Learning from Projects: A Life-Cycle Perspective

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Despite the vast amount of words written on project management and the volume of project work managed by project-based organizations, organizations fail to learn from their success and failures and transform them into improved project and organizational performances. In addition, projects are becoming increasingly complex and constrained. Hence, it is no longer sufficient for project-based organizations to rely on mainstream views of project management. Researchers and practitioners need to move beyond this and embrace a more holistic view of managing projects: not just by applying emerging theories such as program and portfolio management but also by developing more robust learning practices that can enable organizations and their members to implement these lessons across projects. This learning promotes the improvement of an organization's project and organizational performances, as well as optimizing value generation for the owner/sponsor from their constructed facility.

INTRODUCTION

Contemporary perspectives of project management characterize projects as: independent, unique and temporal in nature; having a project life-cycle and operational life-cycle that are clearly separated from each other.

The authors posit that these perspectives have shortcomings, and that it is necessary to change this mindset and move towards a more holistic approach in managing projects through more robust learning practices in place within organizations.

The discussions in this paper occur in the following manner: It comprises three sections. The first section addresses two issues of contention regarding the definitions of 'life-cycle'. This is necessary to gain a common understanding of the life-cycle terminologies to be used as the basis of this paper's discussions. The following sections will each address one of the two contemporary perspectives of project management focusing on their shortcomings, and finally proposals to address the shortcomings.

THE PROJECT LIFE-CYCLE: CLARIFICATION OF DEFINITIONS

Confusing Definitions of 'Project Life Cycle'

To provide an accurate and certain definition of the 'project life-cycle' is difficult. This is because despite the extensive literature on the management of projects, there is still endless confusion over what the 'project life-cycle' is (Fish 2003). Some definitions were written specifically to suit the

context in which the life cycle/phases were developed; for example, the various industries such as chemical processing industry, defence, construction, information technology, and production; while other definitions are generically developed (i.e. non industry specific) for project-based organizations. The lack of convergence on the definition of a project's 'life-cycle' is clearly evident from the range of alternatives in literature.

Three predominant groups of definitions (see ***Table 1***) are espoused below in no specific order.

Table 1: Predominant Definitions of the 'Project Life-Cycle'

Adams and Brandt 1983; Pinto and Selvin 1988; Pinto 1995; Mian and Dai 1999; Cleland 1999	**Stuckenbruck 1981; Kerzner 1989; Cleland 1990; Kerzner 1995; Cleland 1999**	**PMBOK 1987; Webster 1993**
Conceptualization	Conceptualization (initiation)	Feasibility (concept & development)
Planning	Definition (growth/organization)	Acquisition (implementation-
Execution	Production (acquisition)	definition, procurement and execution)
Termination	Operational	Operation
	Divestment	Disposal

The first group of definitions comprise that of: *conceptualization, planning, execution and termination* used by Adams and Brandt (1983), Pinto and Selvin (1988), Pinto (1995), Mian and Dai (1999), and Cleland (1999). Slight variations to this include: *conceptualization, planning, implementation, phasing-out* as used by Cavendish and Martin (1982); *conceptualization, planning, testing, implementation and closure* by Kerzner (2003); *conceptualization, development, implementation (execution), and termination* by Burke 1999; *conceptualization, definition, execution, and closeout* by Archibald 2003; *conceptualization, definition, execution, finish and closeout* by Fish 2003; *conceptualization, development, implementation, and termination* by Carmicheal (2004); *conceptualization, definition, execution, turnover and divestment* by Ritz (1994); *conceptualization, development/definition, execution and close-out/finish* by Shenhar and Wideman (2000); *conceptualization, definition, development, execution and delivery* by Morris (2003); *selection, planning, execution, termination* by Hormozi, McMinn and Okeleke (1984) (adapted from the project life cycle phases of Ruhl (1988)); *conceptualization, planning, definition and design, implementation, and conversion* by Kerzner (1995); *initiation, planning, execution, controlling, and closing* by Clark T.A. (2002); *initiation, planning, executing, controlling and evaluating* by Adams and Caldentey (2004); *initiation, planning and developing, implementing and close-out* by Frame (1998); *definition, planning, executing and controlling, and close-out* by Ireland (2004); *initiation, definition, implementation and completion* by Allen (1991); *conceptual planning, process organizing, implementing and controlling, and evaluation and system improving* by Kloppenborg and Petrick (1999).

The second group comprise that of: *conceptualization (initiation), definition (growth or organization), production (acquisition), operational, and divestment (includes termination)* by Stuckenbruck (1981), Kerzner (1989), Cleland (1990), Kerzner (1995), and Cleland (1999).

The third predominant group comprise that of: *feasibility (concept and development), acquisition (implementation- definition/procurement and execution), operation, and disposal* by PMBOK 1987, and Webster 1993). Slight variations to this are those of: *inception (strategy), feasibility (brief),*

scheme/system design (execution plan), procurement (detailed design, contracting, execution), commissioning and start-up, acceptance, post-completion evaluation by Morris (1998), and those of *study period (user requirements definition, concept definition, system specification, acquisition planning), implementation (source selection, system development, and verification), operations (deployment and operations/maintenance)* by Forsberg, Mooz and Cotterman (2000).

Primarily for purposes of this paper, the 'project life-cycle' definition of conceptualization and initiation, planning/definition/design development, execution/implementing and controlling, and termination (commissioning and handover) *(adapted from the definitions in the first column of **Table 1**)* will be used as the basis of this paper's discussions.

The 'Life' of a Project: 'Life-cycle' or 'life-span'?

To add to the confusion there is also the contention as to whether the 'life' of a project should be appropriately termed 'life-cycle' or 'life-span'.

Based on contemporary thinking, projects are managed individually due to their unique and temporal nature; resulting in no or little possibility of learning opportunities across projects. This interpretation is used in most of the literature. In this case, the 'life' of a project could then be termed a 'life-span'.

However, if projects are perceived as being managed as collective entities in relation to the organization's business environment and where lessons learnt are captured and applied across projects (i.e. 'cross-project learning'), the entire 'life' of a project may than be suitably termed a project 'life-cycle'. Similarly, the projects' operations could also be included in the life-cycle if such lessons-learnt practices are appropriately effected.

In this paper, the life of a project will be termed 'life-cycle'. The term 'project life-cycle' will be used to identify the life of a project from concept through planning, design development and execution till project completion and handover, while the term 'operations life-cycle' will be used to identify the maintenance and refurbishment phases of the constructed facility up till its decommissioning and disposal.

CONTEMPORARY VIEWS OF PROJECT MANAGEMENT, THEIR SHORTCOMINGS AND PROPOSALS FOR ADDRESSING THEM

For purposes of this paper, the two contemporary views of project management will be referred to as 'Contemporary View No. 1' and 'Contemporary View No. 2'.

CONTEMPORARY VIEW NO. 1

The Individualistic Nature of Projects

Contemporary mainstream thinking of project management has been grounded in a "lonely project perspective" (Kreiner 1995) in which a project is characterised as being unique (i.e. a one-off, and non recurring task or activity- where a product is different in some way from other similar products) (Pinto 1995; Archibald 2003; Williams 2003; Barber 2004), and temporal (i.e. having a fixed beginning and a definite end- a definite life span) (Pinto 1995; Brusoni 1998; Burke 2003) in nature.

Shortcomings
There are several shortcomings to this perspective (***Figure 1***):

Firstly, the scope of a project's organizational context is too narrow. Although past research has shown that the implementation of an individual project is closely coupled to its organizational environment (Engwall 1992; Eskerod 1996; Blomquist & Packendorff 1998), contemporary thinking of project management does not take into consideration the organizational environment in which the project is situated.

Secondly, the time frame is totally self-contained. Based on the contemporary perspective, every project is a unique undertaking where each project entails heterogeneous activities that may well not be repeatable in successive projects (Prencipe 2001). Often, it is easier to say this in order to avoid the discipline of drawing experience from the project before which may not have been that different (Barnes and Wearne 1993). Such a mindset results in project-based organizations rarely exploring the reasons for success and failure, rarely adapting management behaviour in light of these lessons, and confronting them with the difficult task of being able to learn from their previous or other projects.

Should construction organizations maintain their contemporary mindset they are unlikely to gain from experiences of past works or from others and will be unable to systematically extract and disseminate management lessons as they move from project to project; thereby prohibiting project and organisational improvement. Studies have shown that a large amount of project assignments are of a repetitive kind, with little deviation in relation to preceding projects of the organization (Kadefors 1995, Obeng 1995 and Turner & Cochrane 1993) and therefore ideal for implementing improvement. As put by Cooper (1994), 'True systemic causes and transferable project management lessons are there to be learnt'.

Thirdly, current lessons-learnt practices are inadequate. Where these practices are in place in organizations, they are usually achieved through 'end-of-project reviews'. Despite the many practical examples of end-of-project reviews in place in organizations (such as BP's Post Project Appraisal (Gulliver 1987), Ericsson and ABB (Turner *et al*. 2000) etc.), this rarely happens (Keegan and Turner 2001). Often, project team members do not have time to review lessons learnt as they are reassigned almost immediately to new projects before they even have time to perform post-project reviews. This means that project failures and successes are rarely analysed and learning just does not happen. Hence, lessons from failed projects are quickly swept aside, with little effort expended on trying to discover useful lessons that can be carried over to future efforts.

Whilst end-of-project reviews or simple recording of experiences may often be easier for simple projects, complex projects by their very nature exhibit behaviours whose causalities are not clear-cut, hence the simple guidance of listing what happened is now insufficient (Pinto 1999). It is therefore pertinent that organizations utilise methods that can capture the complexity of events and causality, and models that can explain why inputs were as they occurred (i.e. understanding what and why something went wrong) and when (at which phase of the project). This is because the outcomes of large projects are usually messy and historically unclear, hence more robust methods are required to enable learning to occur and capture lessons learnt.

Also, when lessons are identified, they need to be specific to cover the organization and their characteristics (e.g. organizational behaviour). This means identifying similar situations in which a success or failure have previously occurred and applying the lessons learnt to other projects but taking into account the particular context of the project.

The Need to Address the Shortcomings

To address the above shortcomings, it is pertinent that practitioners and researchers change their contemporary mindset and manage projects in a more holistic manner. This is done not only by managing projects collectively but also by having practices that enable an organization and its members to learn between projects which we term 'cross-project learning capability'.

The recent shift of project management theory is evident from literature. Subsequent to criticisms that the theory has narrowly emphasized the satisfying of project constraints and not actively on pursuing business benefits to managing project as collective entities, research has been extended to the management of projects with concepts such as program management, project portfolio management and organizational-level management (Morris 1994; Thiry 2002). Some examples of publications in program management include those of Thiry (2002), and Lycett, Rassau and Artto (2003), while those in portfolio management include those of Kangari and Riggs (1988); Englund and Graham (1999); Ghasemzadeh and Archer (2000); Cooke-Davis (2002a); Cooke-Davis (2002b); Elonen and Artto (2003); and Leliveld and Jeffrey (2003). In addition, PMI's (2003) new organizational project management maturity model, OPM3, has reflected the concept of combing the 'Best Practices' of the three separate domains of project, program and portfolio management.

Simply managing projects as a collective entity by applying program and portfolio management theories is insufficient. It is also necessary to enable organizations with the capability to learn between (across) their projects. It is one thing to say that program and portfolio management is used to manage an organization's projects collectively, and another to say that the organization has the capability to enable their project members to learn from their past projects' experiences and improve their project and organization's performances. The is because cross-project learning not only enables an organization to have a bird's-eye view of all its projects and programs, but also for it to systematically assess and review lessons learnt from one project/program and apply it to another, through its organizational routines and processes. This allows valuable information and knowledge that is accumulated to be articulated and codified between projects: thereby preventing knowledge from disappearing with its project members at the end of a project and from being gained in a 'hit and miss' fashion (Frame 1995).

A Proposal to Address the Shortcomings

This section proposes how cross-project learning may be used to tackle these shortcomings (***Figure 2***).

A project should first be broken down into the different phases (*see definitions of project life-cycle phases at end of Figure 1 and 2*). At the end of each phase, compulsory lessons-learnt session(s) are held using a combination of formal and less-formal learning practices. Lessons learnt at the end of each phase of a project (call it 'stage-gate' reviews) can then be applied to (preferably prior to the start of) the same phase of other projects. Some examples of more formal methods may include internal reviews (e.g. project team review meetings), third party auditing of project, report-back sessions using a predetermined set of criteria, directors' meetings, project managers' meetings, and the use of

database management systems while less formal methods may include departmental and project team seminars, discussion forums and focus groups. This method would be beneficial in the two ways.

Firstly, lessons learnt through a combination of formal and less formal methods would allow the flow and transfer of both tacit and explicit knowledge. The importance of combining tacit and explicit knowledge is also noted by Cooke-Davis (2002a): "an effective means of 'learning from experience' on projects, that combines explicit knowledge with tacit knowledge in a way that encourages people to learn and to embed that learning into continuous project management processes and practices" is one of the twelve key success factors in project-oriented organizations. Less formal methods may enable tacit knowledge to be transferred between project members as they would be able to share their personal 'real-life' project experiences with others; for example, more experienced members would be able to share their experiences much more easily with their younger counterparts explaining how and why something went right or wrong using analogies or metaphors. More explicit knowledge acquired through more formal methods could be retained in a central repository; for example, database or document management systems, tender evaluation systems, contracts administration systems, where organizational members can search for past projects with comparable or similar characteristic to manage their future projects.

Secondly, applying lessons learnt between projects enables a more proactive and preventative approach (i.e. improves the 'foreseeability' of problems) to managing projects as compared to contemporary modes of managing projects which are primarily reactive in approach; For example, project members would traditionally address a problem only when they encounter it - a reactive mode to problem resolution. Resolving recurrent problems may not be difficult for an experienced project member because the member's past experiences and learning curves will allow him/her to begin to anticipate likely problem areas and points of potential difficulty. However, such tacit knowledge gained during a project resides only in the heads of team members. Once a project is completed and members reassigned almost immediately to a new project or when a member leaves the organization, that knowledge disappears with them. It is therefore critical to find ways to retain and improve working knowledge, routines and processes (Carillo *et al.* 2004; Love & Huang 2004).

Despite the importance of having mechanisms in place in organizations to facilitate cross-project learning, top management intervention is also necessary to support and promote a culture that provides its staff with adequate time to reflect on their past actions and encourages them to share their experiences with each other. If such a culture is not forthcoming, project members would not have the opportunity to identify what lessons learnt could be carried over to the next phase or project (i.e. to ensure that cross-project learning occurs); resulting in cross-project learning mechanisms that are in place in organizations becoming largely redundant.

These sections have highlighted the shortcomings that arise when projects are perceived as unique and temporal in nature, and provided suggestions on how organizations may be able to resolve these problems through 'cross-project learning'. This 'picture' is, however, still incomplete because another issue in the contemporary view of project management has been overlooked: the view that 'project life-cycle' (essentially concept, design, construct and handover) and 'operations life-cycle' (essentially maintenance and/or refurbishment) are separated from each other. This more inclusive view is discussed in the following sections.

CONTEMPORARY VIEW NO. 2

The Segregated Project and Operations Life-cycles

The operations phases have traditionally been clearly segregated from the design and construction phases (Arditi & Gunaydin 1998) where a project comes to an end when it is completed, commissioned and transferred to the owner/sponsor. The owner or sponsor will either employ facilities management professionals to maintain and operate the facility in-house or outsource these services. It is also generally understood that facilities management is practiced within the operations phases while project management is practiced within the design and construction phases.

Shortcomings

This perspective poses the following shortcomings (***Figure 1***):

The scope of a 'project' is too narrow: If the 'project life-cycle' is managed separately from the 'operations life-cycle' any consideration for the impact of the design and construction of the facility on the operations stage is seldom or not considered.

Under the contemporary perspective of project management, facilities management professionals are brought into the project at a later stage (usually after the owner/sponsor has taken over the completed facility from the design and construction professionals), and have no or limited role at the conceptual and design phases, resulting in the lack of the maximization of value engineering. For instance, during the early phases of the project, if one does not consider what impact the design and specification of an HVAC system of a particular facility has on the operations phases (e.g. does not consider energy consumption hence reducing operating cost), the owner of the facility may realise at a much later stage that value-generation has not been maximised. In that situation, all the owner or facilities professionals can usually do is to find ways to mitigate those problems during the operations phases. Unless the owner is prepared to litigate, or to make (and pay for) the necessary amendments, there would be little or no opportunity for changes to the system to be made once the facility is operational.

The Need to Address the Shortcomings

The contemporary perspective espoused above is inappropriate - a paradigm shift is necessary. It is pertinent to look at a project in a more holistic manner; from conception to disposal instead of just conception to handover as a project life-cycle has been classically known.

This change in focus is evident from recent publications such as that of Burke (1999) and Burke (2004). Burke (1999) identifies the phases of a project life cycle as concept, design, implementation, and commission, and clearly segregates this from the operation phase (which includes maintenance, upgrading and disposal of project). In Burke (2004), however, he identifies the phases of a project life cycle as concept and initiation, design and development, implementation or construction, and commission or handover, and proposes that the classic project life-cycle is now insufficient. He posits that it is now necessary to look at a wider picture by considering the efficient operation and return on investment of the facility when deciding to build it. Also included is an additional life-cycle to explain and support the need to consider the future performance of the facility. He termed it the 'operations life-cycle'. The 'operations life-cycle' includes three main phases: maintenance phase, up-grade or expansion phase, and the decommissioning and disposal phase. The 'project life-cycle' and the 'operations life-cycle' are then known as the 'product life-cycle'.

Traditionally, the facilities or operations manager only enters the picture on or after the project is handed over from the design and construction team to the owner/sponsor. The facilities or operations managers' opinions are seldom or not sought during the design and construction phases of the project. The facilities manager would then manage the project in the condition it is handed over to them. This means that the knowledge and past experiences of the facilities manager is not optimised and applied at early stages of each project in order to maximise value generation.

A Proposal to Address the Shortcomings

This section proposes how input from facilities professionals at early stages of a project could maximise value generation (***Figure 2***).

In contrast to the contemporary perspective of project management, facilities management professionals should be brought into the early phases (for example, concept or design development phases) of a project life-cycle as early as possible. This would allow them to provide valuable 'lessons-learnt' input (for example, their past knowledge and experience on how to select the appropriate operational assets that can optimise energy efficiency and ensure longer operational life for the assets) together with the rest of the design and construction team. In doing so, the owner/sponsor of the facility could be better assured that the facility has been optimally designed and value-engineered with the maintenance phases in mind. Furthermore, having been involved in the design development and construction phases, the facilities professionals would have a much more robust understanding of the initial requirements and the expected capabilities of the facilities (for example, operational assets such as plants equipment; enabling them to manage and rectify problems more efficiently and effectively.

Such a view is also supported by Morris (1998), Frame (1998) and Kolltveit (2004) who highlighted the need for greater focus on more thorough front-end work (i.e. the early phases) as they were often neglected, and by Youker (1988) who highlighted that 'a related problem is the failure to manage the early stages of the project', and that 'delays are often not visible in the early stages since it is often less expensive to buy time in early stages compared to later ones.' Kolltvei (2004) also added that since the early phase is the phase when the 'technical concept' is developed and as it is the abstraction of the technical solution that satisfies the functional, quality and capacity requirements, decisions regarding the technical concept must be taken in the early phase in order to exploit the potential for value generation (especially the performance of the operational assets).

In addition to the above, lessons learnt practices should also be in place to enable facilities managers to evaluate the systems during the operations stage and compare it against what the system was designed for (provided that information and documents with regards to the system requirements have been adequately and appropriately transferred from the design and construction professionals to the facilities professional (Kenafake 2004). Any variations (whether good or bad) can be recorded and brought across to other projects.

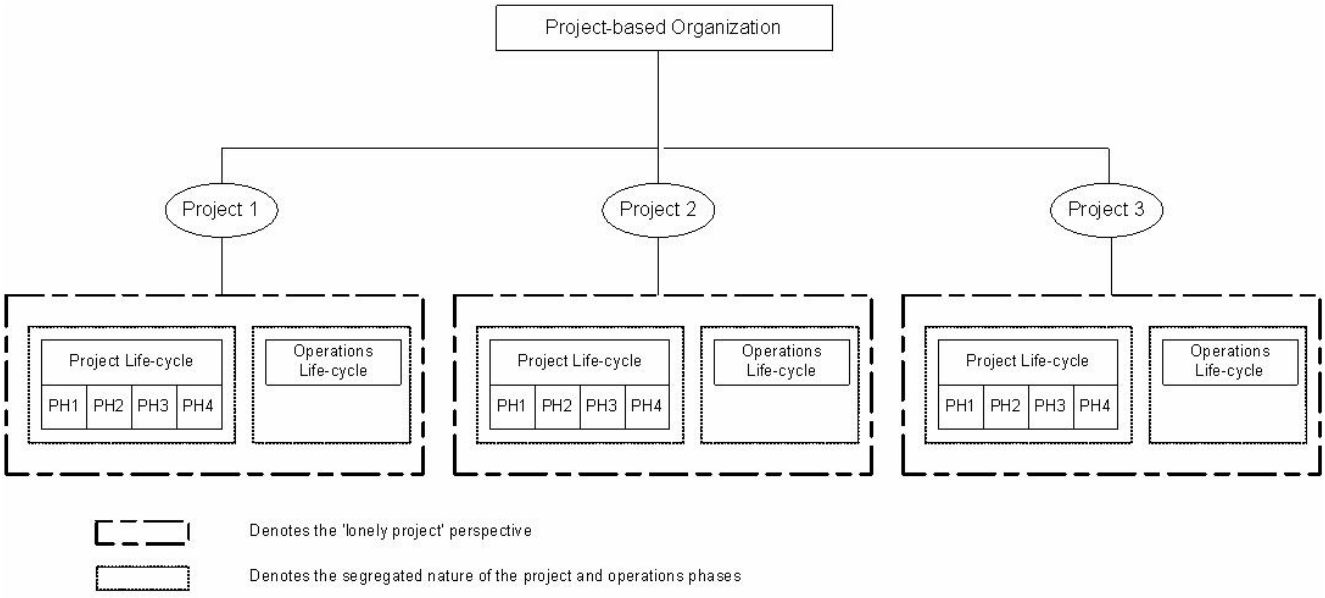

Figure 1: Contemporary Perspectives of Project Management

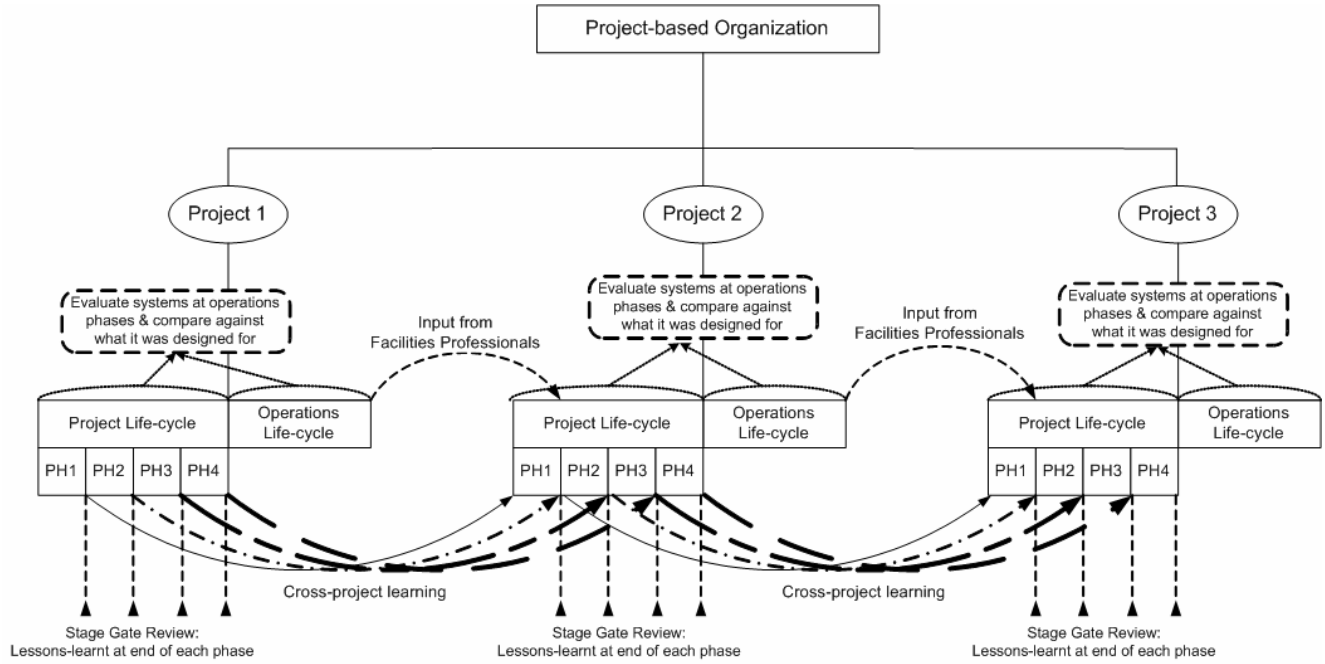

Diagram 2: Enabling Cross-project & Cross-phase Learning

Project Life-Cycle Phases
PH1: *Conceptualization & Initiation*
PH2: *Planning/Definition/Design Development*
PH3: *Execution/Implementation & Controlling*
PH4: *Termination (Commissioning & Handover)*

CONCLUSION

Clearly, contemporary views of project management and current lessons-learnt practices such as end-of-project reviews are now inadequate for the increasingly complex projects managed by project-based organizations. These views limit the opportunity of the organizations and its members to learn from their projects, thereby prohibiting them from transforming lessons-learnt into improved project and organizational performances.

It is therefore pertinent for project management researchers and practitioners to change this mindset and approach the management of projects in a more holistic manner: not just managing projects collectively (for example, applying program and portfolio management) but also by embracing more robust lessons-learnt practices within the organization. This can be achieved by enabling organizations with the capability to learn across their projects and its phases as well as allowing the input of facilities professionals at earlier stages of the project. Such learning capabilities would not only enable project members to apply their experiences across different projects thereby improving their project and organizational performances but also optimizing value generation for owner/sponsor and their constructed facility.

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