Development and Verification of a Conceptual Framework
for Project Manager-To-Project (PM2P) Allocations in Multi-Project Environments

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Abstract--**This research is a follow-up from an empirical study that demonstrated that the current process of allocating project managers to projects (PM2P) in Botswana's multi-project environments is ineffective. The purpose of the current study is to develop a conceptual framework for the PM2P allocation process that can be used as a theoretical lens to study this process in more depth. A critical appraisal of the limited literature on the specific topic of project manager allocation models, including cognate fields of broader theories associated with this specific topic was conducted and encapsulated into the construction of a generic conceptual framework in terms of all the relevant inputs, as part of verification from the source of evidence in the literature that supports each input. The second source of evidence for verifying the developed conceptual framework, which is out of scope for this study, will come from application of the model in practice to ascertain that the emerging data from its application does not result in significant structural modifications of the developed framework.**

Literature searching and management strategies such as cited reference searching, were used during critical appraisal of literature. Really Simple Syndication (RSS) feeds and publication alerts for relevant articles were set-up and reviewed, followed by content and thematic analysis of the secondary data that were used to construct the conceptual framework. The resulting conceptual framework, which incorporates broader theories supporting each input, is considered a contribution in terms of extending the understanding of existing but limited literature associated with this topic.

I. INTRODUCTION

This research is a follow-up from a study that demonstrated empirically (through a country-wide study) that the current PM2P allocation processes in multi-project environments of Botswana are: informal, not objective, not comprehensive in terms of consideration of all the factors that theory suggests should be considered, and characterized by low levels of match between project managers and projects[1]. A statistically significant and positive correlation was found between these independent variables and organizational performance variables. Details of the empirical study have been previously reported (see [1]). The current study focusses on the development of a conceptual framework for understanding the PM2P allocation process in multi-project environments. The construction of this conceptual framework is based on a critical appraisal of the literature that directly propose models for allocating project managers to projects in multi-project environments [2-6], including broader reviews of related theories surrounding the specific topic of project manager allocations in organizations (e.g., [7-16]). These reviews are used to inform the construction of a conceptual framework to further the understanding of PM2P allocation processes in multi-project environments, a research topic that is currently underexplored [17-19]. Justification of this conceptual framework is based on two sources of evidence in terms of; (1) extended literature reviews that demonstrate coverage of the theory behind multi-project manager allocations and (2) application of the developed conceptual framework in practice, to determine if there are any missing components arising from collected data that can result in significant structural modifications. However, the scope of this study covers item 1, in relation to developing a conceptual model to demonstrate coverage of all the relevant theories that inform and support the model contents, such that it can stand up to scrutiny as regards a framework capable of being used as a theoretical lens to study the PM2P allocation process in multi-project environments for different applications, subject to context.

A. Research aim and questions

The aim of this study is to develop a conceptual framework for understanding the PM2P allocation process in multi-project environments, following empirical validation of the research problem of a lack of effective PM2P allocation processes in the context of Botswana. Four specific research questions were constructed to achieve this aim as outlined in Table I.

TABLE I. RESEARCH OBJECTIVE AND QUESTIONS

Research Objective (RO)	Research questions (RQ)
Develop a conceptual framework for understanding effective PM2P allocation processes in multi-project environments	RQ1 What literature specifically/directly address the issue of project manager allocation models in multi-project settings?
	RQ3 What are the related theories around the concept of project manager allocations that can be encapsulated into the development of a conceptual framework?
	RQ3 What are the gaps in existing literature regarding PM2P allocations and how can they be addressed?
	RQ4 Does the developed conceptual model have all the structural inputs associated with effective PM2P allocation processes?

II. BACKGROUND AND CRITICAL APPRAISAL OF THE LITERATURE

A. Literature streams and categorization

Although specific literature that directly discuss project manager allocation models in the context of decision support systems and allocation methodologies is currently limited [17], an attempt was made to encapsulate cognate fields of inquiry in terms of theories surrounding the PM2P allocation process. This attempt resonates with a desire to ensure development of a robust conceptual framework that is supported by a wide range of authors in terms of verification of not only the comprehensiveness but also the generic nature of the resulting framework, which can subsequently be used by other researchers to study the PM2P allocation process. On this note, the literature was categorized into seven streams as depicted in Table II. The term 'allocation' is preferred over 'assignment' because it resonates with resource management theories [20-22], identified as the universal theory comprising resource scheduling and allocation (among other theories).

Stream 1: Project critical success factors

It is evident that there is a difference between the success of the project management activity and the success of the actual project that is implemented through project management activities. For example, Wit [84] supports this view by stating that *"...one must make a distinction between project success and the success of the project management effort, as the two, although related, may be very difference"* (p.164). This implies that although good project management practices can enhance the likelihood of project success, they do not necessarily guarantee project success. Conversely, it is possible to have project success without necessarily good project management. The intent of this review is not to comment on or critique the various sets of success factors by numerous authors in terms of the lack of agreement regarding the factors that influence project success [85]. Rather, the intent is to relate the extensive literature on success factors to the current topic of PM2P allocation process in terms of what publications identify the importance of the selection of the project manager (a human resource) and his/her attributes, as one of the critical factors that influence project success.

The selection decision, referred to as PM2P allocation process in this study, is even more important in a multi-project management environment, where clear links exist between projects and business strategy [78]. Pinto and Prescott's [86] empirical study on project critical success factors is notable in that it reveals that the relative importance of success factors change considerably over the life of a project, depending on what stage the project is in. The relevance of this identified stream to the current study can also be articulated in the context of a project manager's performance (a function of his/her competencies) in the management of projects. Several studies have confirmed the relationship between a project manager's leadership style and project success [87, 88]. For example, Muller and Turner [72, 87, 88] found a link between a project manager's leadership competencies and project success.

Stream 2: Implied methodologies for project manager allocations

A plethora of authors discuss several concepts such as project manager skills, attributes [7, 8, 24, 26, 89] and leadership competencies [70, 72, 79, 87, 90-92] under different contexts. For example, Crawford, Muller, Turner, Aritua et al discuss project manager competencies in the context of developing programs for professional development of project managers, including improving project delivery capability, and not in the context of models for allocating project managers to projects. The implications of a critical appraisal of the literature under this stream lie in their relevance, in the context of implied methodologies for project manager allocations. This means that the list of project manager competencies can be used as inputs that influence the PM2P allocation process. Thus, recognizing and incorporating the work of these authors into the development of a conceptual model for PM2P allocation process is beneficial, in terms of validating its content from a wide range of sources.

TABLE II. IDENTIFIED LITERATURE STREAMS

| Literature streams	Underpinning references
Stream 1: Project critical success factors (importance of choice of project manager)	[7, 23]
Stream 2: Implied methodologies for project manager allocations	[7, 24];[25, 26];[8]
Stream 3:Multi-project environments and management of projects (including programs and portfolios)	[10, 14-16, 27-31]; [32-34]; [35-39]; [40];[41-43];[44]; [45]; [46]; [47]; [48];[49] ; [29]; [50]; [51]
Stream 4:Complexity of projects within a Multi-project management environment	[52]; [53]; [13]; [54];[11, 55-57]; [58]; [51, 59]; [60]
Stream 5: Project manager competencies for managing single projects	[5, 61];[7, 62, 63]; [64]; [65-67]; [68, 69]; [70, 71];[8, 72, 73]; [61, 74-76]
Stream 6: Project manager competencies for managing multiple simultaneous projects	[29, 31, 65, 77];[74, 78-80]
Stream 7: Project manager allocation models applicable to Multi-project management (MPM) environments	[2, 3, 5, 6];[17, 18, 49, 81-83]
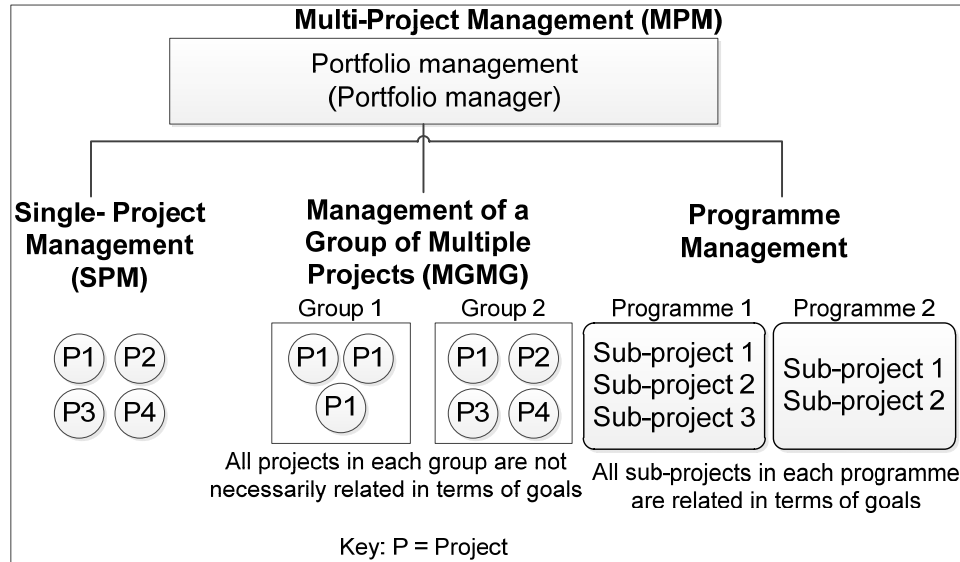
Fig.1. Potential MPM environment within an organization – Source: Patanakul and Milosevic (2009)

Stream 3: Multi-project environments and management of projects

The framework of Patanakul and Milosevic [49], somewhat supported by several authors (e.g., [29, 60]), is adopted to illustrate a potential systems model in relation to Multi-project Management (MPM) within an organizational setting (see Figure 1). The term potential is used to acknowledge the different project organizational structures that exist in relation to the management of multiple projects, portfolios [16] and programmes [43, 60].

In a multi-project management (MPM) environment, project managers within the pool of resources lead several concurrent projects at the same time [37, 49, 93]. The projects may be part of a group, a programme or a collection of single projects. Unlike single project management environments, clear links between projects and business strategy exist in a multi-project management environment [78]. This is mainly because the projects are clustered together in order to facilitate effective management and achieve delivery of business strategy, in terms of strategic goals [50] [49]. At project manager operational level, two scenarios exist that define multi-projects. A project manager can lead either one project or more than one project concurrently.

In the case of single project management, a project manager leads one project at a time [49]. There is sharing of limited resources with the other project managers, but the benefit lies in efficient utilization of scarce resources, leading to reduction in resource idle time. An important distinction between MGMG and program management is that, unlike in program management where all sub-projects in each program have common goals, all projects in each group do not necessarily have common goals. This means that the projects within a group may not necessarily be interdependent or directly related in terms of goals [77].

The management of projects is also influenced by the project management structure adopted by an organization. Several project management structures in relation to the management of projects, programmes or portfolios are possible within an organization. The chosen structure is dependent on a number of factors, such as how top management views the benefits of using a preferred project management structure, probably to be approved by the board. The chosen structure will dictate the approach to be used in implementing the various projects, on the basis of how the projects sit within the organization and their relationships to existing business processes and reporting lines. This represents some of the factors that may have an influence on the PM2P allocation process, to be incorporated into the conceptual model to be developed in this study.

Stream 4: Complexity of projects within a Multi-project management environment

The concept of project complexity is discussed by numerous authors under different contexts [13, 56, 57, 59, 94-96]. The complexities of projects, in the context of characteristics, are more notable in a multi-project management environment, characterized by uncertainties and risks due to a dynamic environment. This has implications on leadership competency profiles of project managers, to cope with the management of projects with varying levels of complexities. The required competencies in turn have an influence on the PM2P allocation decision. Aspects of project complexity are explored further in section IV.

Stream 5: Project manager competencies for managing single projects

Conventionally, project manager competencies have long been conceptualized on the basis of management of single projects, despite the growing body of literature on multi-projects. The concept of a project manager's competencies in

leading single projects is widely discussed (implicitly) by numerous authors under different contexts [5, 7, 8, 61, 64, 69, 71, 74, 87, 97, 98]. Drawing from the work of these authors, this stream is particularly useful, given that the management of multiple simultaneous projects also requires competencies for leading individual projects, all of which play a role in the PM2P allocation decision.

Stream 6: Project manager competencies for managing multiple simultaneous projects

The distinction between a project manager's competencies for managing single versus multiple projects was contended by Patanakul et al. [18, 19, 99], as a contribution to existing literature on multiple project management, in the context of additional competencies for managing multiple concurrent projects. These competencies were: experience in managing multiple simultaneous projects, multi-tasking among different projects, managing interdependencies and interactions across different concurrent projects and switching contexts to manage project teams for different concurrent projects. However, multi-tasking, the authors argue, is not a new set of competencies for multi-project management but rather, the level of multi-tasking across different concurrent projects is higher than in single project management, given that a project manager leading a single project must also multi-task by coordinating different activities of the same project. To this effect, the competencies of a project manager in leading multiple simultaneous projects is particularly relevant for the current study and will be incorporated as inputs that play a role in the PM2 allocation process.

Stream 7: Project manager allocation models applicable to MPM environments

It is evident that the literature that directly propose models for allocating project managers to projects is currently limited. For example, a handful of studies have directly proposed project manager allocation models from 2001 to 2013, applied in the context of different countries such as USA [3, 4, 17, 81, 82], Egypt [100], Thailand [101], Iran [102, 103] and Israel [104, 105]. However, it is worth noting that only studies conducted in USA directly propose models for PM2P allocations, explicitly applicable to multi-project management environments. In particular, the existing framework of Patanakul [17, 18, 81], identified as the most comprehensive and directly relevant to the PM2P allocation process in multi-project environments, was used as a basis to develop a conceptual framework for this study. This existing framework was modified on the basis of broader reviews of other literature streams, along with adopting a process-based approach.

It is important to highlight that the seven literature streams are bounded by resource management [20, 22, 106-109], identified as the universal theory which incorporates theories such as: resource planning, resource scheduling and allocation, developing resources and managing them. This universal theory of resource management is relevant to the

PM2P allocation process, in terms of the project manager being a type of resource (i.e., human) that is allocated to projects. Drawing significantly from the seven literature streams, a notable consideration is the organizational environments in terms of contextual elements that influence the PM2P allocation process, discussed in the next section (section B).

B. Project manager allocation process and organizational environments

There are various organizational dimensions (e.g. organizational operating models, project management structures in relation to the management of projects, organizational politics, power and authority dynamics, culture and physical resources) that have an influence on the project manager allocation decisions. The framework of Clegg [110], in terms of a socio-technical system, is adopted to illustrate the interactions between these dimensions and their influence on the behaviour of the decision maker, and hence the PM2P allocation decision. The dynamic interplay between these dimensions [29] warrants explicit recognition, in terms of influence on the PM2P allocation process. The decision maker, as a manager in his/her role of allocating project managers to projects, must handle and balance dimensions such as culture [99, 111, 112]; a dimension that is linked to the organization's strategy, processes and people [113]. The interplay between the various organizational dimensions of the socio-technical system in relation to the PM2P allocation process is illustrated Figure 2, using the framework of Aritua [29, 113].
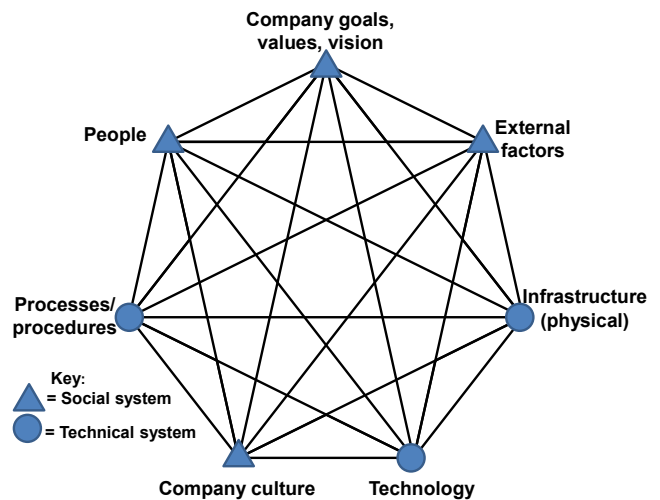

Fig. 2. Organizational dimensions and their interactions – Source: Aritua (2009, 2010)

Cooke and Slack [114] highlight the influence of these organizational dimensions, which they refer to as the social pressures and issues felt by the decision maker acting in his role in the presence of others within the organization's internal climate. Fiedler and Chermers [115] agree with this concept of organizational dimensions by using the term

'organizational climate' in relation to *"organizational constraints and redtape"* (p. 57) faced by the decision maker. The external factors can fall under both social and technical system and include factors such as: legal, economic, political, environmental, and religious conditions within the specific country in which the organization is operating. These factors are referred to by Boyatzis [116] as *".......aspects of the economic, political, social, environmental, and religious milieu surrounding the organization"* (p.6), in the context of an influence on an individual's demonstration of his/her competency. These factors, the authors argue, can be viewed to have an influence on the PM2P allocation process. For example, external stakeholders such as clients, customers and suppliers (who are the user of the project's output) can have an influence on the project manager allocation decision. Internal stakeholders such as company executives can also influence the decision maker in terms of which project manager should be allocated to specific projects.

The interplay between the organizational dimensions and their influence on the PM2P allocation process is implied at the various stages in the process. For example, in project prioritization, organizational dimensions such as culture, leadership and politics, are at play in terms of deciding which projects will make the biggest impact to a certain strategic theme. However, existing literature on project manager allocation processes and methodologies [2, 5, 81] do not explicitly highlight these organizational dimensions; present in the current management practices of today's organizational environments. Therefore, this study will respond to this gap by explicitly incorporating these organizational dimensions into the generic conceptual framework for PM2P allocations.

C. Identified gaps in extant literature and actions to address the gaps

Among the literature streams presented in Table II, stream 7 is identified as the most relevant to this study, in terms of methodologies that directly propose models for the PM2P allocation process. In the context of this literature stream, the framework proposed by Patanakul et al. [4, 17, 81, 82] was identified as the most comprehensive and relevant to this study, particularly in the context of multi-project environments, a principal focus of this study. This existing framework was used as a basis to develop a conceptual framework for PM2P allocation process, drawing from the other six literature streams discussed in section II part A. The identified gaps in extant literature, along with the actions to address each gap are presented below:

➢ Proposed allocation models do not explicitly consider organizational dimensions (internal and external factors) that have potential to influence the allocation decision. However, the most comprehensive model proposed by Patanakul et al. [4, 18, 83] addresses this to some extent but implicitly. It is contented that the potential role played by these contextual elements on the PM2P allocation

decision needs to be explicitly recognized as an addition to existing framework, in the context of furthering the understanding of the theory behind matching project managers to projects;

➢ Although the model proposed by Patanakul et al. [4, 18, 82] represents a solid foundation for this study in terms of being comprehensive, it does not incorporate and discuss broader theories related to the concept of PM2P allocation process. In an attempt to close this gap, resource management is identified as the relevant universal theory, which comprises the following activities: resource planning, resource scheduling and allocation, developing resources and managing them [20, 22, 106-108, 117-119]. These activities have specific aims such as minimizing operational costs, improving customer service delivery, maximizing profits [106], which are consistent with the aim of the PM2P allocation process in terms of optimizing performance [17, 81]. Human resource management is viewed as a subset of resource management because it focusses on one type of resource (i.e. people/personnel or project managers in the context of this study), which represents one example of resource under the broad field of resource management. The PM2P allocation process constitutes one functional task of human resource management [109];

➢ Existing PM2P allocation models are characterized by absence of feedback loops. The inclusion of feedback loops is viewed to improve the current understanding among project management researchers and practitioners, in relation to practicability of developed frameworks to enable continuous flow of information regarding effectiveness of processes and identification of gaps in the decision making process, particularly in a dynamic multi-project environment;

➢ Existing models for allocating project managers to projects do not use appropriate symbols consistent with the theory behind process modeling, in the schematic representation of the model elements. Drawing on a process based approach in terms of business process modeling techniques, this gap will be addressed by using the appropriate symbols consistent with business process modeling [121], to represent the conceptual model elements;

➢ Existing literature use the terms "project assignments" and "project manager assignments" interchangeably [3, 17, 18, 49, 82]. This implies that the task of assigning a project to a project manager is the same as that of assigning a project manager to a project. The authors argue that these two tasks are distinct on the following basis: (1) when assigning projects to project managers, the decision maker assesses which projects can utilize the available project manager competencies, given the limitations of the available project managers in the firm, (2) when assigning project managers to projects, the decision maker seeks for

suitable project managers to lead those projects, which opens up opportunities to search for the required project managers not necessarily within the constraints of the pool of project managers in the firm. A distinction is made between these two distinct tasks in order to avoid confusion and add to the understanding of the theory on project manager allocations. For example, the phrase project manager-to-project (PM2P) allocation process is used consistently and not interchanged with project allocation process in this study.

III. RESEARCH APPROACH

A critical appraisal of the literature discussed in sections I and II was used to inform the development of a conceptual framework for understanding the PM2P allocation process. In particular, content and thematic analysis of identified literature were conducted as part of the methods to achieve the aim of this study as stated in section I part A, following the use of literature searching and management strategies. Expert reviews of the preliminary conceptual model were used to verify its contents, in addition to verification from extensive sources of literature. The details are provided in the next three sections labelled A, B and C.

A. Literature searching and management strategies

In the pursuit of addressing the research aim, literature searching and management strategies such as setting up RSS feeds and publication alerts for relevant journal articles were used to extract current issues in relation to concepts of the PM2P allocation process, including related theories [122, 123], as discussed in section I.

Some of the keywords used for setting up RSS feeds and publication alerts include "multi-criteria decision making methods", "project assignments", "project manager allocations", "resource allocation" and "multi-projects". The initial literature review conducted focused on annual reviews. Some of the databases used for searching the literature are: Web of Science, Engineering village, IEEE, Inspec, Aqualine, ABI Global and Nexis. These databases were found to be the right sources, not only in view of the specific research topic of project manager allocations but cognate disciplines to enable a quick and broader understanding of the foundations of existing theory. The references in the annual reviews were used as a roadmap to expand the literature search.

The literature review process then focused on specific articles, conference papers and books. Some of the keywords used for this specific search were: "(project assignments OR project manager assignments) AND (project allocations OR project manager allocations) AND (multiple project management OR multi-project management OR multiple projects OR multi-project environment OR multi-project setting), (project assignment process OR project assignment

models OR project assignment methods OR project assignment methodologies), (project allocations) AND (decision making) OR (project assignments) AND (decision making)." These combinations of alternative keywords enabled comprehensive searching of relevant literature. Research techniques such as using alternative and less specific keywords (i.e. "decision making," "decision modelling," "multi-criteria decision making") as well as using combinations of search techniques in terms of using "OR" "AND" (to include synonyms and additional concepts) and application of phrase searching, were utilized. Truncation characters such as * were also used to broaden the results of searches by retrieval of a wide range of endings for search terms. For example, (assignment method*) as a search term, using the truncation character * to retrieve the results (assignment methods, assignment methodology and assignment methodologies). Results were also refined using techniques such as flowchart, article or document type, within specific databases such as Web of Science and Scopus. These techniques and instruments are summarized below:

➢ Title searching – searching by title of an article;
➢ Searching by author name – especially the identified major authors from impact factor outputs and citation counts;
➢ Cited reference searching – to identify which other authors cite a particular article, such that it could be established (to some extent) whether or not the article is a major piece of work and hence has a solid foundation from which to build on;
➢ Viewing of related records with common references – to expand the literature search by following the reference trail to identify the presence or absence of other articles that have the same references in their reference lists;
➢ Subscribing to RSS feeds that frequently deliver published articles from a website; such that new updates that have been automatically downloaded by an internet browser are reviewed when visiting the feeds;
➢ Setting up publication alerts that automatically produce relevant articles from selected databases via e-mail;
➢ Intelligent web searching and use of mind maps to outline related concepts;
➢ Systematic and linear note taking strategy [124] and use of Endnote to manage citations.

B. Content and thematic analysis of literature

Content [125] and thematic analysis [126] of identified literature were conducted to identify the major aspects that play a role in the PM2P allocation decision and therefore warrant inclusion into the construction of the conceptual framework to be developed. These major aspects were contrasted and compared across a plethora of literature sources to conceptualize the literature in relation to categories of similar themes that constitute various concepts as used by numerous authors, during qualitative analysis of secondary

sources. Pattern matching and groupings were necessary, given the observation that different authors use different terms to refer to the same concepts, leading to determination of the number of times that particular themes were used. The results of implementing these methods are reported in section IV.

C. Expert reviews

Two academics in the general field of Engineering management, two practitioners in project management industry and two project management consultants, were contacted to give input to the structure and content of the preliminary conceptual model presented to them, as part of verification. The geographic spread of these experts was USA, UK and Botswana, in line with the need to develop a generic conceptual model. The feedback from these expert reviews were compared with existing literature that support proposed inputs/components from experts, as part of verification from both industry practice and academia.

IV. RESULTS AND DISCUSSION

The details that emerged from implementing the methods discussed in section III, that informed the construction of the developed conceptual framework are outlined in this section. The discussion is given in light of the work of a wide range of authors that support each concept/input as part of the explanation of the resulting conceptual framework considered as the first source of evidence in terms of verification, including the verification exercise from six experts.

A. Results from content and thematic analysis of identified literature

Following a content and thematic analysis of the literature, as part of the methods to address the research problem, Table III is a summary of the preliminary output from implementing these methods, in relation to a wide range of authors who contend and expound the view that the choice

of project manager is one of the critical project success factors.

The views regarding the choice of a project manager as one of the crucial factors influencing project success have been consistent over the last 44 years, from 1969 to 2013. The number of publications supporting this view in each decade reveals the following: 1960s (1 publication), 1980s (8 publications),1990s (15 publications), 2000s (8 publications), 2010 to 2013 (6 publications). It is evident that the selection of a project manager to lead a particular project is one of the critical project success factors. This evidence provides enormous implications for management in terms of the importance of the PM2P allocation process, in the context of both project and business success.

A content and thematic analysis of the literature on characteristics of project complexity, particularly within a multi-project management (MPM) environment, revealed twelve main aspects, as depicted in Table IV.

The numbers within the cells indicate the number of times that a particular theme has been referred to by several references (represented in the column labeled underpinning references). The total for each theme is shown in the last row at the bottom of the table. The results of this analysis reveal that the concept of numerous interfaces (both internal and external) is a dominant factor that characterizes the concept of project complexity, in the context of multi-project environments defined by unanticipated changes. This is followed by the concept of resources and people, and the need to manage risk and uncertainties. These characteristics of project complexity are recognized on the basis that they may play a role in project manager allocation decisions, in the context of a project manager's competencies in leading different types of projects with varying levels of complexities [55, 72, 88]. Given the contention from several empirical studies regarding the established link between a project manager's leadership competencies and project success, the implications on this study is that the PM2P allocation decision is crucial to managing risks in projects, leading to project and organizational success.

TABLE III REFERENCES FOR CHOICE OF PROJECT MANAGER AS A CRITICAL SUCCESS FACTOR

Identified success or failure factors	Underpinning references
Selection of personnel for the project team	[23]
Project manager in terms of importance to company performance	[7]; [127]
Project manager technical capability and goal commitment	[128]
Inappropriate project manager	[10, 129]
Project manager technical and administrative capabilities	[84]
Project manager's leadership style and skills	[130]; [131]
Competency of project manager and project personnel	[132]
Competency of project manager for selection and project team	[22]; [133]
Selection and training of the right person as project manager, choice of project manager	[134]; [135]; [136]; [137]; [138]; [65]; [139];[120] ;[140] ;[141];[142]; [143] ; [144];[145] **;** [146] ;[147];[148] ; [149] ; [150]
Competent project manager and project team (including project manager assignment/allocation)	[99, 103]; [92]; [104]; [19, 105]

Table IV ASPECTS OF PROJECT COMPLEXITY WITHIN A MPM ENVIRONMENT

Resources & People	Company Structure	Decision Support Systems	Planning & Controlling	Strategic Goals & Prioritization	Synchronization	Numerous interfaces	Communication & Stakeholder Sophistication	Managing Risk/ uncertainties	Processes	Distributed or co-located resources	Underpinning References
						1		1			[52]
1			1								[15]
1			1								[16]
1						1	1		1	1	[13]
1	1						1				[151]
2	1		1	1	1	1			1		[10, 32, 53]
						1		1		1	[58, 59]
3	1	1	1		2						[43, 60]
									1		[152]
					1	1	1				[11]
1			1			1					[16, 94]
	1			1							[153]
1			1								[34]
2				1		1					[45]
						2	1	2	1		[154]
						1	1	2			[54]
						2		2	1		[55, 56]
		1				1					[50]
						1		2			[57]
Total 13	4	2	6	3	4	14	5	10	4	2	

B. Overview of proposed conceptual model for PM2P allocation process

Following implementation of the methods outlined in section III, 38 inputs of the conceptual framework that are considered as important elements of the PM2P allocation process, supported by a wide range of studies from different contexts, emerged. Details will be provided in section B2.1, following an overview of the model structure and explanations of the verification process. Some of these inputs address the gaps identified in existing project manager allocation models (discussed in section II part C). These inputs were then brought together in a systematic manner, using the theory of business process modelling techniques [155], to represent them under three sub-processes within the overarching PM2P allocation process. These 38 inputs exclude the internal and external factors that represent contextual elements, which have been added to contribute to the understanding of existing literature on PM2P allocations. Figure 3 is an overview of the proposed conceptual model for understanding the PM2P allocation process. This model signifies the relationships between inputs, processes and outputs, including feedback loops and boundaries that define the scope of the PM2P allocation process for this study. The blocks A, B, and C (Figure 3) fall under the general theme of inputs to processes labelled 2, 3, and 4. Details of these inputs are shown in exploded views (section B2.1). The inputs A, B and C are subsets of D, which is not a process but represents the influence of the contextual elements on the PM2P allocation decisions.
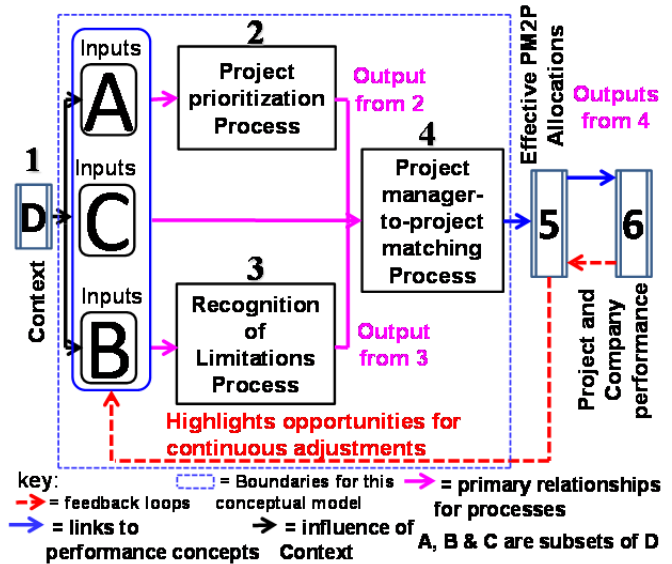

Fig. 3. Conceptual model for PM2P allocation process – Source: Seboni et al. [1]

The numbers 1 to 6 represent the visual flow of elements, such that what comes out of each block becomes an input feeding into the next block. In view of addressing the gaps identified in existing frameworks, internal and external organizational dimensions that play a role in the allocation decisions are explicitly recognized and represented by block D, as an addition to the existing framework of PM2P allocations.

Another significant component that the authors have added to the understanding of extant and limited literature on PM2P allocations is the addition of feedback loops to recognize opportunities for continuous improvements in the PM2P allocation process. Unlike the existing framework for project manager allocations [17], appropriate symbols consistent with process mapping [121] have been incorporated into the proposed conceptual model (Figure 3), with a view to add to the understanding of the theory on PM2P allocation processes in multi-project environments. For example, the general theme of inputs to each process is represented by rounded rectangles while processes are represented by rectangles, including arrows that show primary relationships for processes and feedback loops.

B1. Verification of the conceptual model on the basis of expert reviews

Following presentation of a preliminary conceptual model to six experts as part of verification of its contents and structure, the output of these expert reviews were incorporated into the construction of a final model presented in Figures 3 to 7. For example, "geographic team dispersion" was part of the feedback from expert reviews that was intersected with literature reviews ("co-located or distributed project team") to verify this input and incorporate it into the construction of the proposed framework. Soliciting feedback from expert reviews in different continents and backgrounds (i.e., industry and academia) was necessary to substantiate the generic nature of the proposed conceptual model.

B2 Verification of the conceptual model on the basis of literature

Following extended literature reviews, the model contents were verified with a plethora of articles from a wide range of sources, industries and contexts. This extensive literature, along with expert reviews, represents the first source of evidence in terms of verification of the developed framework. The second source of evidence, which involves empirical application of the developed framework, is out of scope for the current study. The developed conceptual framework proposed in Figure 3, shows an overview (and not details) of the following components, in sequential order as per the PM2P allocation process:
➢ Organizational dimensions (internal and external influences) – block 1 or D;
➢ General theme of inputs to processes – blocks A, B and C;
➢ Project prioritization process – block 2;
➢ Recognition of limitations process – block 3;
➢ Project manager-to-project matching process – block 4;
➢ Effective project manager- to- project (PM2P) allocations – block 5;
➢ Project and Company performance – block 6.

The emphasis is on the first six blocks (labelled A, B, C, 2, 3, 4), including block 1 (contextual elements), considered as the main components that form the basis for this study.

The inputs under each of these blocks are supported by a wide range of authors in existing literature. However, some of the inputs supported by existing studies have not been included or discussed specifically in the context of models for PM2P allocations, applicable to multi-project environments. These inputs are discussed in the next section, to demonstrate new additions and hence contribution to existing framework.

B2.1 Exploded views of the proposed conceptual framework and underpinning references

Exploded views of the proposed conceptual framework (blocks A, B, C, D, 2, 3, and 4) are outlined in this section, as regards details of the 38 inputs mentioned in section IV part B. Figure 4 is an exploded view of the organizational dimensions [43, 159, 160], identified in this study as contextual elements that vary on the basis of context [8, 29, 114, 115, 161], and influence the PM2P allocation process. The contextual elements include a specific country, industry, organization and project types. The explicit recognition of these contextual elements [9, 21, 116, 162, 163] represents an addition to existing models on PM2P allocations in multi-project environments, in the context of a practical and generic framework. These contextual elements have not been explicitly discussed in existing literature on the specific topic of project manager allocation models, applicable to multi-project environments.
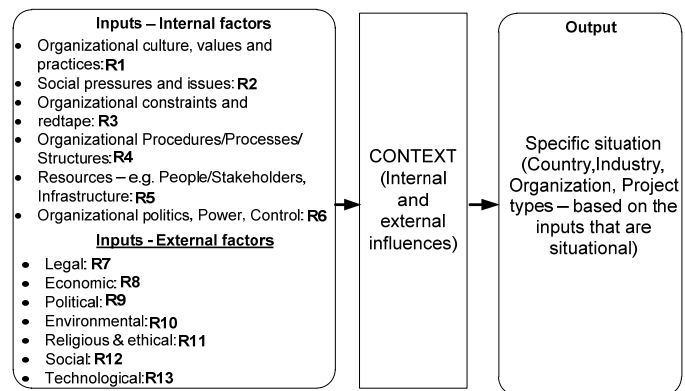

Fig. 4. Organizational dimensions (Model block D, labelled 1)
Note - **R1**:[5, 9, 29, 72, 82, 101, 111, 161, 163]; **R2**:[114]; **R3**:[115, 160]; **R4**:[30, 160, 164]; **R5**:[20, 21, 43, 113]; **R6**:[9, 21, 162]; **R7**:[162]; **R8**:[21, 116, 162]; **R9**:[21, 116, 162]; **R10**:[116, 162, 163, 165, 166]; **R11**:[116, 159]; **R12**:[116, 162]; **R13**:[159, 162].

A multitude of studies discuss numerous issues under different contexts, identified in this study under internal and external influences to the PM2P allocation decisions, on the basis of context. This implies, for example, that factors such as organizational culture [9, 29, 111, 161], politics [9, 21, 162] (internal factors), environmental [116, 163], political [116, 162], economic [21, 116, 162] (external factors), will have varying levels of influence on the PM2P allocation decisions based on context. Empirical studies by Patanakul et al. [17, 18, 81] acknowledge that the proposed model of their

work needs to be extended to other industries and project types to address the limitations in their studies, which is consistent with the view that the factors to be considered in the PM2P allocation process are contextual. Crawford highlights the importance of project management context, in relation to customizing global project management standards to assess project management competence, on the basis of issues such as regulations and culture, which are specific to each country [141]. Although the development of these standards may be generic and geared for assessing project management competence across national boundaries, industries and organizations, the implications of Crawford's recognition for customization at local levels is consistent with the concept of contextual elements in the proposed model for this study. Other literature sources in terms of evidence supporting the concept of context are studies on corporate globalization, which discuss issues of global versus local, in relation to global projects seeking to provide consistent products and services to customers across Countries [165, 166].

In sum, these studies demonstrate and warrant the need to explicitly recognize the internal and external factors that play a role in the PM2P allocation process, based on the conditions and situations of a particular country, industry, organization and project types. The output of contextual elements (Figure 4) is a specific situation in a specific country (including different regions within the same country), organization and project types.

Based on the logical flow of elements in the developed conceptual model depicted in Figure 3, the next sub-process in the PM2P allocation process is the project prioritization process. In this process, which is outside the immediate scope of the project management function, senior management determine the relative priority of projects in relation to impact on strategic business imperatives. Different management tools and techniques are used to determine this priority. This process addresses questions such as; which projects will make the biggest strategic impact to a company's bottom line? The relevance of this process to the concept of the PM2P allocation process lies in determining which project

managers must be allocated to which projects, on the basis of strategic impact. Figure 5 is an exploded view of the project prioritization process (model block 2 in figure 3), treated as a subset of the PM2P allocation process.

Details of the inputs presented in Figure 5: conceptual model block 2

Organizational Mission – this represents the reason for existence of a company, in relation to mission and vision statements that get cascaded down into specific strategic goals to be executed at operational level, in the form of projects.

Organizational Goals – These are the strategic business imperatives or leverage areas (a breakdown of the company's mission) such as economic/financial indicators (e.g., return on investment and shareholders, revenue, operating and capital costs). These factors are affected by issues such as market demands/business dynamics, competitors, risk level and schedules. The implications on the current study lies in the role played by these factors on the contribution of projects to organizational goals, and therefore, which project managers are better suited to manage those projects.

Organization's Projects – the vehicle through which the organization's strategic goals are achieved, through capabilities of project managers allocated to the various projects.

Contribution of Goals to Mission – This input is concerned with addressing the question, what is the relative contribution of each identified company goal to the Mission. An answer to this question will ultimately influence the PM2P allocation decision, in relation to optimizing the level of match between a project manager's competencies and the project requirements, as part of achievement of strategic goals and hence company mission.

Contribution of Projects to Goals – This addresses the issue of relative importance of each project towards the achievement of company goals, which informs the PM2P allocation process, in terms of matching the project manager's competencies to the various projects, based on their relative priority in relation to bottom line impact.
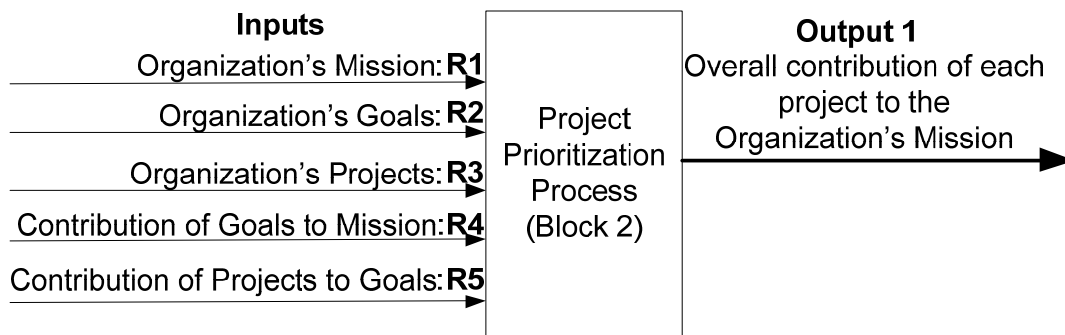

Fig. 5. Project prioritization process (conceptual model block 2, block A inputs in figure 3)
Note – **R1**: [17, 18, 81]; **R2**: [3, 82, 167]; **R3**: [3, 82]; **R4**: [3, 17, 18, 81]; **R5**: [3, 17, 18, 81]

In terms of the project prioritization process (Figure 5), existing literature highlights the importance of prioritizing projects in relation to the success of project management, particularly portfolio management [65, 168, 169]. Portfolio management is linked with project prioritization in terms of making strategic resource allocation decisions. However, the literature on project prioritization is focused mainly on product development. The literature on project prioritization in terms of activities such as idea screening and project selection [170] [171] [172], in order to decide which projects should be given funding is beyond the scope for this study. Organizational strategic business imperatives are widely used in existing literature (e.g., [156, 167]), under the context of project selection, but seldom used for PM2P allocations in multi-project environments [82]. The assumption is that projects have already been evaluated, selected, given funding

by top management and awaiting resources (i.e., project managers) to implement them. The emphasis is on prioritizing funded projects by evaluating their relative contribution to the company's strategic leverage areas (e.g., financial, environmental, and sustainability), such that appropriate decisions can be made regarding the choice of project managers to be allocated to those projects. This prioritization process, which takes account of a company's strategic business imperatives as inputs, is aimed at improving the effectiveness of the PM2P allocation process.

The next sub-process within the PM2P allocation process is the recognition of limitations that play a role in the allocation decisions. An exploded view of the Recognition of limitations process (conceptual model block 3 in figure 3) is depicted in Figure 6.
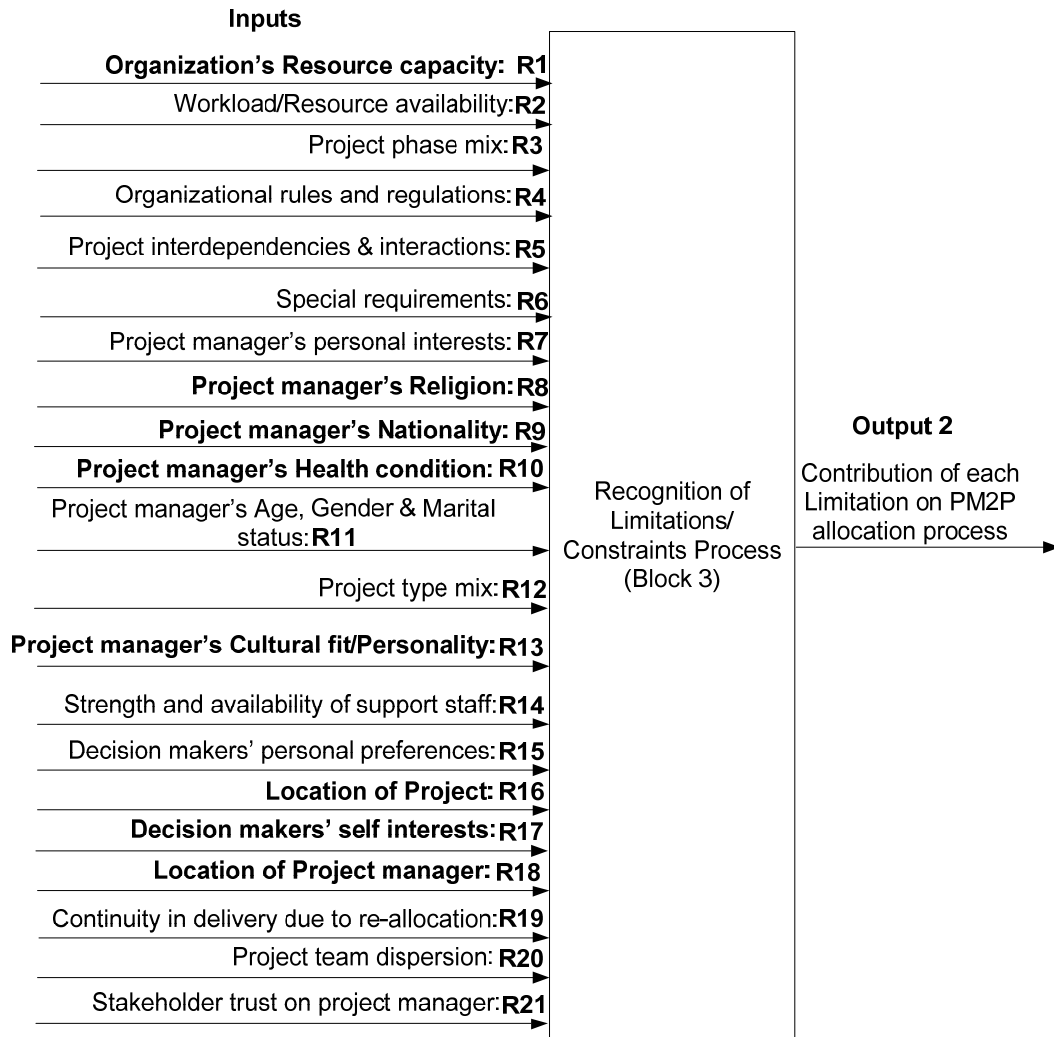
Inputs

Organization's Resource capacity: R1
Workload/Resource availability: **R2**
Project phase mix: **R3**
Organizational rules and regulations: **R4**
Project interdependencies & interactions: **R5**
Special requirements: **R6**
Project manager's personal interests: **R7**
Project manager's Religion: R8
Project manager's Nationality: R9
Project manager's Health condition: R10
Project manager's Age, Gender & Marital status: **R11**
Project type mix: **R12**
Project manager's Cultural fit/Personality: R13
Strength and availability of support staff: **R14**
Decision makers' personal preferences: **R15**
Location of Project: R16
Decision makers' self interests: R17
Location of Project manager: R18
Continuity in delivery due to re-allocation: **R19**
Project team dispersion: **R20**
Stakeholder trust on project manager: **R21**

Recognition of Limitations/ Constraints Process (Block 3)

Output 2

Contribution of each Limitation on PM2P allocation process

Fig. 6. Recognition of limitations process (Model block 3, block B inputs in figure 3)
Note – **R1**:[20, 103, 106, 156, 173, 174], **R2**:[3, 19, 20, 82, 123, 139, 156, 173, 175, 176], **R3**:[3, 82], **R4**:[17, 164], **R5**:[3, 15, 16, 60, 82], R6:[3, 82], **R7**:[19, 82], **R8**:[177], **R9**:[177], **R10**:[178, 179], **R11**:[101], **R12**:[3, 82], **R13**:[101, 180, 181], **R14**:[82], **R15**:[82], **R16**:[139], **R17**:[21], **R18**:[20], **R19**:[17], **R20**:[17], **R21**:[18, 182]

Although discussed in existing literature under different contexts, the 8 inputs highlighted in bold font (Figure 6) have not been included in previous studies that directly propose project manager allocation models applicable to multi-project environments, as factors to be considered in PM2P allocations. However, resource capacity is discussed by Patanakul et al. in the context of a project manager's availability to be allocated to additional projects without an impact on his/her productivity. The concept of Organization's resource capacity in relation to assessing the capability of the existing pool of project managers, with a view to address both current and future project delivery capability [174], including project manager development [8, 144, 183] to up-grade their competency levels, has not been discussed in existing PM2P allocation models. Therefore, these inputs represent new additions and hence contributions to existing framework on project manager allocation models. The details of these additional inputs are provided below:

Explanations of the 8 inputs that represent new additions to existing framework

Organization's resource capacity – the concept of assessing an organization's resource capacity, discussed by Bower [174] in the context of enhancing project delivery capability, has implications on an evaluation of the skills gap of existing pool of project managers, leading to a likely influence on PM2P allocation decisions;

Project manager's religion – the religious beliefs of a project manager, a function of his/her values [144] and "self-views" [177], has implications for the current study, in terms of their likely influence on the project manager allocation decision. This input is referred to in this study as one of the six "unofficial inputs" that should be considered in the PM2P allocation decision, since they may violate HR regulations in relation to employee rights, although they may influence allocation decisions implicitly;

Project manager's nationality – Zavadskas et al. [177] highlight the concept of nationality, which they refer to as *"racial stock"* (p. 465) in their empirical study on multi-criteria selection of construction project managers. Although these authors do not explain this input in their framework, the implication for this study is that a project manager's nationality is a criterion to be considered in PM2P allocations. Given that certain nationalities are restricted in terms of entering specific countries, a project manager's nationality may play an implicit role in allocation decisions, particularly if international business travel is required. This has implications on the ability of the project manager to obtain visas for international travel, as part of his/her mandate to manage projects.

Project manager's health condition – the concept of an employees' physical and mental status, in the context of ability to perform a job, is discussed in existing literature [178, 179]. However, this concept has not been discussed specifically in relation to criteria to be included in the PM2P allocation process. A project manager's health condition is related to ability to manage projects on a continuous basis, without interruptions from illnesses and absenteeism. Bockerman et al. [178] postulate that *"sickness absences cause a substantial reduction in working time"* (p. 589). The implications for this study is that this may affect his/her ability to lead projects on a continuous basis due to sickness absenteeism, leading to an impact on project delivery, particularly if it occurs at critical project phases when he/she is most needed. The contention is that this input is likely to be considered (implicitly) during PM2P allocations, and hence included under what the authors termed "unofficial inputs".

Project manager's cultural fit/Personality – this relates to ability of a project manager to lead projects by leveraging on his/her stakeholder management skills in terms of issues such as "political sensitivity" [101, 180]. Adobor uses the phrase *"political skills"* (p. 165) to highlight the importance of a project manager's cultural fit in successful management of projects [181]. In a similar vein, Birkhead et al. discuss the personality traits of a project manager in their empirical study of core competencies required of project managers in the context of South Africa's information technology, construction and engineering industries [144]. Although the concept of cultural fit may well be classified under a project manager's competencies, it has been identified as an independent inclusion in the proposed model to explicitly recognize the ability to work across and adapt to different cultures, values and beliefs, given globalization issues in today's business dynamics.

Location of project – Kuprenas et al. [139] discuss the geographic location of a project as an influence to project delivery and success. Owusu et al. [20] discuss the need to know the location of the work to be completed, in relation to the location of the required resources to be deployed, in context of resource planning and scheduling; within the broader field of resource management. Although not mentioned in the context of PM2P allocation models, the implications of these studies lie in the potential to influence the allocation decisions, on the basis of the distance between the project sites and the project managers (to be allocated to the projects in those sites) location, which plays a role in communication effectiveness and quality of project delivery (both of which have an impact on the allocation decision).

Decision maker's self-interest – this recognizes the fact that a decision maker may have personal interests on the delivery (success or failure) of certain projects, based on his/her authority in relation to the allocation decision [21].

Location of project manager – Owusu et al. [20] discuss the importance of information regarding the location of the required resources to be deployed, in relation to resource planning and scheduling, under the universal theory of resource management. Although not previously discussed in the specific context of PM2P allocation models, this implies that the location of a project manager is an important consideration in the PM2P allocation decision, for similar reasons given under location of project.

Details of the other inputs presented in Figure 6 that have already been mentioned in existing frameworks

Workload/resource availability – this refers to the effective capacity of a project manager in terms of how much time is actually committed to performing project activities and not overhead time such as time spent carrying out administrative work or other non-project work, including holiday [173, 175, 176].

Project phase mix – this is related to the ability of a project manager to simultaneously lead concurrent projects in particular phases, without an impact on his/her productivity. Since the project management effort required of a project manager varies on the basis of project phase, this has implications on the allocation decision [17, 18].

Organizational rules and regulations – several authors discuss the concept of a company 's rules and regulations dictated by top management under different contexts. This include issues such as company processes and procedures, all of which affect the delivery of projects [22, 86, 117, 120]. Other issues under the concept of company rules, the authors argue, include: company legislation, agreements on recruitment and outsourcing in terms of limits on the number of projects that can be taken on board for implementation (related to budget constraints). These issues have implications in view of playing a role in the PM2P allocation process.

Project interdependencies and interactions – this relates to the possibility that certain projects, which have strong interdependencies and interactions [10, 15, 185], should be managed by the same project manager, where possible [4].

Special requirements – these signify requirements of certain projects that call for specialist competencies that are only possessed by specific project managers, as influenced by different stakeholder views on project manager credibility [17, 18, 49, 82].

Project manager's personal interests – this relates to specifically accommodating a project manager's personal preferences in terms of his/her development in the allocation decision [4,19, 82], also referred to as a fixed assignment constraint in the context of optimization modeling.

Project manager's age, gender and marital status – these three fall under what the authors refer to as the six "unofficial factors" that play a role in the PM2P allocation decision, since they may violate HR regulations (depending on context) but still play an implicit role in the allocation decision. A project manager's age [100, 177, 180, 181], gender [177, 186] and marital status [101], are related to the concept of work-life balance or more specifically, the need to balance employment and family responsibilities [179, 187]. El-Sabaa support the input, project manager's age, in terms of enhancing the selection, training and performance of effective project managers in the context of Egypt [100]. All these three inputs play a role in PM2P allocation decisions.

Project type mix – given that different project manager competencies are appropriate for different types of projects with varying levels of complexities [72, 73, 88, 184], the types of projects is a limiting factor that affects the choice of project manager and hence the PM2P allocation decision.

Strength and availability of support staff – Patanakul et al. [4] assert that the project management effort required of a project manager varies on the basis of his/her project team strength and availability. The contention is that a project manager's productivity may increase, if leading a project in which the project team is strong, since the project manager will be freed from managing details.

Decision maker's personal preferences – this relates to the level of trust a decision maker has on a particular project manager to succeed in managing a certain project [4].

Continuity in delivery due to re-allocation – this relates to ability of a project manager to manage the potential discontinuity in the delivery of a project, following re-allocation to a project that was managed by a different project manager [17, 18].

Project team dispersion – this input defines the nature of the project management team set-up in terms of geographic distribution of the project team [17, 18]. This affects efficiency of both communications and project delivery and hence viewed as an influencing factor on the PM2P allocation process.

Stakeholder trust on project manager – Einsiedel Jr [182] discuss the level of trust that stakeholders have on the credibility of a project manager in terms of his/her ability to lead projects to success. This is supported by empirical studies of Patanakul [4, 18, 82], in relation to models for allocating multi-project managers to projects.

Following consideration of both the strategic importance of each project and recognition of all the constraints, the project manager-to-project matching process can then be conducted, consistent with the logical sequence of the conceptual model elements. An exploded view of the project manager-to-project matching process, within the PM2P allocation process, is depicted in Figure 7.

The four inputs in bold fond (Figure 7) are discussed in existing literature under different context but have not been included in existing models as criteria to be considered in PM2P allocations. Details of these four inputs, representing new additions to existing framework, are provided below.

Explanations of the 4 new additions to existing framework

Project manager development – this input is related to the concept of employee development [144] as part of effective human resource management practices of training, up-skilling and retaining talent [196], with the aim of building *"competitive advantage"* and the company's *"knowledge assets"* (p. 81). Other related studies discuss the concept of project team development and highlight its importance in relation to project manager competencies [8, 183, 195], but not in the context of PM2P allocation models.

Number of Project managers – this relates to the supply of project managers as the types of resources to be allocated to projects [106].
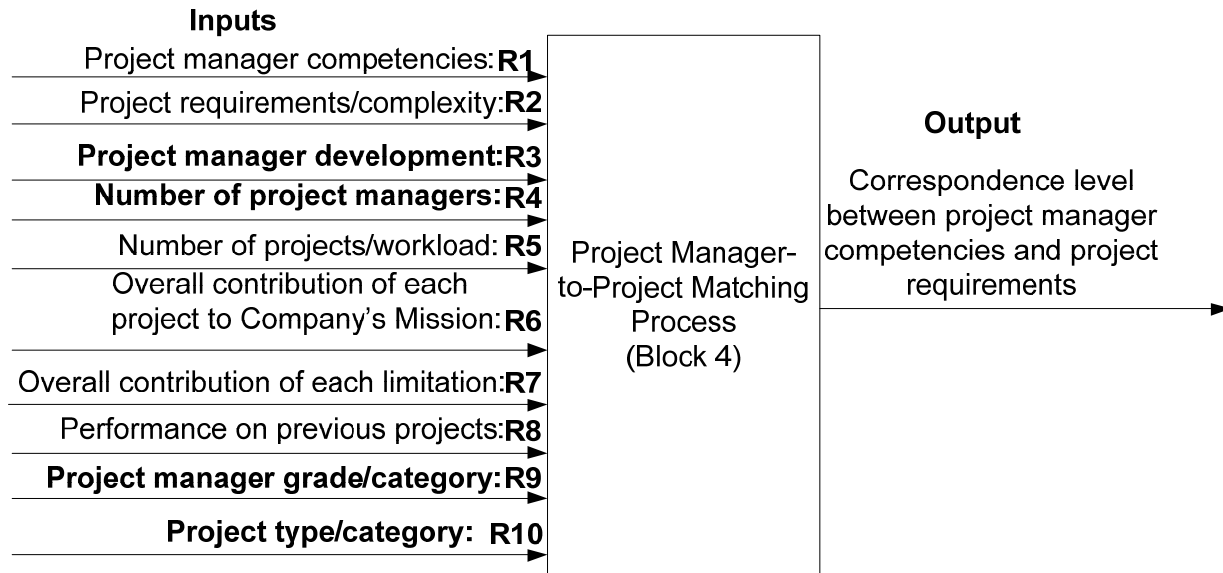
Inputs

Project manager competencies: **R1**

Project requirements/complexity: **R2**

Project manager development: R3

Number of project managers: R4

Number of projects/workload: **R5**

Overall contribution of each project to Company's Mission: **R6**

Overall contribution of each limitation: **R7**

Performance on previous projects: **R8**

Project manager grade/category: R9

Project type/category: R10

Project Manager-to-Project Matching Process (Block 4)

Output

Correspondence level between project manager competencies and project requirements

Fig. 7. Project manager-to-project matching process (Model block 4, inputs block C)
Note – **R1**:[17, 19, 68, 90, 92, 98, 100, 103-105, 109, 141, 177, 188-192], **R2**:[2, 15-17, 100, 104, 105, 157, 188, 193, 194], **R3**:[8, 97, 144, 183, 195], **R4**:[106], **R5**:[4, 17, 20, 106], **R6**:[3, 17], **R7**:[17], **R8**:[104, 105], **R9**:[72], **R10**:[72, 73]

Project manager grade/category – this relates to the seniority of a project manager (e.g., assistant project manager, senior project manager) in relation to an indication of the extent of capability and experience in managing projects [72, 73].

Project type/category – this relates to the category of a project, in relation to the concept of project complexity, which influences the category or grade of project managers required to lead such projects [72, 73].

Details of the other inputs presented in Figure 7 that have already been mentioned in existing frameworks

Number of Projects/workload – the number of projects indicates the demand or workload, in terms of the portfolio of current projects to be executed as a vehicle to achieve the company's strategic goals [4, 17, 20, 106].

Performance record – concerned with the performance of a project manager on previous projects [101]. This addresses questions such as; what portfolio of projects has the project manager led in the past? and what are his/her performance evaluations on those projects? Hadad et al. [105] contend the importance of feedback on a project manager's performance from other stakeholders as part of performance evaluations. These evaluations, the authors argue, can be readily available to be used as guidelines in PM2P allocations.

Project manager competencies – this refers to a continuum of skills, knowledge and behaviors required to lead different types of projects with varying complexities. There are 3 application areas of competence and competency models namely: (1) skill assessment, (2) recruitment and (3) development [90, 141, 197]. Although the English dictionary does not make a distinction between the terms 'competency'

and 'competence,' the literature suggests that competence is associated with achievement of a minimum standard of performance, while competency is associated with excellence in performance. These concepts include domain knowledge, which refers to specific industry experience required to understand the work content in which the project is based. Ogunlana et al. [101] include criteria such as project manager's performance on previous projects, qualifications and management capability, in their framework for matching project managers to construction projects. One of Crawford's [141] data collection instruments, in her international 3 year empirical study on project management standards across several Countries, in the context of assessing project management competence, includes qualifications and experience based on PMI's framework regarding PMP Certification [90, 197]. These concepts are covered in the proposed conceptual model under project manager competencies, on the basis that they are components of a project manager's competency. The concept of project management competence is broad and discussed by a plethora of articles under different contexts. For example, Partington [198] discusses it in the context of its importance to capability of both project managers and program managers in large organizations that implement projects with a *"technological dimension"* (p. 87). An important point to underscore is the various studies that support the concept of a project manager's competency, as part of validating this input in the developed conceptual model.

Project requirements/Complexity – this is concerned with the demands of a project in relation to its characteristics, which dictates the required project manager capabilities. Other key aspects of project complexity, as per the outcome of a content analysis (Table IV), contended by several

researchers include: resources and people [10, 15, 60], managing uncertainties/risks [52, 57, 154], planning (strategic and tactical) and controlling [43, 94, 185]. All of these issues, geared towards addressing particular business needs, define project complexity and related to the concept of project requirements, which in turn, influence the PM2P allocation decision.

Overall contribution of each project to Organization's Mission – this is concerned with a determination of the impact of each project to the company's mission, cascaded into key business imperatives. This has a direct influence on the choice of project manager, based on the required competencies to match the demands of each project.

Overall contribution of each Limitation/Constraint – concerned with a determination of the impact of each limitation (both organizational and personal limitations of the candidate project manager) to the allocation decision. This takes account of factors such as risks of project failure, on the basis of the allocation decision.

The project manager-to-project matching process (Figure 7) incorporates project manager competencies (which include domain knowledge) and project requirements (which include the concept of project complexity) as part of the criteria to determine which project managers should be allocated to which projects [4]. The inputs to this process are: the available project managers, number of projects to be taken on board for implementation, management tools and techniques to measure the level of match between project manager competencies and project requirements, as well as the organizational dimensions which influence the allocation decisions. Project requirements, in the context of a multi-project environment, covers a wide range of issues as per the results of the content analysis presented in Table IV. The output is the extent of match between available project manager competencies and project requirements. Blismas et al. [44] contend the view that an understanding of *"project requirements or characteristics"* (p. 358) is important to enable project success, including management techniques that suit the project requirements. Ireland [77] expounds this view by asserting that categorizing projects into different types helps to determine what resources and effort would be required to execute the project.

V. CONCLUSIONS

This study set out to develop a conceptual model for understanding the PM2P allocation process in multi-project environments. Content and thematic analysis of the identified literature, including expert reviews, were implemented as methods to construct the proposed conceptual model presented in section IV, as part of the evidence regarding verification of the model structure and content. Several gaps were identified in existing models and addressed in the proposed framework, in the context of furthering the understanding of existing theory on PM2P allocation

processes. The following significant additions were made to existing framework:

➤ Contextual elements (5 internal and 7 external factors) that influence the PM2P allocation decisions, based on context;

➤ 2 feedback loops between the model elements, to permit continuous improvements and more effective PM2P allocation processes;

➤ General theme of inputs (i.e., 12 new additions under exploded views of the proposed conceptual model) that have to be considered as criteria for effective PM2P allocations. These 12 new additions comprise 8 additions under the recognition of limitations process (Figure 6) and 4 additions under the project manager-to-project matching process (Figure 7);

➤ Appropriate symbols to represent the structure of the proposed model, consistent with process mapping theory;

➤ Clear distinction between the use of terminology used in existing literature (i.e., "project assignments or allocations" and "project manager assignments or allocations"), to avoid confusion and improve the understanding and application of future models in studying the concepts of PM2P allocation process. This is consistent with Crawford's assertions regarding a shared understanding and consistency in the use of basic project management terminology, irrespective of location within the global world [141];

➤ Comprehensiveness in relation to a list of 38 important factors to be considered, both within and outside the immediate scope of the project management function, that play a role in the PM2P allocation process;

➤ Generic nature of the proposed model (from explicit recognition and inclusion of contextual factors). The proposed conceptual model may be used by other researchers to study the multi-project manager allocation practices in other countries, industries and project types, taking into account the contextual elements that will influence the allocation decisions. This implies that the conceptual model developed in this study has capacity to stand up to scrutiny in terms of a framework that can be applied by other researchers as a theoretical lens to examine multi-project manager allocation practices under different contexts.

The modifications of existing project manager allocation models on the basis of broader management theories (identified in section II) that include generic inputs or factors, is envisaged to improve the project management body of knowledge, in terms of project manager allocation models. This study is among the first to add to the existing framework in terms of a comprehensive and generic conceptual model that can be used by other researchers as a theoretical lens to study PM2P allocation processes used in project based-organizations, with a view to improve processes and hence organizational performance [18, 139, 156].

VI. FUTURE RESEARCH

Following the development of a conceptual framework, informed by existing literature as part of the first source of evidence to verify the developed framework, the next steps are to use or deploy the developed conceptual model as a theoretical lens to study the PM2P allocation process, with a view to identify and demonstrate the gaps and strengths in current processes. Completion of this next step, which is beyond the scope for the current study, represents the second source of evidence as regards validating the conceptual framework in the context of establishing its robustness and comprehensiveness, in light of determining whether its application in practice can result in significant structural modifications.

ACKNOWLEDGEMENTS

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