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Procedia - Social and Behavioral Sciences 226 (2016) 116 – 123

Procedia
Social and Behavioral Sciences

29th World Congress International Project Management Association (IPMA) 2015, IPMA WC 2015, 28-30 September – 1 October 2015, Westin Playa Bonita, Panama

Project ecosystem competency model

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Abstract

This study proposes a conceptual framework of Project Ecosystem Competency Model that could contribute to the creation of sustainable performance in engineering organizations and industries as well as enhancing the value of project stakeholders to contribute to project sustainability.

Within the engineering organizations, working processes are evolving from operational-oriented processes, which are repetitive and sustainable, to project-oriented processes, which can be defined as temporary and unique. In addition, organizational structures are changing from functional structures to project-driven structures. For example, engineering projects are becoming influential to industrial and organizational sustainability because of its performance of special features and requirements of the projects. However, engineering projects are not easily sustainable because they are only evaluated by one criterion whether the project has succeeded or failed.

For many organizations or industries, more than one project is being executed simultaneously, and these multi-project environments can affect the sustainability of the organizations or industries. This study proposes a Project Ecosystem Competency Model to show how ecosystem impacts project lifecycle and understand mutual and reciprocal relationship for successful management of multiple projects. Project Ecosystem Competency Model consists of three aspects: design and maturity of the project ecosystem; project success factors and performance index; and the competency of engineering project management organization that contributes to the maturity of the project ecosystem.

Peer-review under responsibility of the organizing committee of IPMA WC 2015.

Keywords: Project Ecosystem; Sustainable Performance; Project Ecosystem Competency Model; Engineering Project Management; Multi Project Management

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Peer-review under responsibility of the organizing committee of IPMA WC 2015.
doi:10.1016/j.sbspro.2016.06.169

1. Introduction

The conceptual framework of the Project Ecosystem Competency Model (PECM) proposed in this study is intended for engineering projects that create sustainable performance by implementing the Engineering Project Management (EPM).

A Project Ecosystem is a group of projects with the same life cycle within the organizations or industry in Fig. 1. This means that their interactions and interrelations impact the sustainability of the projects.

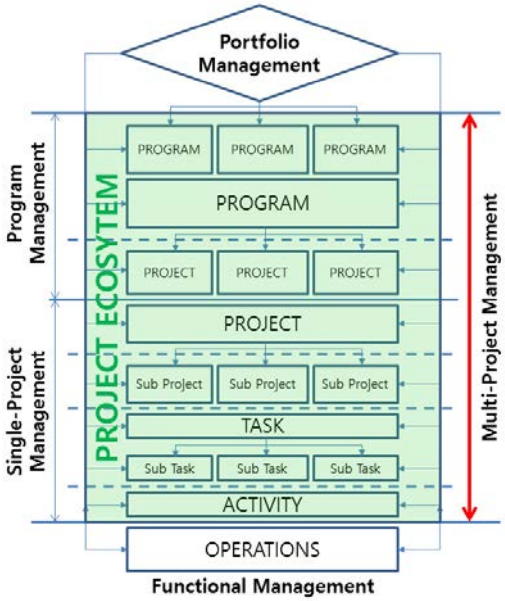

Fig. 1. Project Ecosystem and Project Management

Apollo 11 Project: It has been over forty-seven years since humankind first landed on the moon. Even though this incredible discovery happened, the exploration to this new land has not continued. Why has the Apollo Program not continued? Is it even possible to bring humankind to the moon once again? It is more likely to project the life cycle of how the dinosaur became extinct. With unsustainable Project Ecosystem, it would require restoring and reconstructing the dinosaurs' ecosystem, which is possible only with tremendous effort.

Within the engineering organizations, the work processes are evolving from operational oriented works, which are repetitive and sustainable, to project-oriented works, which can be defined as temporary and unique. In addition, the organization structures are changing from functional structures to project-oriented structures. This is especially true for the engineering projects that are becoming influential to industrial and organizational sustainability through its performances with special features and requirements of the projects. According to analysis, engineering projects are not easily sustainable due to its need for evaluations and its dependency on indications of success and failure.

For any organizations or industries, more than a single project operates under supervision and these multi projects can affect the sustainability of the organizations and industries. From this study, the conceptual model of life cycle of project through how ecosystem can give impact on life cycle of project and its mutual and reciprocal relationship for successful management of projects is proposed.

2. Literature Review

The coordination theory promotes the decomposition of a goal as an important function in managing tasks and subtasks. In coordinating projects that involve multiple organizations, management has, as its goal, the establishment of shared goals. According to Nellore and Balachandra (2001), the definition of shared goals and visions is a critical factor in an integrative and cooperative project environment. In this environment, managing tasks and subtasks is based on the level of importance and relevance of the tasks that are associated with the shared goals.

Patrick (2003), Multi-Project Management (MPM) means managing several projects in the same period by organizing, coordinating and others, and scientifically organizing all projects selection, evaluation, planning, conduct process, and combing multi-project in a mechanic way. This is Concept, but also a method.

It is important to create performance from a project in execution, which requires project management to achieve a goal. However, if project performance has not developed sustainability, it may not be possible to lead to organizational sustainability. Understanding Project Ecosystem and creating a project with sustainable performance are directly related to organizational sustainability.

Perhaps the engineering project made the trip to the moon and the extinction of the dinosaur are not repeated because there is a lack of unstable adaptation and sustainability within the ecosystem.

This study proposes a conceptual framework of PECM for creating sustainable performance in EPM of engineering project within an organization and the industry.

To create and propose a conceptual framework of Project Ecosystem, positive research is conducted and analyzed with previous studies on industrial ecosystem and MPM. A conceptual framework will be proposed by approaching differentiated aspect of Project Ecosystem from previous competency models.

Engineering based Organizations with a good MPM are also economically more successful. This is one important result of the 2009 benchmarking study on MPM of the Technische Universität (TU) Berlin. This finding results not only from the current study, but also from a longitudinal analysis of participants from the previous study in 2009.

The International Multi-Project Management (iMPM) Study 2010 is conducted jointly with academic partners globally in seven countries (Germany, Switzerland, Finland, Canada, Austria, Denmark, and South Korea). Partnerships with local universities enable international cooperative research. The iMPM Benchmarking Study 2009 is conducted with internationally reputable universities that conduct research in the field of Project Management.

In order to propose the conceptual framework of the PECM, the empirical review of the industrial life cycle and MPM are conducted through the literature review. The differentiated conceptual framework work is intended to be proposed from previously established competency models. The key objective of the framework is to create sustainable performance within the organizations or the industry by presenting an academic-based sustainability model and further extend the life cycle of the organizations or the industry.

Most of engineering organizations do not successfully relate or contribute their performance and sustainability to other projects or organizations' sustainability. Also, when a project fails to create sustainable performance, there are risks developed as consequences which may be critical to organizations and the industry. Even though project failure can develop risks, engineering organizations and the industry have the potential to contribute if sustainable performance can be created with implementation of PECM.

The Project Ecosystem for organizations and industries that mostly deal with engineering is particularly important. NASA's first step to the moon is a good example of how sustainability impacts its extinction. To revive and restore the project, the technical issues are not main factors to consider, but the Project Ecosystem is. In order to restore Project Ecosystem, it requires a tremendous amount of budget and effort to recreate the ecosystem for the possibility of its recurrence. It seems very complicated to restore what has faded, and for this reason, the trip to the moon illustrates that a reliable competency model is needed and needs to be maintained.

Operational work improves the sustainability of an organization through improvement activity, but for temporary and unique work, a project is more demanding in it contributions. Temporariness and uniqueness of a project makes it more difficult to create sustainability of performance, yet it is a lesson learned, and its information can be used and collected as the organization's process assets. Ongoing projects under management interact closely within a single system, which should be deemed as Project Ecosystem and should be considered when creating sustainable project performance.

Project Performance constituted with feasibility, efficiency, and effectiveness, and they impact and contribute to tactical thinking, strategic thinking, and beyond silo thinking. Also project performance based on the morality in Fig. 2.

Efficiency means doing the things right whereas Effectiveness is about doing the right things. Project Performance has to be both feasibility, efficiency, and effectiveness and in order to be successful. Though an overused term, 'silo thinking' is a good description of a real impediment to collective effectiveness.

Through literature review and analysis of former studies, it is realized that research on enhancement of interrelations and creation of sustainable performance using interface management are high in demand or at least in trend for further research.

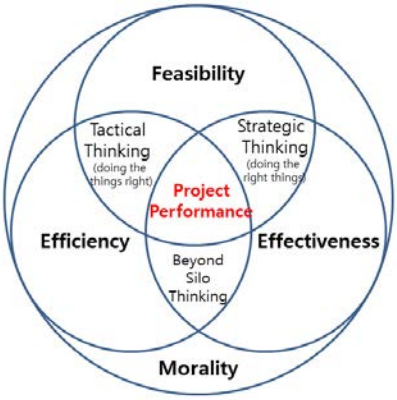

Fig. 2. Project Performance

3. Methodology

There are three purposes for this study in its analysis of the relationships between Project Ecosystem and sustainability.

First, it needs to secure sustainable performances through theoretical approach to Project Ecosystem. Most engineering organizations count its success based on a single project. Its goal is to make it possible so that EPM can lead to sustainable development that is practicable by expanding the system to multi-leveled in its management of projects, programs, and portfolio, with consideration of Project Ecosystem.

Second, purpose of the research of proposing a conceptual framework for PECM that could create sustainable performance record through MPM within its ecosystem is to conduct a qualitative analysis on MPM and its competency. Through its framework, it will secure organizational and industrial sustainability created from the MPM system, rather than having only a single project execution.

Third, the study analyzes in order to propose a conceptual framework that can create sustainable performance. It also proposes implications that can help to maintain healthy Project Ecosystem and development of industry.

It is hypothetically assumed that all professionals who filled out the questionnaire thoroughly understood questions on MPM and have professional opinions as project managers. Even though the range of targeted professionals filling out questionnaire was broad, the majority of surveys have been answered responsibly and professionally. The targeted organizations for this research are groups executing projects with engineering techniques and knowledge base.

It was complicated to secure the dependency of the questionnaire answers for data collection because most small to medium size organizations operate with a focus on single-project management, even though globally recognized

engineering organizations are constructed with the MPM system. The contents of the questionnaires also limited qualitative analysis, with the terminologies and varieties for its international joint research purpose.

For further international joint research, its dependability will be reinforced with data collected from professionals with better understanding of project management with framework propose.

4. Project Ecosystem Competency Model

The following is a conceptual framework is proposed to establish Project Ecosystem Competency Model (PECM) for Creating Sustainable Performance in EPM (see Fig. 3). The PECM can be summarized into 3 as followings.

The first is the design and maturity of the Project Ecosystem. The Project Ecosystem is constituted with the levels of portfolio, program, project and operation. By designing of these multi levels, the Project Ecosystem can be matured. The maturity levels of Project Ecosystem are categorized into 4 groups as Chaos Phase (Level 0), Adhoc Phase (Level 1), Synergy Phase (Level 2) and Sustainable Phase (Level 3).

Second category is updates of MPM success factors through processes of identifying of MPM success factors and performance index (MPI). In this study, the empirical study on the MPM success factors of Korean engineering organizations is conducted based on iMPM Benchmarking Studies of Gemünden MPM team and comparison was made with European engineering organizations. These MPM success factors should be remained for continuous updates and improvement using iMPM's studies which can be applied and contributed to create sustainable performance.

Thirdly, the competency of EPM contributes to the maturity of the Project Ecosystem. The competency of EPM can be classified into Engineering Competency, System Engineering Competency and Project Management Competency. Along with Engineering Competency, System Engineering Competency and Project Management Competency, Concurrent Engineering, Life Cycle Assessment and Concurrent Marketing should be enhanced to increase the maturity of the Project Ecosystem for the sustainable performance. In order to enhance EPM, various data should be analyzed to be applied. For this purpose, the development of the project data warehouse system is a critical for enhancement of EPM competency.

The Proposition of interrelations and interactions between the indication of successful performance and the enhancement of stakeholders' value

Proposition1a. The engineering firms and industry generate the Project Ecosystem and the ecosystem interacts with maturity level.

Proposition1b. The Project Ecosystem consist the levels of portfolio, program, project and operation.

Proposition1c. The maturity level of Project Ecosystem is composed as Chaos Phase (Level0), Ad-hoc Phase (Level1), Synergies Phase (Level2) and Sustainable Phase (Level3).

Proposition2. The maturity levels of Project Ecosystem contribute to create sustainability within the organizations and industry.

Proposition3. The sustainable performance of engineering firms and industry contributes to enhancing the value of stakeholders.

Proposition4a. The enhancement of stakeholders' value contributes to creating governance of engineering organizations and industry.

Proposition4b. The enhancement of stakeholders' value of engineering organizations and industry provides information data as project data warehouse system for Project Ecosystem.

Proposition4c. The enhancement of stakeholders' value contributes to updating MPM success factors of the ecosystem within the engineering organizations and industry.

Proposition5a. The governance of engineering organizations and industry provides standards for the performance of MPM.

Proposition5b. MPM is constituted of and executed with portfolio management, program management, single project management and functional management.

Proposition6. The execution of MPM with portfolio management, program management, single project management, and functional management contributes to and interacts with each level of Project Ecosystem.

Proposition7a. MPM performance interrelates with the measurement of MPM success factors.

Proposition7b. MPM success factors are constituted with roles and responsibilities, strategic level, tactical level and operation level.

Proposition8a. Measurement of MPM success factors interrelates with Identify MPI (MPM Performance Index).

Proposition8b. Identify MPI is consisted of execution quality, project portfolio success, and business success.

Proposition9a. Identify MPI interacts with up-to-dated success factors of MPM.

Proposition9b. Continuous Identify MPI updates success factors of MPM.

Proposition10a. Competency EPM (Engineering Project Management) contributes to maturity level of Project Ecosystem.

Proposition10b. Competency EPM is constituted of engineering technology, systems engineering competency and project management competency and they impact and contribute to concurrent engineering, life cycle assessment and concurrent marketing.

Proposition11. Development of project data warehouse system for Project Ecosystem provides information data for competency EPM.

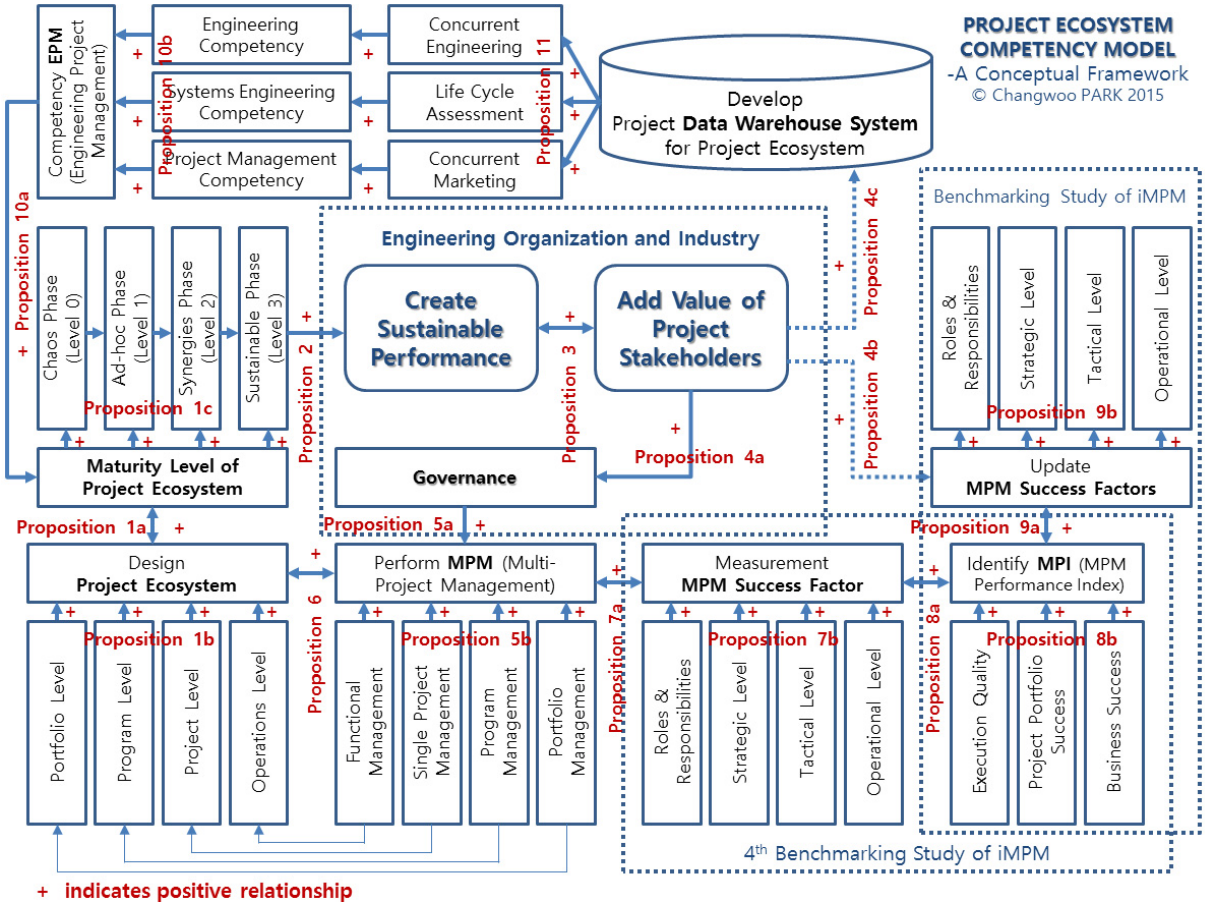

Fig. 3. Proposition Validation Flow Diagram for Project Ecosystem Competency Model

The Proposition is made that the sustainability of organizations and industries through its interrelations with enhancement of stakeholder's value (*P3*), and with the governance (*P4*), which is based on the value of the stakeholder, the MPM gets executing (*P5*). These performances of MPM have interrelation with the Project Ecosystem design (*P6*), and the design of the Project Ecosystem is mutually related with the maturity of the Project Ecosystem (*P1*). By enhancing the maturity of the Project Ecosystem, it contributes to create sustainable performance (*P2*).

Through International MPM Benchmarking Studies (iMPM), the execution of the MPM interrelates with success factors of the MPM (*P7*), and furthermore, it relates to the MPM Performance Index (MPI) (*P8*) and updates the success factors of MPM (*P9*). The competency of EPM (*P10*) contributes to the maturity of Project Ecosystem, and this competency of EPM creates and contributes to developing project data warehouse systems (*P11*). All these relations stated above are proposed as a conceptual model of PECM to create sustainable performance within EPM.

5. Conclusions

To draw the final conclusion of this study, this chapter delineates research Propositions validation and summary of each chapter for the conceptual framework of the PECM, draws concluding remarks with research contributions, and recommends future research and recommends future research. The research results can be summarized into three categories, as follows.

Firstly, ongoing projects managed by engineering firms and industry are forming Project Ecosystem.

Secondly, a project within the ecosystem creates sustainable performance, and it is related to successful competency of organizational MPM.

Thirdly, sustainable performance within Project Ecosystem contributes to engineering organizations being retained and developed.

In conclusion, this study proposes a conceptual framework of PECM, which could contribute to and create sustainable performance in engineering organizations and industries and as well as to the value enhancement of project stakeholder's for creating sustainability.

5.1. Contributions

To finalize and draw the conclusion of this study, the iMPM Benchmarking Study conducted by Gemunden's research team of Engineering Department at Universität Berlin in 2009 has contributed to this work. The research is made possible by the help and cooperation of Korean engineering organizations that participated in the survey.

This is for those Certified Engineering Project Manager (CEPM) and Korean engineers and Engineering Project Management Programme at Seoul National University who took the time to take the surveys and questionnaires for this study. At last, through this study, it is expected to contribute recommendation and cooperation for further research.

5.2. Limitations and Future Research

The conclusion drawn from this study requires further study in order to establish a detailed framework of the PECM. The primary purpose of this study is to recommend the idea of the Project Ecosystem, but it requires further research to form better academic and theoretical concepts. Also, it is important to continuous to carry out the study of iMPM with the research team of Engineering Department at Universität Berlin and to revise the MPM Success Factors constantly.

It has been valuable research to try to form theoretical concepts of the Project Ecosystem through this study, and the empirical analysis and the data base of iMPM Benchmarking Study by the research team of Engineering Department at Universität Berlin made the research possible. The engineering organizations may be one of the biggest organizations that have contributed to human development. One of the most influential organizations, their work execution is becoming increasingly complex, and in the age of convergence, the importance of the engineering project management is becoming more recognizable, and the biggest issue they are facing is to create sustainable performance. As mentioned in the introduction of this study, the dinosaur's extinction and the Apollo program are definitely related to sustainability of the project. But it is the matter of ecosystem of nature or project.

As sustainability becomes more noticeably important, the industrial ecology is becoming a new field that needs academic attention, and the concept of sustainable infrastructure is becoming a new subject to consider. Hopefully, the conceptual framework of the PECM can contribute to the engineering organizations and industries to create sustainable performance and furthermore, contribute to the development of EPM.

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