

# A Method for Designing Processes for Project Portfolio Management

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## **Abstract**

Project Portfolio Management (PPM) is the process that aims to the evaluation, selection and prioritization of ideas and projects for developing new products. PPM is considered a key managerial task and a core competence influencing companies' competitiveness. It is agreed that there is not a best general model for PPM processes, and that it should be designed for suiting each company conditions. However, few contributions have been made for guiding a company in designing and introducing a process for PPM. This paper investigates the procedural aspects of PPM, and proposes a method for designing processes for PPM. The method is evaluated by applying it in a particular company.

**Keywords:** *Project portfolio management, process design, product development.*

## **1 Introduction**

In most industrial companies, product development is carried out by conducting multiple parallel projects that are somehow dependent on one another [1], [2]. In addition, innovative companies use to have many ideas for new products [3]. However, because of limited resources, they are forced to make choices [3], [4], [5]. They have to decide which ideas to develop, and which ones to reject; which projects to start and, sometimes, which to be cancelled; and if something unexpected occurs, they have to decide which projects are more important than others. Those decisions determine companies' future [2], [4], [6], thus managing parallel projects is considered a key managerial task [2], and it may even constitute a core competence influencing companies' competitiveness [1].

Project Portfolio Management (PPM) is the process that aims to the initial screening, selection and prioritization of project proposals; the concurrent reprioritization of projects; and the allocation and reallocation of resources to projects [6]. The objective of PPM is to translate business strategy into a dynamic set of development projects [4], [6]. PPM also aims to managing risk, achieving a proper number of parallel projects, and communicating decisions [3], [4], [7]. A poor PPM may damage company's competitiveness because of resources are allocated in wrong projects [4], [6], too many projects makes difficulty to terminate them; and people experience stress as resources are continuously reallocated [2].

As a process PPM is described as a complex system of interrelated and recursive decision-making processes [4], [6]. Prioritizing between projects and ideas becomes difficult because of interdependencies among projects, multiple decision makers involved, and many different criteria to consider [3], [5]. Two models for PPM processes are often cited in PPM literature, and are presented in Archer and Ghasemzadeh (1999) and Cooper, et al (1998).

Archer and Ghasemzadeh propose a sequential model in which the PPM activities are performed in five steps: pre-screening, individual project analysis, screening, optimal portfolio selection and portfolio adjustment. Other processes encompassed in PPM are: strategy development, resource allocation, generating project proposals, and project development. The model aims to support decision making and suggests, for each stage, which decision tools are appropriate to be used. In the second model, Cooper proposes three major decision processes: business and product development strategy, management of individual projects; and portfolio review. The model emphasizes the role of strategies in guiding PPM; and the role of stage-gate models for individual projects as a part of the PPM process. It proposes also a design and implementation plan.

Although both models provide a holistic representation of PPM, and they give guidelines for using diverse tools, they are considered being too general and not totally theoretically grounded [3]. Besides, while it is agreed that there is not a best model for designing PPM processes [3], [4], very few contributions have been made for guiding a company in designing and introducing a PPM process. Furthermore, empirical evidence indicates that most companies experience problems in managing their PPM processes [2], [3], [6]. Hence researchers advocate for a better understanding of how PPM is actually carried out in companies [3], and call for prescriptive models based on this understanding [2].

Thus there is a need of a deeper analysis of the procedural aspects of PPM, and the models that have been proposed. It is also needed a method, that guides companies in designing processes for PPM for suiting to their conditions, and that takes into account the introduction of the new process in the organization. The purpose of this paper is to investigate the procedural aspects of PPM, to propose a method for designing processes for PPM, and to evaluate its applicability in a particular company.

## **2 Methodology**

An empirical study was carried out for exploring PPM practices. It was based on qualitative interviews in three companies and it is presented in [8]. Based on this empirical study, and on a literature study, the requirements for a method for designing PPM processes were stated. According to that, a preliminary method for designing processes for PPM was developed, according to the general methodology for building a method presented in [17].

A second empirical study was carried out in a fourth company for applying and evaluating the method. This was made by a master thesis supervised by researchers. Researchers made observations of some activities that the master students carried out in the company, although never were involved in their organization or execution. Researchers interviewed the two master students, and the Technology Director of the company, eight months after the thesis was finalized. The students were asked about how the method helped them in mapping, analyzing and improving the PPM process. The manager was asked about how the study was experienced, and which recommendations were actually implemented. The interviews and observations were used for analyzing and discussing the appropriateness of the method.

### **3 Requirements for a method for designing PPM processes**

Our approach consists in proposing a method for designing processes for PPM. In other words, instead of a generic model for PPM process, we develop a method for generating one that suits to a particular company. In this section, the requirements for a method for designing PPM processes are stated by critically analyzing the models proposed in PPM literature.

#### **3.1. Basic functions**

According to [9] process models for managing projects should fulfill certain basic features: clarifying the activities that are encompassed by the process; providing control; complying with business norms; and providing a standard working procedure. Thus the method should make possible to design a process for PPM that fulfills those basic features. Besides, it should work as a general guide about which steps to be taken when designing the process.

#### **3.2. Complexity in PPM process**

PPM process is described as a dynamic decision-making process in which several processes, decisions and actors are integrated [3], [4], [5]. Some of these processes are: generating new ideas; evaluating and selecting ideas; starting projects; managing individual projects; prioritizing among projects; defining strategies; long-term decisions about resources; and short-term allocation of resources [8]. However, it is still unclear how the different decisions and processes encompassed in PPM influence and relate to each other [6].

It is agreed that interactions between the different processes are very complex [3], [4]. Decisions taken or unexpected events occurring in one process influence the other processes, triggering for example reallocation of resources, reprioritizations of projects or reviews of plans. The reciprocal influences are continuously happening, in formal and informal ways and in non-sequential order [8]. Furthermore, people operate in networks in which formal and informal decisions are made [8], [10], at various organizational levels [6].

In the models presented before [3], [5], those interactions are oversimplified by considering the influence of a limited number of processes, decisions and actors [8]. Besides, they assume that these influences are made in a linear logical process [3], while some authors point out the difficulties for modeling PPM as one dimensional linear system [6]. In addition, the given models assume that decision making occurs mainly in formal forums with clearly defined decision makers. Thus a method for designing PPM processes should take into account the procedural complexity of PPM. It should provide ways for understanding and managing the interrelation of the different processes encompassed in PPM, the influence of informal activities, and the roles played by different networks of actors.

#### **3.3. Suitability to specific company**

In a qualitative research study, Kestler (2008) found a relationship between the company's business strategy, the approach for managing innovation, and how PPM processes are designed and practiced. We interpret these results as the PPM process should be designed to be consistent to the company's approach to innovation. However, the models presented before assume particular approaches for managing innovation, and impose them in the recommendations that they give.

For example, both models assume that previously defined strategies strongly influence the selection and prioritization process. However, some companies may have an approach to innovation, in which the strategy arise in an emergent process and is not totally defined in

advance [6], [12], [13]. Regarding management of individual projects Cooper (1998) states that stage-gate models and the decisions made in them should be a central component of the PPM process. However, according to [11] gates not always work as forums where decisions on projects are made. Besides, stage-gate models may be not appropriate for managing certain projects that because of their nuance may require other approaches [9]. Concerning portfolio composition Cooper (1998) argues that all projects that compete for the same resources ought to be considered in the portfolio approach. However, [2] asserts that it should be a decision of each individual company whether or not all projects should be part of PPM as long as management is aware about the effects on the management of resources that it may imply.

Thus how strategy is used as decision criteria, how the management of individual projects is integrated to PPM, and which ideas and projects to include in the scope of the PPM process, is a matter of contextual suitability. These aspects should be considered when designing PPM processes in a way that become consistent to company's approach to innovation. A method for designing PPM processes should also provide ways for achieving awareness about some aspects of the PPM process, as for example: which processes, activities, decisions, projects and ideas are managed by the PPM process, and which ones are left outside.

### 3.4. Sense making and decision criteria

Several examples of decision criteria for PPM are given in literature [3]; and it is agreed that it should be relevant for the company in terms of business and types of projects [3], [5]. However, there is a sense-making dimension in PPM that has not been taken into account [14]. Decisions are influenced by how people interpret the decision criteria, and the different ideas and projects in relation to them [15]. Thus guidelines should be given for how a company should proceed for choosing decision criteria, and taking into account the sense-making process that it implies.

### 3.5. Managing change

Introducing a new process may produce resistance from people who are affected by it [16]. In PPM literature is stated the importance of the implementation phase [4], and some general recommendations are given as: organizing it in a project form involving senior management [4]; implementing gradually different PPM activities [7]; and defining the requirements on the PPM process [3], [4]. Thus a method for designing processes for PPM should provide guidelines for managing the implementation of the new process in the organization.

**Table 1. Requirements for a method for designing processes for PPM**

Designs PPM process that provides control, becomes accepted, and contributes to organizing.
Works as a general guide, defining the steps to be taken and the aspects to be considered for designing the PPM process.
Provides a way of taking into account the complexity of PPM process concerning the different processes, decisions, actors, and their mutual interactions.
Allows designing PPM process in a way that become consistent to company's approach to innovation and other specific conditions.
Guides in achieving awareness about which processes, decisions and projects are managed by the PPM process, and which ones are left out.
Provides guidelines for choosing decision criteria, taking into account the sense-making process that it implies.
Provides guidelines for managing the implementation of the new process in the organization. Considers the requirements on the PPM process of different actors within the company.

## **4 A method for developing processes for PPM**

We propose a method that aims to guide companies to develop a formal process for PPM that is suitable for their particular conditions. The method does not impose a model for how the PPM process should look like. Instead, it defines the steps to be taken for generate a process. As follows, the most important features of the method are summarized, and it described how they are supposed to contribute to fulfilling the requirements stated in the previous section.

### **4.1. Project form**

The method is outlined in the form of a project. It has five main phases: Preparation, Project management, Development, Training, and Implementation. This form is supposed to provide a guide for designing the process by defining the steps to be taken; and to allow the implementation of the process by integrating the people affected by the process in its design. It is based in Beskow (2000) guidelines for implementing changes in product development, and Sörqvist`s (1998) methodology for developing processes.

### **4.2. Preparation phase**

This phase has as a goal to anchoring the design of the new PPM process in the organization [16], [17]. It aims to obtain support among different actors to assure that necessary resources are given to the project work. It is recommended to start with a minor interview study among people involved and affected by PPM for defining opportunities for improvement; and to hold a seminar for the management group for explaining the importance of PPM. A general scope for the PPM process is defined in this phase, for example, if the PPM process is going to encompass the whole organization or just specific business units. A Project Group is build for designing the PPM process and managing its implementation.

### **4.3. Project Management phase**

The data collection phase is planned, identifying relevant actors to be interviewed; and seeking formal information as reports, written routines and manuals. It is suggested to include not only formal decision makers, but also people that might influence decisions and people that are affected by decisions. This is important for assessing the requirements on the PPM process of all the stakeholders it might have.

### **4.4. Development phase**

One of the central characteristics of the method is that it not imposes any model for the PPM process. That means that the different processes, decisions, actors and their interrelations, encompassed in the PPM process, are designed from the analysis of the collected data, and not are presupposed in a model. Data is collected by carrying out interviews, and assessing documentation of processes and decisions. Our empirical experience shows that PPM is a concept that is not well known by many people in companies. It is suggested to not collect data by asking for a PPM process but by asking by the different sub-processes and decisions that it might encompass. Besides, it is suggested that each company defines and names in its own way the PPM process to be designed.

Then data is analyzed aiming to capture the complexity of the PPM process and achieving a description about how it is currently run. A matrix-based approach is considered a proper way for assessing objects and theirs interdependencies in a complex process [18]. A simplified matrix approach is proposed. It consists of building diverse matrices, in which the different processes, decisions, actors, requirements and other procedural dimensions (as reviewing

frequency, information, tools, etc) are displayed in relation to each other. In that way is possible to represent the complex formal and informal interrelation between the different objects in the process. The different matrices are synthesized in a map in which the different decisions, groups, frequencies, and information flow between groups are visualized as they occur, without presupposing any sequential or lineal relationship. Regarding informal decisions, it is recommended to consider which processes they influence and which information flow would provide a status of that influence.

For designing the new PPM process, the scope is first decided. For that, it is stated which decisions and processes are managed within the formal PPM process. The mapping of the process that was made before is supposed to provide awareness about the interrelation between the designed PPM process and the rest of the mapped objects. The boundaries of the process and the necessary information flow in and out of the PPM process are stated.

Workshops in which portfolio decisions are simulated are suggested for defining decision criteria. The workshops are supposed to work as discussion activities in which people are able to develop, communicate, and discuss decision criteria. It is intended to achieve a common understanding about what a certain criteria might mean in the context of the company and in relation to different types of ideas and projects. It is also expected that the discussion allows to state in which way the criteria are used for supporting decision making.

Depending on the company size and types of projects, one or several workshops may be required for defining different sets of decision criteria. Participants in the workshops are formal decision makers and people that might influence decisions. For defining criteria for evaluating ideas and projects, is presented a list of real projects and ideas that the company works with. The group is divided in sub groups, and each one defines a set of criteria, and makes a ranking of the projects. Then the sub groups present to each other the chosen criteria and the ranking. The result is discussed until the whole group agrees on one list of criteria. The subgroups rank the projects again but according to the new common criteria. The result of the new ranking are compared and discussed. The chosen decision criteria are adjusted. For defining criteria for prioritizing projects, a similar workshop is arranged but the group task in this case is to visualize the group of projects in different diagrams and to define the dimensions of the diagrams axles. As a result diagrams and the dimensions represented in their axles are chosen.

#### **4.5. Training and implementation phase**

The last phase aims to refining the process and for overcoming the resistance its implementation may meet [16]. It is recommended a preliminary test of the information flow between different groups, the decision criteria, and routines for the decision meetings. It is evaluated in which extent these elements support decision making. The requirements stated before are checked to be sure that all the stakeholders of the process have been considered. Some supporting tools could be gradually tested, as software for making financial evaluations, scoring models, balancing diagrams, etc. The day-to-day application of the process becomes a responsibility of each decision group. A final evaluation is made, and proposals for improvements and future developments of the process are stated.

## **5 Results of the empirical study**

The method was applied by two students in a master thesis supervised by the researchers. It was agreed that students could freely decide which parts of the method applied, according to their needs. The purpose of the study was mapping, analyzing and improving the PPM process in the company. It was limited to the decisions for screening ideas and starting development projects. The company develops technology for medical device. It has about 14000 employees worldwide, and the study was conducted in one division, located in Sweden, with about 700 employees, and around 250 working in research and development.

The company lacked a formalized decision process for managing the portfolio of ideas and projects. However, ideas were screened by several forums along their development, and eventually one forum decided the start of formal development projects. The company experienced the whole decision process as difficult. Particularly, it was considered hard to manage a large number of ideas, of different types and with different grades of definition. Besides, there were more than 40 decision criteria that were hard to put in practice. There were no simple ways for communicating how the different decisions were made.

The initiative for carrying out the study was taken by a manager responsible for the early development of ideas. Based on the method, the students outlined the study in six steps: preparation, data collection, data analysis, discussion, workshops, and development. In the preparation phase they build up two groups. One group was constituted by managers involved in screening of ideas. This group provided information for mapping the current process, and participated in designing the improved one. The second group consisted of people that influenced or were affected by portfolio decisions, and they contribute with information.

Data was collected in interviews and internal documents. For mapping the current process, the students used just a limited number of the matrices proposed in the method. They considered that it was too complex to combine too many matrices. Instead, they built a diagram in which different sub processes were displayed. They filled the diagram combining the information from the different interviews. Finally considering the interactions between the different sub processes a general map of the process was built. However, they experienced it too complex for being presented to the company. They decided to map the current decision process by considering the general stages in which ideas are supposed to be developed; but considering loops when the interactions were not straightforward. Moreover, the company experienced a bit unclear how the students made the analysis and how they draw their conclusions.

The students discussed with the group of managers how to improve the process; and one of the proposals was to choose a new set of decision criteria. It was performed by carrying out the workshops presented in the method. Furthermore, the students developed several proposals for visualizing data. Eight months after the project completion, the process run, in general terms, as it was designed in the project. Most of the visualizations were considered useful and have been actually implemented in the company. Furthermore, the company used the workshops routines after the project, for discussing decision criteria with different groups within the company. Besides, company also found useful the workshops for defining criteria for other purposes, for example, for spanning new areas for business and technical development.

## 6 Discussion

The students experienced that the method provided a clear guide of what to do and in which sequence. The major phases of the method were followed and its structure was considered useful. Moreover, students were able to apply the method by themselves without major supervision. Thus the method worked as a general guide for designing a process for PPM.

The method intended to provide a way for mapping PPM complexity by the use of diverse matrices. In the study, the representation of the process that was achieved was considered confusing. At the same time that people in the company experienced unclear how the whole analysis was done. The students decided to map the process in a simplified way, by following the sequence of the development process. Thus both students and managers considered important to achieve a representation of the process that was understandable and legitimate. This is according to [9] and [11] one reason that explains why sometimes companies model their processes in a way that does not reflect how they work in reality. However, we used the matrices in the empirical study described in [8], and in accordance with [18], we experienced that they were useful for mapping PPM complexity. Thus we consider that the results of this study do not provide enough evidence for concluding the appropriateness of the matrix-based approach. More research is needed to evaluate if it is able to provide a representation of PPM complexity, that becomes understandable and accepted.

For designing a process that suits to company's conditions, the method does not provide any model for PPM process. The method intends to give guidance for designing the context-based aspects of PPM. The students experienced it as exciting and challenging, and that promoted a creative designing process. Despite a lack of a model, people were able to understand which sub processes would be encompassed in PPM, and to design the necessary groups, decision criteria and reviewing routines, suiting their ways of working.

However, it might be argued that the method is based in a certain model for PPM process. This model would in fact be embedded in the recommendations and procedures proposed for analyzing current practices and designing the process. We consider that for assuring that the method does not misguide the designing in a way that it is not consistent with a company way of working, deeper knowledge about which aspects of PPM are context dependent is needed. According to [14] this issue is still not enough investigated by PPM literature, thus more research in this area is needed.

Furthermore, people in the company expected that the students would be able to tell in advance how a PPM process should look like. Some resistance arose due to not proposing a model for the process, and the relative complexity of the matrix-based design. The method tries to overcome the resistance that arise when implementing a new work procedure [16] by recommending that people is informed about the project, and by participation of the company staff in the design of the process. These contributed to anchoring the whole project in the organization. However, it seems that more emphasis should be put in explaining the procedure by which the design of the process is carried out.

For choosing decision criteria, the method proposes a simulation of portfolio decisions. It provoked a discussion about what certain criteria would mean in relation to particular ideas and projects, and how they should be put in practice. The proposed workshops seemed to work for considering the aspects of sense-making in PPM that are discussed in [14]. One question that arises is to what extent the decision criteria chosen were influenced by the ideas and projects used in the simulations.



## 7 Conclusions

PPM is considered a key managerial task that influences companies' competitiveness. As a process PPM is complex, because it encompasses several processes, decisions and actors that interact in non-linear and non-sequential ways. However, few contributions had been made for guiding a specific company in designing a process for PPM that suits to its conditions.

A method for designing processes for PPM should meet the following requirements: working as a general guide about the steps to be taken for designing a PPM process; providing a way of taking into account PPM complexity; designing a process that is consistent to company's approach to innovation; taking into account the aspects of sense making that are involved in decision making; and providing guidelines for managing the implementation of the new process in the organization.

In this paper, a method for designing processes for PPM has been proposed. The method does not impose any generic model for PPM process, but gives guidelines for generating one. It is organized in a project form, and it involves company's staff in the design and implementation of the process. It proposes a matrix-based analysis for mapping and designing the process; and simulations of decisions for choosing decision criteria.

An empirical evaluation of the method was done by applying it in one company. This study only allows drawing preliminary conclusions. The method should be considered as a first attempt for developing a method for designing processes for PPM that takes into account its procedural complexity. More research is needed for testing the applicability of the method and for developing the aspects pointed out below.

The method was easy to be applied and it provided a clear guide about how to proceed for designing the PPM process. The project form allowed to involve company's people in the design process, and overcome resistance in the implementation of the process. Furthermore, not imposing a model for PPM process contributed to a creative generation process and to designing a process suiting to company's conditions. However, it is still needed more research about which aspects of PPM are context dependent for assuring that the method does not misguide the designing in a way that it is not consistent with a company's way of working.

The matrix-based approach provided a map of the processes that was considered difficult to be understood. As a consequence, the process designed in the empirical study was not totally based in a comprehension of PPM complexity. This study do not provide enough evidence for concluding the appropriateness of the matrix-based approach for designing processes with non-linear and non-sequential interrelations between processes, decisions and actors. Furthermore, more empirical applications of this approach are needed for stating how to be applied for designing a process that becomes understandable and accepted.

Simulation of portfolio decisions seemed to work for considering sense-making aspects when choosing decision criteria. This appears to be an effective way to achieve awareness of how the decision criteria are interpreted by different people and how they should be used for evaluations of ideas and projects. More research is needed to state how the different variables used in the simulation would influence the decision criteria that are chosen.

## 8 References

- [1] Jerbandt, A. "Organisering av projektbaserade företag", (in Swedish) Ph.D. dissertation, *Royal Institute of Technology, KTH, Sweden*, 2009.
- [2] Stillin Blichfeldt, B. and Eskerod, P., "Project Portfolio Management-There's more in it than what management enacts", *International Journal of Project Management*, 2008.
- [3] Dawidson, O. "Project portfolio management - An organizing perspective", Ph.D. dissertation, *Chalmers University of Technology, Sweden*, 2006.
- [4] Cooper, R. G., Edgett, S. J, Kleinschmidt, E., "Portfolio management for new product", *Reading, USA, Perseus Books*, 1998.
- [5] Archer, N. and Ghasemzadeh F., "An integrated framework for project portfolio selection", *International Journal of Project Management*, 1999.
- [6] Kester L, Hultink J, Lauche K, Badke-Schaub P. "An explorative study of the practices and challenges of portfolio decision making genres". In *Academic Research Forum*, Orlando, USA, September 2008.
- [7] Reyck, B. D., Y. Grushka-Cockayne, et al. "The impact of project portfolio management on information technology projects." *International Journal of Project Management*, 2004.
- [8] Gutiérrez E., Ölundh Sandström G., Janhager J., Ritzén S. "Designing Work Procedures for Project Portfolio Management". *Proceedings of NordDesign 2008*, Estonia 2008.
- [9] Engwall, M., "Produktutveckling bortom kunskapens gränser, mot en osäkerhetens grammatik", (in Swedish), *Studentlitteratur, Lund*, 2003.
- [10] Christiansen J. and Varnes C., "Making decisions on innovation: meetings or networks", *Creativity and Innovation Management*, 2007.
- [11] Christiansen J. and Varnes C., "The ignorance of information at gate meetings," *Proc. 13<sup>th</sup> Product Development Management Conference*, 2005.
- [12] Fonseca J., "Complexity and Innovation in Organizations", *London, Routledge*, 2002.
- [13] Bower. J.L., Daz Y.L., Gilbert C.G., "Linking resource allocation to strategy", *From resource allocation to strategy, Oxford University Press*, 2007.
- [14] Engwall, M. and A. Jerbrant, "The resource allocation syndrome: the prime challenge of multi-project management", *International Journal of Project Management*, 2002.
- [15] Gutiérrez, E., Kihlander, I., Eriksson, J., "What's a good idea?: Understanding evaluation and selection of new product ideas". *Proceedings of ICED'09*. CA, USA, 2009.
- [16] Beskow, C. "Towards a higher efficiency: Studies of changes in industrial product development", Ph.D. dissertation, *Royal Institute of Technology, KTH, Sweden*, 2000.
- [17] Sörqvist, L., "Poor Quality Costing", Ph.D. dissertation, *Royal Institute of Technology, KTH*, 1998.
- [18] Danilovic, M. and Sandkull, B., "The use of dependence structure matrix and domain mapping matrix in managing uncertainty in multi project situations", *International Journal of Project Management*, 2005.