterprise perspective, four criteria have been introduced; leadership, culture, expertise, and governance. The leadership refers to the awareness of senior managers, the alignment of the leadership team in decisions, the behavior and process thinking of the senior executive team, and leadership style (a shift from focusing on command and control to collaborative and vision-based approach). The culture involves team-working with the operational groups, emphasizing the actual needs of customers, feeling a sense of mission in serving customers, and attitude toward change. The expertise is another important aspect of maturity which brings two elements of people (process for developing and maintaining skills) and methodology (embedding process management) together. The governance, as the fourth criterion, takes into account process model, accountability and integration. From a process perspective, five criteria explain the level of BPM maturity as follows:



- **Design:** Three subscales in this category refers to the role of design in BPM. 1) The purpose that includes breaking down the process into specific tasks and designing the sequence of work on an end-to-end basis in collaboration with functional managers. 2) The context in which inputs, outputs, and interfaces that were fitting processes together. 3) The documentation of the process design.
- **Performers:** This element combines 1) knowledge and familiarity with the enterprise's industry and trends, 2) skills of the team members in introducing and controlling changes throughout the process implementation, and 3) behavior of the performers in terms of pursuing the achievement of enterprise's goals through outcomes of the processes.
- **Owner:** This aspect of BPM maturity considers 1) the position of the process owner, 2) activities of a process owner in improving the process performance, 3) authority to make decisions and taking control of the process's budget or outcomes.
- **Infrastructure:** As one of the important components for a mature BPM, information systems, as well as human resource systems, should be linked together to meet the industry standards for supporting the processes. The robust infrastructure allows a smooth flow of data between processes and enables the functional team to interact effectively.
- **Metrics:** Towards a successful performance in the BPM process, organizations should first identify metrics based on the goals of the processes, and regularly review and update the performance indicators and their target to ensure continuous improvement.

There is also another perspective to explain aspects of a BPM system. The process portfolio management plays an important role in the effective performance of business processes ([Von Rosing, Von Scheel, & Scheer, 2014](#)). It introduces a mindset claiming that directing limited resources in processes for achieving expected outcomes requires uniform process-based management.

### **3. Research methodology**

This theoretical study defines the application of BPM in relation to PPM, in which results are presented in a conceptual framework. Theoretical studies are applied to synthesize ideas and provide an overview of the assumptions on the topic by bringing the concepts of independent studies together ([Briner & Denyer, 2012](#)). Theoretical research provides the basis for a better understanding of the PPM system and the specific application of BPM in relation to that.



Critical thinking was applied to interpret the findings of previous research and build a framework as a valuable input to further practical studies. Adopting this approach is beneficial in putting similar ideas together that form a basis for developing a theoretical framework.

The steps for an appropriate research design as introduced by Machi and McEvoy (2016) were followed to ensure adopting a scientific method in this study. Step 1 involves defining the research problem. As discussed in the introduction, there is limited research on the application of systematic methods in the study of PPM. Thus, it is needed to discuss the aspects of PPM implementation in organizations and then to apply BPM concept in order to determine how this approach can be effectively used to facilitate this process. The second step includes creating an approach to solve the problem. The current body of knowledge on this important topic is dispersed and a theoretical approach is needed to be applied for bringing the relevant concepts together. The third step is about collecting information from sources. References were retrieved from the search of Scopus, Web of Science, and Google Scholar as basic search engines. The EndNote software was used to organize the references and manage citations.

The theme of the topic is composed of two keywords including 1) “Business Process Management”, and 2) “Project Portfolio management.” Although there are many publications on either domains 1 or 2, searching keywords in their intersection did not retrieve any records. It indicates that previous research has not focused on this specific overlapping area. Thus, in this study, authors try to bring ideas from these two domains and identify the conceptual relationship between the BPM functions and the components of PPM to highlights one of the applications of the BPM approach. Step 4 focuses on building the argument based on the key ideas elicited from the literature. Thus, the studies were critically reviewed and their findings and theoretical discussion around the requirements of PPM implementation were elicited. The fifth step involves drawing conclusions on the retrieved findings. In this regard, we brought together findings and linked ideas together to provide a meaningful framework of the components of PPM and the role of BPM in relation to them. The last step is to validate the resulting framework, which was conducted by soliciting experts’ viewpoints. Five experts in the area of PPM who have insight into the application of BPM were selected based on a purposive method considering their experience, who confirmed the validity of the theoretical framework without major remarks.

## 4. Results and discussion

### 4.1 The role of BPM in mechanizing PPM processes

The PPM processes in the literature include ([Amaral & Araújo, 2009](#); [Ko & Kim, 2019](#); [Project Management Institute, 2017](#); [Volkov & Kraynov, 2014](#)): 1) portfolio strategic planning, 2) evaluation, prioritization and selection of new projects, 3) portfolio authorization, planning and budgeting, 4) portfolio performance monitoring and controlling 5), optimizing and balancing project portfolios. BPM as a process-oriented approach, links these processes to business processes. It maps out the value chain of an enterprise in the form of primary and support processes. Effective management of portfolios requires close interactions with both of these process groups. Such interrelations of PPM with business processes are discussed in the wider framework of BPM:

**Portfolio strategic planning.** The first stage of PPM process is to determine project portfolios based on the fields of business that are being determined based on the organization's strategic planning ([Olteanu, Ionescu, & Barbu, 2013](#)). Furthermore, the project selection criteria, as well as the indicators for monitoring the performance of portfolios should be clarified in this step. Enterprises need to specify their investments in new product development (NPD) in this stage to direct their resources and set boundaries of the PPM system. There is a close relation between this process and strategic planning process as the senior management's policies, as well as corporate strategies, need to be incorporated. The BPM can specify when decisions should be escalated to a higher level and how the decisions should be communicated and enforced.

**Evaluation, prioritization and selection of new projects.** There is a link between the PPM and the tendering process since portfolio-level strategies should be considered in the critical decisions whether or not to bid a tender. Other criteria such as risk and reward can be incorporated in the screening of new project ideas and NPDs. The resources and potential capacities of an organization may be more or less than its current undertaken projects. Thus, the prioritization needs to be made based on criteria to ensure optimum utilization of resources and potentials towards maximizing value ([S. Moore, 2009](#); [Project Management Institute, 2017](#)). The respective procedure and coordination can be clarified using the BPM approach. BPM determines how the final decisions should be communicated to the business development team.

**Portfolio authorization, planning and budgeting.** As an important stage of the business planning, the actual work which has been approved to be performed within each portfolio will be determined considering available budget and resources. Authorized portfolio components are budgeted and planned to be executed. Considering the strategic priorities, the master plan of portfolio components is needed to be developed ([Project Management Institute, 2017](#)). The BPM approach can determine how the budget and resource planning at the portfolio level should be linked to the operational level. Integration of the level of controls, key performance indicators (KPI) and cost controls requires the systematic approach of the BPM in order to unify all components. Otherwise, data accumulation and consequently, the informed decision-making will not be possible.

**Portfolio performance monitoring and controlling.** The performance of portfolios has to be continuously monitored by collecting feedback from portfolio components. Using such feedback, organizations can compare the performance of the components with initial planning, resources and risks to show the condition of each component to the whole portfolio ([Petro et al., 2020](#)). The portfolio performance report may include items such as the overall status of each project, the fulfillment of strategies, and the balance between risk and rewards. The role of BPM can be to map out the reporting procedures and integrate data collection from operational and their flow to the level of management. It enables the PPM system to consolidate reports and produce overall managerial reports reflecting the collective performance of projects.

**Optimizing and balancing project portfolios.** The combination of portfolio components should be evaluated based on specific criteria and performance outcomes. The risk-reward balance is one of the important criteria that need to be considered ([S. Moore, 2009](#)). Portfolio balancing is not limited to assets but also is applicable to projects ([Project Management Institute, 2017](#)) as new projects may be added to the portfolio while some of them are stopped due to strategic or operational reasons. The BPM can provide a proper connection between PPM analytical tools and enterprise information systems to ensure performing comprehensive portfolio-level analysis. Besides, the process of making follow-up decisions and keeping track of actions need an overview of the relevant business process, which can be determined using BPM.

## 4.2 Key components of a PPM system

Since the introduction of portfolio concept in the project management field and its development in organizations, various frameworks are presented by different researchers. These frameworks have been introduced to explain the components of a PPM system in terms of structure, tools and processes. Some of these frameworks merely focus on processes, while others adopt a more systematic outlook covering essential elements for managing one or more portfolio of projects. For instance, Amaral and Araujo ([Amaral & Araújo, 2009](#)) introduced five key steps for PPM including 1) The strategic consideration and orientation towards the selection of the projects with better strategic alignment, 2) evaluation of new projects, 3) selection of optimum portfolios, 4) assigning organizational resources, and 5) control and monitoring the portfolios. The project management institute (PMI) ([Project Management Institute, 2017](#)) also proposed five process categories, including strategic planning, aligning, monitoring and controlling and component processes. In this study, we reviewed the frameworks and relevant references to draw on conclusions regarding the implementation of the PPM system in an organization. Figure 1 provides an overview of such requirements.

**Aspect 1 (structure).** This category refers to the structure and responsibilities which are necessary for PPM implementation. This element constitutes a solid background for governing the PPM tasks. It provides a management framework within which portfolio decisions are made. Applying project portfolio management without a definite governance framework does not achieve the desired outcomes. This framework and management structure should clarify how key decisions should be taken, what are the decision-making criteria, who participate in decision-making, How to ensure the enforcement of decisions, and what are responsibilities in each decision. The level of control from portfolio to sub-portfolio and projects coupled with respective strategic initiatives should be clearly specified in the PPM system. System specifications in these aspects may take time to be established and accepted by senior managers but afterward, it just should be reviewed and updated as needs arise. The respective components in this element include ([de Medeiros et al., 2019](#); [Dezhkam et al., 2019](#); [Project Management Institute, 2017](#)): S1) governance model, S2) configuration, S3) defined users (roles), S4) responsibilities, and S5) user access (authorities).

**Aspect 2 (infrastructure).** This group points to tools and infrastructure which are necessary for running portfolio management tasks in an organization. IT infrastructure and tools enable organizations to ensure proper coordination, control, analysis, and visualization of PPM-related information in the organization. This aspect mainly emphasizes the

components of a project portfolio management information system (PPMIS), which is a set of interrelated data collection tools, software applications, databases, and dashboards. Such a system translates raw data from execution into meaningful information that can be used for the decision-making of executives. The corresponding components in this group encompass ([Dezhkam et al., 2019](#); [El Hannach, Marghoubi, & Dahchour, 2016](#); [Project Management Institute, 2017](#)): I1) hardware, I2) software, I3) ICT networks, I4) databases/data warehouse, and I5) dashboard.

**Aspect 3 (process).** It refers to the processes and steps which are needed from the definition of portfolios to their optimization. Enterprises need to adopt some form of a disciplined approach to the identification, selection and approval of portfolio components ([Hosseini et al., 2019](#)). As a centralized approach for overseeing organizations' project, PPM should include the intake process of projects and supervise the whole operations to ensure their smooth operations in terms of risk-reward balance, strategic alignment and fitting into the organization's long term strategic plan ([Project Management Institute, 2017](#)). The main components in the process aspect of a PPM system encompass: P1) process map, P2) procedures, P3) inputs/outputs, P4) events, and P5) measures.

### 4.3 The role of BPM in implementing the key components of a PPM system

The characteristics of PPM were categorized into three aspects in the previous section. These three sections have close interrelationships and their link should be formulated properly in a bigger framework to ensure a smooth operation. The BPM functions have been acknowledged in previous research and researcher mainly mentioned seven functions comprising of 1) designing, 2) modeling, 3) setting up, 4) monitoring and optimizing, 5) aligning, 6) connecting, 7) integrating ([Minonne & Turner, 2012](#); [Ramadhani & Er, 2019](#); [Smart, Maddern, & Maull, 2009](#); [Vukšić, Bach, & Popovič, 2013](#)). This study explains the contribution of these 7 BPM functions to the implementation of the three aforementioned aspects of a PPM system as follows:

**1. Designing.** The BPM approach can define users in a PPM system and specify their level of access, their responsibilities and decision-making authorities which determine their access to information and taking specific actions in the system. All these features are being defined in accordance with a bigger PPM governance model that should be designed based on the corporate governance framework. The configuration of the PPM system needs to be set properly by means of BPM to systematically arrange information systems, processes, and

devices that compose the system and its boundary. Thus, the contribution of BPM in this aspect of the PPM system brings significant values to the organization.

**2. Modelling.** Mapping out the layout of the processes in relation to databases and tools. Developing such a map gives an overview of the sequence of events, as well as the flow of information in processes. The BPM plays an important role in providing this oversight which is needed for putting separate components together. This approach clarifies the interface of processes and systems, which is characterized by inputs and outputs. The BPM also can apply systems engineering techniques such as flow charts, control flow diagrams, or data flow diagrams (DFD) to model PPM processes.

**3. Setting up.** This contribution of BPM refers to running the PPM system of a small scale as a pilot study to identify shortcomings and rectifying possible problems. Then the scope of the PPM system can be extended to cover the defined portfolios and projects. BPM analyses the performance of the PPM system in the pilot-scale and evaluates all aspects from a systematic perspective.

**4. Monitoring and optimizing.** The PPM specifications need to be reviewed, updated and improved regularly depending on the scope and complexity of the system. BPM monitors the whole PPM process as it runs through the workflow. It applies metrics to measure efficiency and locate bottlenecks in the system. Continuous improvement of this system and its development along with other enterprise system is an important matter being achieved by means of BPM.

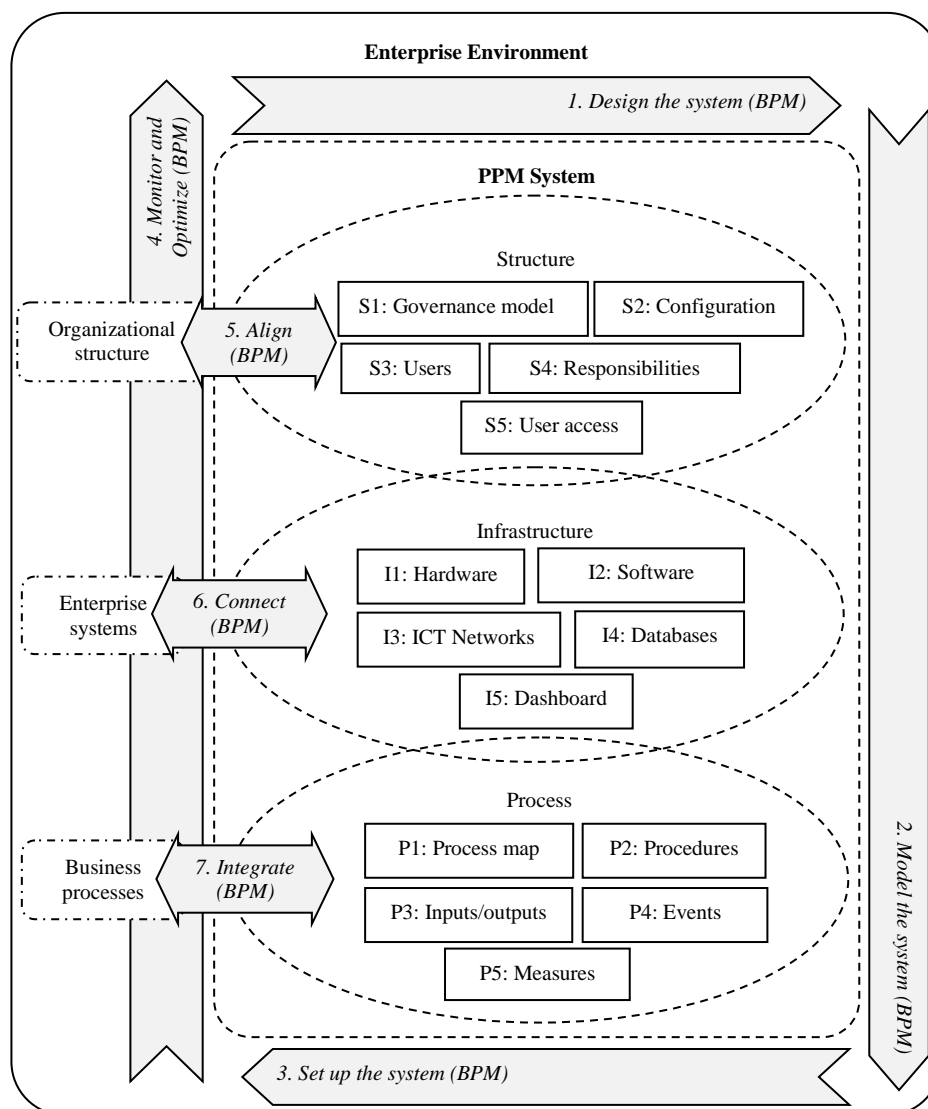
**5. Aligning:** The structural aspect of a PPM system which refers to the governance model, configuration and responsibilities, is considerably dependent on the organizational structure. Strategic direction of an enterprise should be reflected in the PPM structure. BPM can help in aligning the PPM structure with the organization since it maps out the bigger business model. In this way, the compatibility of PPM roles with respective authorities or decision-making power can be guaranteed.

**6. Connecting:** One of the common problems in organizations is the architecture of the whole systems in an enterprise and their interconnections within this platform. Considering the systematic view of BPM, this goal can be met through analyzing the transactions and interactions with other tools and systems. For example, accumulated cost information from project accounting systems may be needed to be imported into the PPM system for cost control analysis at the portfolio level. Also, the knowledge and best practices as one output of

the PPM system can be effectively captured and stored in a knowledge management system to be used for the future.

**7. Integrating:** Another important application of BPM is to determine where the PPM tasks fit with other business processes. In this regard, the process map gives practitioners an overview of the link between inputs and outputs of all processes from strategic portfolio management to portfolio optimization. The integration between business processes facilitates the exchange of knowledge and information, which are necessary for agility.

Overall, the contribution of the BPM approach in each aspect of a PPM system has been mapped out in figure 1. It is evident that applying this approach can provide the enterprise with values in all three aspects of a PPM system. This framework was proposed based on the concepts elicited from the literature and then validated by soliciting expert comments.



**Figure 1.** Seven contributions of BPM in implementing the PPM system



## 5. Conclusion

The ambiguity of roles and responsibilities or lack of a proper link between components are among the common barriers to the successful operation of enterprise systems. The PPM system, as a strategic system that requires to be linked to the rest of the organization's systems and processes, is not exempt from this rule. This management approach facilitates the selection of the best projects and brings considerable benefits to the business through the alignment of projects with the objectives, optimal assignment of the resources, and minimizing the risk of investments. The PPM capabilities and resources should all be arranged to support the organization's strategies. The proper collective performance of all components in this system depends on integrating existing, often disparate systems in such a way that brings value to the overall process of management portfolio of projects. The internal coherence of PPM components coupled with their integration with other systems justifies applying a systematic approach. BPM has been introduced as an approach that adopts a holistic view of all business processes and maps out their interactions. This concept has been used in a variety of contexts to ensure compliance, while promoting productivity in support of corporate objectives.

In this paper, besides introducing the components of a PPM system and categorizing them in three groups of 1) structure, 2) infrastructure, and 3) process, seven key functions of BPM were highlighted that include 1) designing, 2) modeling, 3) setting up, 4) monitoring and optimizing, 5) aligning, 6) connecting, and 7) integrating. Finally, a conceptual framework was provided to represent the contribution of the 7 BPM functional areas to 3 aspects of a PPM system. The validity of the framework was confirmed by five experts. We found that the BPM concept can be potentially applied to the implementation of this system. The benefits of applying this concept range from clarification of PPM boundaries with other enterprise systems to the integration of PPM processes with other business processes. The BPM brings systematic thinking to the implementation of management systems within an enterprise and assists managers to avoid the establishment of several systems as separate islands with the least level of interactions. This approach defines the flow of project information from operational levels to strategic levels, giving managers the ability to make informed and effective decisions based on consolidated reports. We also found that BPM promotes reactivity and operational flexibility in PPM processes, improving the quality of strategic decision-making based on real-time data. Without following a BPM approach in the

implementation of the PPM system in an enterprise, it is probable that the PPM team face many problems such as lack of coordination, the resistance of internal stakeholder parties, and ineffective decision making at a portfolio level.

Previous research sheds light on the importance of the PPM in enterprises ([Petro et al., 2020](#)) and the strategic competitive advantage that it brings to organizations ([Paquin et al., 2016](#)). Hosseini et al. ([Hosseini et al., 2019](#)) applied system thinking to the study of the PPM process in order to analyze the problems arising from a static portfolio analysis. However, this study opens open a new arena of research by applying system thinking in the design and implementation of this system. This enables managers to properly embed the PPM systems in the processes and structure of an enterprise to ensure a smooth flow of information from operations to senior management level and the top-down enforcement of portfolio decisions. The findings assert that incorporating risks, policies and rewards into portfolio decisions requires the BPM approach to properly identify interrelations with information systems, data warehouses and knowledge repositories to capture and use required data whenever necessary. Previous research acknowledged the link between PPM and other processes; but, this link was clarified in this research in terms of structure, infrastructure and process. These are three levers describing the aspects of a PPM system and the role of the BPM approach to map out its intersections and bottlenecks with the remaining subsystems.

This study has implications for research and practice. The findings explain an important role of BPM in organizations to manage their project portfolios in a systematic manner. This paper theorizes how the BPM functions can be fulfilled towards the effective implementation of a PPM system. Practitioners can also benefit from this research by focusing on the core capabilities of BPM to facilitate and improve the implementation process of a PPM system. As for limitation, this paper is theoretical in nature and, thus, leaves testing the proposed theories to future studies. Thus, the authors suggest that future empirical research on the topic focuses on applying the conceptual framework to real-world situations by adopting a case study method. For instance, it is important to develop a process map for PPM in interaction with other enterprise systems using one of the specific BPM techniques.

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