

Project Management and Project Portfolio Management in Open Innovation: Literature Review

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Abstract—Managing open innovation is typically viewed as managing a project with a set of expectations. It requires careful planning and proven management principles to enable companies to respond to their needs in the most effective and efficient way possible. However, the literature on integration and comparison among project management, project portfolio management and open innovation principles is limited. Viewing open innovations as a series of separate projects can lead to many problems including those related to transaction costs and risks. This paper extensively reviews the literature of project management, project portfolio management, and open innovation in the hope that these principles can be better integrated and synergized both in terms of the literature and in practice.

I. INTRODUCTION

Competition among businesses has never been fiercer than it is today. Organizations are constantly searching for means to compete and attract more customers by, for instance, providing better quality products and services, faster time-to-market, and more cost efficiency. To be more competitive, innovation is undoubtedly one of the key ingredients to success. When companies stop innovating, their competitors will catch up and make them irrelevant and/ or obsolete. However, relying only on the organization's own innovation capacity may not be sufficient in today's fast paced business environment. One option to innovate is to open the boundaries and organize in-house tasks and/ or outside source activities to accelerate innovation on a project basis. This paradigm is widely known as "open innovation", an open platform around innovations where they can be built upon with an emphasis on collaborating externally and internally.

In many organizations, innovation strategies are implemented through new product development projects (e.g., [1], [2]). Open innovation is no different. It is typically carried out as a unique endeavor with a specific timeframe, budget, and set of expectations. It leverages on the knowledge exploration opportunities and the benefits of project portfolio flexibility in the short term [3]. However, managing open innovation initiatives as a series of separate projects can incur transaction costs and risks [4], if they are not properly planned, executed, and synergized. This leads to the need for more studies on the integration and comparison among project management, project portfolio management and open innovation principles (e.g., [3], [5]). Moreover, little attention has been dedicated to studying the practices of open innovation that occur from project and project portfolio management perspectives. Therefore, this study aims at

explaining the literature of open innovation through the perspectives of project management and project portfolio management.

II. LITERATURE REVIEW

To better understand the topic, the literature on project management, project portfolio management, and open innovation has been reviewed, compared and contrasted.

A. What is a project? What is project management?

A project can be defined in a number of ways depending on the context in which it is used. For example, Oxford dictionary generally defines a project as "*an individual or collaborative enterprise that is carefully planned to achieve a particular aim*" [6]. Professional associations in project management have defined a project in more detailed, specific ways with defined characteristics. For example, a project is:

- "*a temporary endeavor undertaken to create a unique product, service, or result*", as defined by the Project Management Institute (PMI) in the PMBOK Guide, 5th Edition [7].
- "*a temporary organization that is created for the purpose of delivering one or more business products according to an agreed Business Case*", as defined by the Office of Government Commerce in Managing Successful Projects with PRINCE2, 2009 Edition [8].
- "*a unique, transient endeavor undertaken to achieve a desired outcome*", as defined by the Association for Project Management (APM) in the APM Body of Knowledge, 5th Edition [9].
- "*a unique, temporary, multidisciplinary and organised endeavour to realise agreed deliverables within predefined requirements and constraints*", as defined by the International Project Management Association (IPMA) in the IPMA ICB, 4th Edition [10].

To manage a project, there are several different standards. One of the most widely-known standards is the Project Management Body of Knowledge (PMBOK) guide, developed by PMI, the world's largest association for project management practitioners. In the PMBOK guide, PMI defines project management as "*the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements*" [7]. It refers to the management of a project through a structured process that includes multiple phases, from the start to the end, in order to deliver the promised project objectives.

B. What is project portfolio management?

Above the level of project management is project portfolio management. It is critical since many companies are doing more than one project at a time and many more are waiting in the pipeline. The PMI defines project portfolio management as the coordinated management of one or more project portfolios to achieve organizational strategies and objectives [11]. Similarly, but more specifically, the IPMA defines it as a set of projects and/ or programmes, which are not necessarily related, brought together to provide optimum use of the organization's resources and to achieve the organization's strategic goals while minimizing portfolio risk [10]. Thus, a portfolio in this sense refers to a collection of projects and/ or programmes that are grouped together to facilitate effective management to meet strategic business objectives and to maximize projects' impacts to the overall success of the organization [11]. The term "effective" couldn't be more emphasized. The emphasis is more on doing the right projects than doing projects right as in the case of project management.

While project portfolio management typically consists of multiple projects, it is more than managing multiple projects concurrently and repeatedly. Synergy and holistic mindsets are crucial to deliver and maximize the required business results. For example, project portfolio management is less operational and more strategic in nature than project management. According to PMI [7], projects have defined objectives, and scope is progressively elaborated through the project life cycle. Portfolio of projects, in contrast, has an organizational scope that changes with the strategic objectives of the organization [11]. It is generally used to identify, categorize, monitor, evaluate, select, prioritize, balance, and authorize projects within the organization [11].

C. Professionalism and the body of knowledge of project management and project portfolio management

Project management and project portfolio management have been generally recognized as the professional entities by the community at large, each of which has its own body of knowledge and standards. Being professional, there are more than 70 associations related to project management around the globe [12], some of which are highlighted in Table 1.

D. What is open innovation?

Henry Chesbrough, a scholar who popularized the term open innovation, indicates a new paradigm for management in which "firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology (page xxiv)" [13]. This new paradigm is called "open innovation." It redefines how the firms manage their research and development activities/ projects from the traditional closed model where companies gain their competitive advantage from their internal funding for internal R&D operations, to the new mode of finding innovation from the outside as well as sharing its own innovation with others. This idea of opening up the innovation process to external entities is not entirely new. The literature regarding this practice uses various terminologies such as user centric innovation [14], lead user innovation [15], [16], wisdom of the crowds [17], and wkinomics [18]. For open innovation, distinct directions of innovation flow between the firm and its counterpart, with the new ideas either flowing into the firm or flowing out of the firm. The inflow of ideas and innovations from external sources is called inbound open innovation [13] while the outflow of ideas and innovation from the firm to external parties is called outbound open innovation [19], [20], [21]. There is also the coupling effect of both outside-in and inside-out processes which is referred to as the coupled process or co-creation [22]

TABLE 1: MAJOR ASSOCIATIONS IN PROJECT MANAGEMENT AROUND THE WORLD

Associations	Project Management and Project Portfolio Management Standards	Focus	Headquarter	Remarks
Project Management Institute (PMI)	"PMBOK" or A Guide to the Project Management Body of Knowledge (5 th edition, 2013)	Process groups and knowledge areas	US	PMI is the world's biggest association for project management professionals
	The Standard for Portfolio Management (3 rd Edition, 2013)	Process groups and knowledge areas		
Association for Project Management (APM)	APM Body of Knowledge (6 th edition, 2012)	Dimensions of professionalism	UK	APM is the largest professional body of its kind in Europe
International Project Management Association (IPMA)	IPMA Individual Competence Baseline (version 4, 2015)	Competence elements	Switzerland	IPMA is the world's first project management association
	IPMA Project Excellence Baseline (version 1, 2016)	Foundation, reinforcement, and proof of excellence		
	IPMA Organisational Competence Baseline (version 1.1, 2016)	Competence elements		

In the past decade since the term open innovation was coined in 2003, there are a number of studies including academic research as well as industrial practices covering the concept and the application of open innovation in different industries. For example, the literature review article by Huizingh [23] addresses the questions of what open innovation is as well as when and how to use open innovation. Huizingh also points out that the prior literature mainly focused on the early adopters of the concepts, and the lessons learned from the early adopters might not necessarily be true when applying the concept in different companies and industries [23]. In addition, Elmquist, Fredberg, and Ollila [24] review the literature on open innovation in different research themes and identify two dimensions which distinguish open innovation processes from other innovation processes. The two dimensions are known as the locus of innovation process and the extent of collaboration. Furthermore, Gassmann, Enkel, and Chesbrough [25] suggest nine different perspectives in the development of the open innovation concept which are spatial perspective, structural perspective, user perspective, supplier perspective, leveraging perspective, process perspective, tool perspective, institutional perspective and cultural perspective.

It can be seen that the literature on open innovation covers the broad perspectives of the concept. These studies serve as basic building blocks for further development of open innovation. In addition to these foundation studies, there have been a number of attempts to apply the open innovation concept to other technology management fields such as in the work of Lee, Park, Yoon and Park [26], which explores the possibility of SMEs utilizing open innovation through the support of an intermediary organization that supports and facilitates innovation. Along the same line, this paper also contributes to the body of knowledge of project management, project portfolio management, and open innovation as explained in the following analysis section.

III. THE ANALYSIS

A. Process perspectives: comparisons

According to PMI [7], [11], a structured process of project management and project portfolio management can be largely classified into certain groups for better management and control. Project management process groups consist of initiating, planning, executing, monitoring and controlling, and closing processes (or 47 sub-processes), whereas the

project portfolio management process groups consist of defining, aligning, and authorizing and controlling processes (or 16 sub-processes). To explain open innovation through this perspective, the process of open innovation in the firm can be put into stages similar to the well-known change management model proposed by Kurt Lewin: unfreezing, moving, and freezing [27]. First, the open innovation activity begins from leveraging of individual social networks (unfreezing), then continues on switching of individual social networks to a firm-level exploration network (moving), and finalizes by establishing long term collaborations with outside entities such as universities, research centers, or other firms (freezing) [28]. There is also another model introduced by Slowinski and Sagal called “Want, Find, Get, Manage” [29] that offers rational thinking to the firm that tries to adopt open innovation practices. This simple yet intuitive model breaks the lifecycle of open innovation into four phases and allows the firm to embrace open innovation into its strategy by first asking the question of what information or asset the firm *wants* in order to meet its objective. Then the firm must proactively *find* that asset by using various means to *get* it through collaborative efforts and relationships which need to be *managed* effectively.

Table 2 shows the processes of these principles.

B. Success measure perspectives: comparisons

The success of project management and project portfolio management can be further distinguished by their nature. Since project management focuses on the management of a project, success is typically measured by product and project quality, timeliness, budget compliance, and degree of customer satisfaction [7]. Project portfolio management, in contrast, focuses more on business results and therefore the success is measured by the aggregate investment performance and benefit realization of the portfolio [11]. As for open innovation, similar to the measure for success of any kind of innovation, the success of open innovation is typically measured by the return on investment of inbound innovation (generation of new product and process) and outbound innovation (generation of profit and/or strategic partnership). In other words, the success of open innovation can be viewed as the level of innovativeness of the firm which in turns drives the sales volume and/or market acceptance of the firm’s new products [30].

Table 3 displays the success measures of these principles.

TABLE 2: PROCESS GROUPS OF PROJECT MANAGEMENT, PROJECT PORTFOLIO MANAGEMENT, AND OPEN INNOVATION

Project Management Process Groups	Project Portfolio Management Process Groups	Open Innovation Process Explained by Kurt Lewin’s Change Management Model	Open Innovation Process Explained by Slowinski and Sagal
Initiating	Defining	Unfreezing	Want
Planning	Aligning		Find
Executing		Moving	Get
Monitoring and controlling	Authorizing and controlling		Manage
Closing		Freezing	

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TABLE 3: SUCCESS MEASURES OF PROJECT MANAGEMENT, PROJECT PORTFOLIO MANAGEMENT, AND OPEN INNOVATION

Project Management	Project Portfolio Management	Open Innovation
Success is measured by product and project quality, timeliness, budget compliance, and degree of customer satisfaction	Success is measured in terms of the aggregate investment performance and benefit realization of the portfolio	Success is measured by the return on investment of inbound innovation (generation of new product and process) and outbound innovation (generation of profit and/or strategic partnership)

C. The practices of open innovation through the lens of project management and project portfolio management

An example of good practices in open innovation can be seen from the model of Slowinski and Sagal [29]. The practices are based on the observation of the authors from the actual efforts of open innovation among firms in various industries, such as the pharmaceutical, consumer products, foods, electronics and chemical industries. Table 4 illustrates the detailed description of the aforementioned practices in each phase of the open innovation effort.

More recently, in 2013, the Project Management Institute (PMI), in partnership with the American Productivity & Quality Center (APQC), the nonprofit leader in benchmarking and best practice research, published a report that was done by extensively analyzing several leading organizations with multiple years of experience implementing open innovation practices (Amway, British Telecom, Cisco Systems, Inc., Corning Incorporated, and General Mills). Based on the report “*Open Innovation: Enhancing Idea Generation through Collaboration*” [31], there are 11 open innovation best practices across four areas (strategies, roles, processes, and measurement/ improvement). According to the

report, these best practices, if implemented properly, should lead companies to a faster response to strategy opportunity and shorten the decision or production review cycles [31]. The following table summarizes their findings.

Although there is currently no single best way of managing open innovation, these studies provide proven ways of how to practice open innovation done by experienced global organizations in the real world. Figure 1 shows the relevance of their findings through project portfolio management and project management perspectives.

The “Want” and the “Find” practices can be generally mapped to “innovation strategy” and “innovation roles” respectively due to their strategic nature. What are the needs and how can they be found should be targeted, needs-based and closely aligned to the organization’s strategy [29] [31]. Project portfolio management can play an important role as the management system to align such needs with strategic business objectives and to maximize their impacts to the overall success of the organization (through defining, aligning, and authorizing and controlling process groups of project portfolio management).

TABLE 4: GOOD PRACTICES IN OPEN INNOVATION FOR THE “WANT, FIND, GET, MANAGE” MODEL

Want Practices	Find Practices	Get Practices	Manage Practices
<ul style="list-style-type: none"> • Incorporate external thinking into the strategic planning process • Convert planning outcomes into a set of prioritized Want Briefs • Utilize a structured process for the Make/Buy/Partner decision 	<ul style="list-style-type: none"> • Look inside first • Treat the Find effort as the bilateral process • Use information gather in Find to refine the Want Brief 	<ul style="list-style-type: none"> • Establish and maintain internal alignment • Use a structured process for internal planning and negotiations • Negotiate with a focus on “Win-Win-Lose-Lose-Lose” 	<ul style="list-style-type: none"> • Hold a kick-off session to enable the integration of management systems • Use the kick-off session to make sure that both firms have the same understanding of operating principles established in the agreement • Train managers in both firms in the principle of conflict resolution

TABLE 5: OPEN INNOVATION BEST PRACTICES BY PMI AND APQC

Strategy	Roles	Processes	Measurement/ Improvement
<ul style="list-style-type: none"> • Focus on targeted, needs-based open innovation • Partner broadly across a variety of external and internal organizations* • Position the organization to build and manage key relationships • Allow open innovation maturity to drive the approach to intellectual property ownership 	<ul style="list-style-type: none"> • Build a central dedicated group to drive open innovation* • Find team members with specialized skills and backgrounds 	<ul style="list-style-type: none"> • Integrate and align the process with other relevant processes to ensure that key entities are involved • Embrace broad and specific scouting for new ideas • Invite participation in open innovation via experience* 	<ul style="list-style-type: none"> • Find compelling measures • Use change management to drive commitment

* Denote the top three best practices

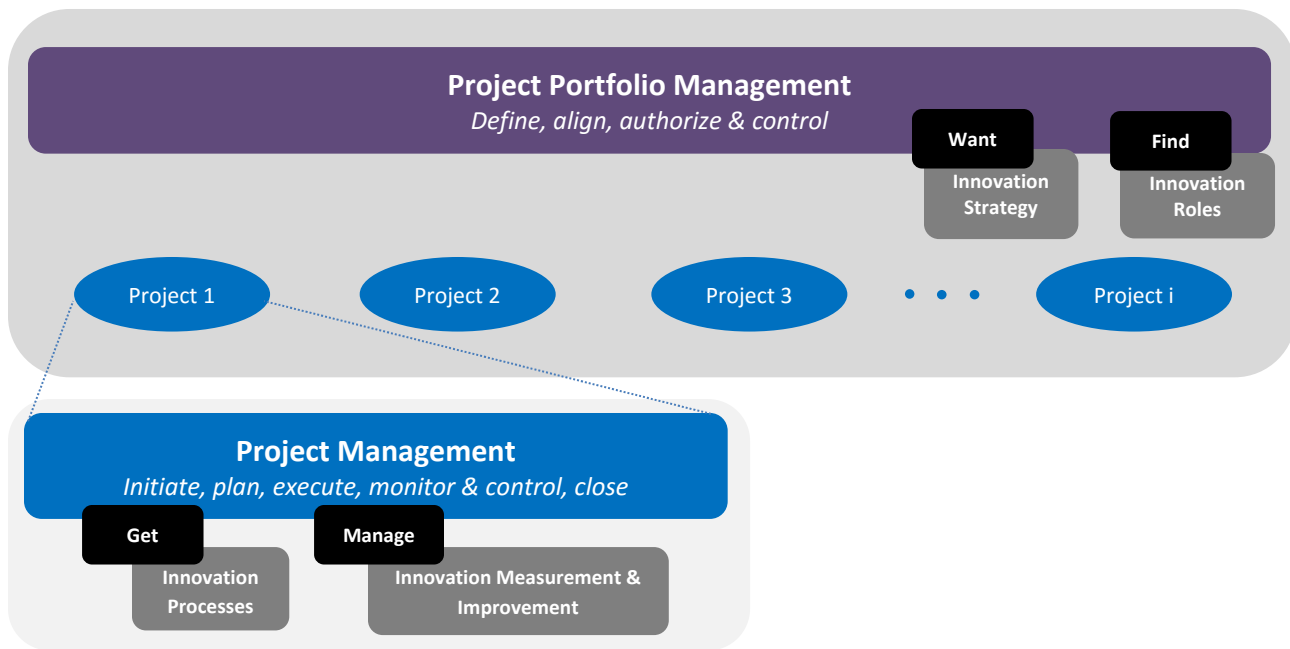


Figure 1: Open Innovation Practices through Project Management and Project Portfolio Management Perspectives

The “Get” and the “Manage” practices lean towards processes, tools and metrics, which can be generally described by “innovation processes” and “innovation measurement and improvement”. In particular, the “Get” stage could be viewed as the early phase of a project, particularly in the initiating process group, where internal alignment is emphasized in order to allow all major stakeholders to participate and understand the details, leading to their commitment to the project [29]. The “Manage” stage then is followed up to ensure the coordination and integration of resources to meet the project’s specific objectives, emphasizing the planning, executing, monitoring and controlling, and closing process groups of a project. Effective measurement and continuous improvement are keys to drive commitment (the people side) through change management, and complete the project successfully done on time, within budget, and according to the designated scopes (the process side) through project management [29], [31].

IV. CONCLUSION

Open innovation has become one of the most interesting topics in technology management since it was first introduced over a decade ago. The concept of opening up the research and development effort from the traditional way of keeping such activity in secrecy within the organization provides fascinating and fruitful results to the early adopter of the idea. Moreover, the concept has multiple aspects which can be implemented in various ways. There is still no concrete body of knowledge for open innovation practices, unlike the principles of project management and project portfolio management, both of which are well established disciplines

with a number of solid professional organizations dedicated to promote the effective and efficient practices of the concepts. This study attempts to bridge the gap of the open innovation literature where no systematic approach is presented in implementing the concept by drawing from the project management and project portfolio management practices in the hope that it will enable the organization to realize the benefit of open innovation practices.

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