

PROBE – MANAGING THE PROJECT PORTFOLIO FOR COMPETITIVE ADVANTAGE

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ABSTRACT

Project portfolio management (PPM) is a complex managerial subject that still remains neither well defined nor explained. More knowledge is needed about how the evaluation of ideas and projects affects both the process and the results of designing. A research project, ProBe, has been started with the purpose to contribute to a better understanding of PPM and to develop practice-oriented models for improved PPM.

This paper presents an analysis of earlier research on PPM regarding unresolved problems and gaps. Initial empirical results related to them are presented and the ProBe Design Research methodology is described and evaluated.

The empirical results shown new factors that are crucial to explain and understand PPM, securing a potential to develop efficient PPM methods. It was also stated how the different components of the research methodology contributed to obtain relevant findings regarding understanding complexity within PPM and developing customized solutions.

Keywords: project portfolio management, organizational and process perspective, action research, experiential learning, company cases

1 INTRODUCTION

1.1 Background

In a marketplace characterized by faster technological development and globalization, the development and introduction of new products are core activities for companies to remain competitive. Development work is an investment that must justify the money invested by money earned, and that faces competition for corporate support with other investment opportunities without the product development field [3, 16, 13]. Companies usually have a plethora of new ideas and running projects at the time as they face limited resources to fund those development efforts [1]. Also, companies must have the ability to identify customers' needs and to create products that meet these needs. Besides, the development activities must be carried out quickly and at low costs [16].

Thus, companies run their development efforts in a dynamic environment, with multiple projects running in parallel, having to fit strategies, with limited resources available and a lot of new ideas demanding funding. In this multi-project context, companies are forced to choose which projects and opportunities are going to be a part of their project portfolio and which ones are going to be abandoned. As the decisions regarding which projects are going to be conducted are considered critically important, because of being determinant in the fulfilment of strategies and assuring being competitive, a systematic way to manage the activities involved is needed [3, 4].

Project portfolio management (PPM) is about systematically organizing and running the activities that aim to achieve a portfolio of projects that contribute to companies' goals. Within companies PPM includes managing resources, making allocation decisions, choosing and compromising on portfolio's composition and achieving an entire portfolio of projects that is balanced and strategically aligned [3, 4, 12, 14]. As a research subject PPM addresses a variety of issues including procedures, checklists,

methods and tools for project evaluation and selection, financial models, project categorizations, conceptualisation of selection criteria, etc. Important to point out is that companies are in common still unsatisfied with the performance of practices implemented and researchers advocate for a better understanding of the whole managerial field.[12, 3, 4] From both the industrial perspective and the research perspective PPM is an area of great complexity. In order to deeply understand PPM and the challenges that are faced both by researchers and practitioners the most referred aspects contributing to complexity in PPM are presented.

Uncertainty

One aspect that most powerfully characterizes PPM is uncertainty. When managing project portfolio, resources must be allocated to entities that do not exist, decisions must be made based on uncertain and unreliable information and the dynamic of the environment means that the assumptions once made may not be valid tomorrow [1, 3, 12, 15].

Large amount of opportunities and projects

Having too many projects seems to be a common problem for most companies when managing their project portfolios. To differentiate the good projects from the bad ones is one important task in order to achieve a value adding portfolio. However, companies often face what seems to be a more complex problem: to decide between a large number of promising projects and opportunities, which ones are going to be a part of the portfolio and which ones are going to be rejected. Another aspects adding to complexity are interdependences among projects and that projects to be compared are at different stages of completion [1, 9].

Conflicting aspects

The criteria to ground decisions are characterized of multiple and conflicting objectives, qualitative and quantitative measures and multiple constraints. This means that the number of possible portfolios may be enormous [9, 1].

Large amount of actors

The decision process central in PPM features of multiple stages and involves groups of decisions makers which sometimes are located at different places [15, 3]. In addition, since PPM scopes many processes, several internal customers arises demanding different requirements from the PPM process [4]. Other aspects adding complexity to the PPM process is about motivation and commitment of the involved people and that the process runs across different hierarchical levels and organizational functions [13, 5].

Process boundaries

The PPM process has a certain relation with several other processes in the organization: new product strategy, business development, product development, pipeline management, individual project management, innovation, resource allocation, etc. No unity on which processes that PPM encompasses is found in literature. Regarding the interface between PPM and the innovation process another complexity aspect arises. The process to spread a new idea and to get approval for a project start up is not considered a rational process but a long social process of generating support [5].

Divergent driving forces for priorities

Beside the uncertainty under which decisions in PPM must be taken and the strategic importance of these decisions, the actors involved in the decision process is affected by power conditions in the organization, subjectivity and individual experiences [13, 5]. This affects which priorities that people are willing to define. Moreover the multi-project environment is described as highly political, with a constant competition going on between different managers and projects concerning priorities, personnel, attention and resources [6]. Also adding to complexity is the problem arising due to resistance and frustration among personnel when projects must be reprioritized.

ProBe research project

At the Royal Institute of Technology in Sweden the research group Integrated Product Development¹ has started a project on PPM. The project - ProBe - is founded by VINNOVA² and run over a three years period. The main goal of the project is to develop industrially applicable methods for improved PPM. The project has taken an action research approach and collaborates with three middle sized companies. The company participants are represented by design managers and business developers. The results of ProBe should be new established routines for PPM in collaborating companies besides the general methods and tools.

Purpose of paper

The purposes of this paper are to present an analysis of existing literature regarding earlier unresolved PPM problems and gaps in literature; to present empirical results concerning identified new factors that are crucial for understanding PPM and for developing PPM methods; and to evaluate the ProBe Design Research methodology according to how it allows reaching relevant findings.

2 RESEARCH METHODOLOGY AND DESIGN

Background to project design

ProBe was firstly initiated by the insight that project portfolio management was an issue that within many companies was left to an unsystematic working process and with a great potential for improvements. Among several companies an awareness of problems related to project portfolio management existed with a willingness to change. Thus, a project for *research and change* could be designed. The design is based on three major blocks, action research, experiential learning and change process and is greatly affected by the work of [7 & 8]. The design builds on that there are two major actors, in the reasoning below called the researchers (i.e. ProBe research group/the authors) and the practitioners (i.e. people from different disciplines and hierarchical levels within the companies participating in ProBe).

The action research area is a vast knowledge area which not should be outlined here, however some ideas from action research is important to address since they form the ideology behind ProBe. An important statement from the creator of action research (Kurt Lewin) is that *research should be conducted with the aim to create use for those who act in the context that is researched*, e.g. Westlander [17]. ProBe focus on making benefit of research to the companies involved in the project by developing solutions to problems identified from within the participating organizations. The form to do this, according to actions research, is to share the responsibility of the project and to jointly identify problems and develop solutions. ProBe intention is to use both existing knowledge (theories, models and guidelines) as well as developing new knowledge with the aim to build up solutions suitable to being directly applied to industry in order to increase the capabilities of the practitioners. A goal for the researchers in ProBe is also to make research beneficial for other companies than those participating in ProBe, by developing new models and guidelines from the cases in the research project.

Action research is about learning: researchers and practitioners learn from experiences in practice. Kolb [10] created a model that clearly illustrate the “experiential learning cycle”, see Figure 3. New solutions and concepts that give changes in e.g. a work procedure can be produced from the reflection upon own experiences. The most important contribution from this model to an action research project is that opportunities for reflection must be considered in the project design. In many companies time for reflection is hard to get since the practitioners are driven by high demands on quick results.

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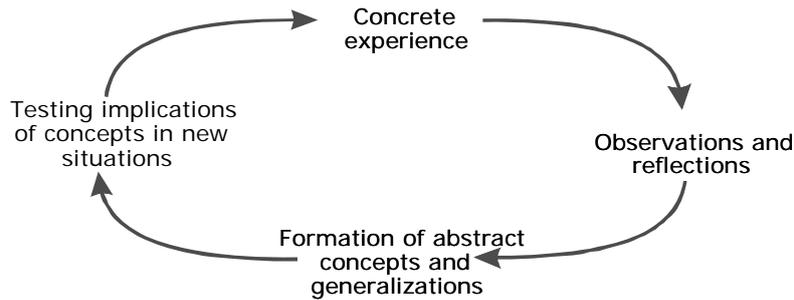


Figure 1. The cycle of Experiential Learning, from [10].

The change of work procedures should be a consequence of research and learning in the action research approach and take place simultaneously. To support this change process and make it successful, i.e. among other things to make a change lasting after the project has finished, a pragmatic guide for change can be utilized. Kotter has defined such a procedure that has been evaluated in practice [3] and contains three major phases: refreezing of current practice, change, and establishing new work procedures. In ProBe is suggested that this change procedure is going to be utilized in order to evaluate the work of the companies and to check if required efforts for change are made.

Project design – the ProBe organization

The design of the ProBe project contains two major parts, the organization and the process. The organization of the project is a network organization, see Figure 2. A learning from before and also addressed in the model of *learning networks* by [7], is that each company must address both a granter and a project leader. These clearly addressed roles secure that the company has an outspoken will to change (not only on an individual level) and that an individual is assigned to take part in the project activities. Also the practitioners should in people be at least two. Meetings and activities in between get more efficient if two people from the same organization attend, by giving a more natural setting for a continuous reflection. Main features of the network is to create an organisation that allows researchers to have access to the companies organizations (even if restricted in several ways) and allow for experience exchange between the different practitioners. This feature has showed to be a key factor for many companies to join a learning network.

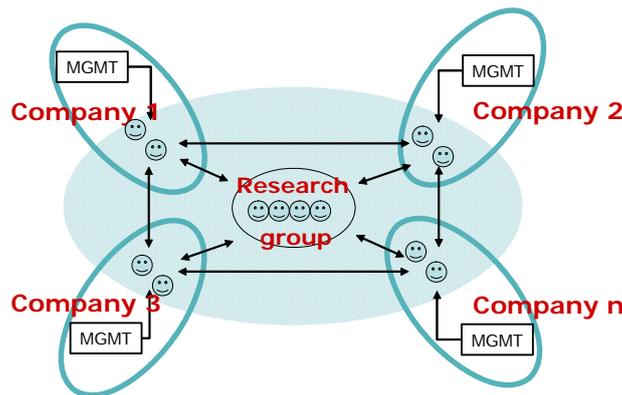


Figure 2. The organization of ProBe as a network of companies and the research group.

Project design – the ProBe process

The main feature of the ProBe process is that it provides a structure for the stages: problem investigation (analysis); model and tool development (synthesis); implementation; and evaluation, see Figure 3. This structure could also be compared to the learning cycle by Kolb (see above) as models

and tools should be developed based on experiences and both researchers and practitioners reflections upon experiences. The conceptualisation of this should in the form of models and tools thus be implemented and tested in full action. This process is time set in order to provide a plan for the companies and a control function for the research group. Gates or milestones are defined for passing from one stage to another. In the following the different phases and milestones of the process will be briefly presented.

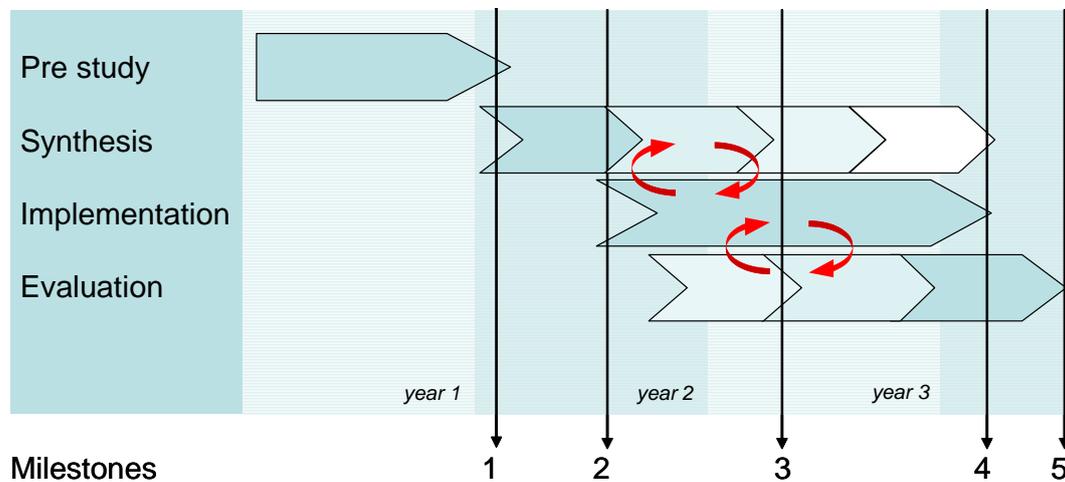


Figure 3. The process of ProBe, which is following a phase and milestone logic.

Pre Study: The purpose is to deeply investigate current practice within the participating companies and identify needs and challenges for an effective PPM.

Milestone 1: Delivery of case descriptions, needs, challenges. Input to models and tools development.

Synthesis: Development of models and tools. This phase continues in parallel to implementation and evaluation in order to continuously improve models and tools.

Milestone 2: Delivery of initial models and tools.

Implementation: active implementation of new work procedures within the companies.

Milestone 3: First evaluation of change process within companies.

Evaluation: A systematic follow up of functionality of models and tools.

Milestone 4: Second evaluation of change process within companies.

Milestone 5: Finalization of project, final reports.

Each milestone includes a meeting between companies and researcher. In parallel to these phases an activity is run for scientific publication and knowledge transfer to other companies.

3 RESEARCH ON PPM

PPM is a research area closely connected to and influenced by several research disciplines such as business development, financing, product development and project management. A specific aim in the literature studies in ProBe has been to identify research needs and problems defined in different publications.

Research needs

In spite of a wide-spread awareness of the importance of Project portfolio management, few companies report being satisfied with how they manage their portfolios, and the use of methods and support tools is quite low [12, 13].

One area, commonly agreed needing more research, is on the contextual factors that, in some way, affect or condition PPM. There is a need for more research in different types of business, organizations, portfolios and environmental contingencies in order to determine which factors should be taken into account when developing models and tools for PPM. In addition, more knowledge is needed concerning which of these factors are context-specific and which factors are universal [5, 6].

When trying to understand PPM from a holistic perspective the current literature do not show a deeply developed and generally accepted explanation. Better understanding is needed concerning what PPM is from a procedural point of view, that means which process are encompassed, how different organizational functions and individual actors interact, and how the activities are carried out [4, 1]. Despite the general goals of PPM, different functions and individuals within an organization demand different requirements of the PPM process [4]. Thus, it is important to explore how the different functions, hierarchies and individuals affect and are affected by the PPM process in order to design a model that would be able to satisfy in a certain way all this multiple internal demands. More specifically, it is also highlighted in the literature that there is not enough knowledge about how PPM really works in practice, its dynamic, the problems managers face when coordinating it, and why it is organized in certain ways [6, 13, 4].

Some other important issues addressed by different authors are how the support techniques and tools are chosen and integrated to a process, the way of involving organizational participants in the activities, the identification of problems when managing project portfolio and more general managerial procedures that take into account PPM complexity and scope [1, 4, 6].

Another topic that researchers have pointed out is the need of tailored models or solutions that take into account the companies' specific situations. Which tools are preferable to use, how the processes are going to be coordinated and organized, and according to what implementation plan these tools and models are going to be adopted, are issues that must be designed, implemented and carried out considering each company situation, expectations and goals [4, 14].

Beyond the procedural dimension of PPM some authors have emphasized an organizational dimension of PPM that needs to be further developed in order to achieve a better understanding of PPM complexity. It is generally agreed that the resource allocation process is, in some way, included or related with PPM. This interaction has, beyond the procedural, an organizational dimension that needs to be deeply explained. According to [6], allocation of resources, and its interaction with PPM, is a process of politics, horse trading, interpretation, and sense making that is far more complex than traditionally has been discussed. Other organizational aspects that different authors emphasized that should be further developed are tools and models to supporting communication and cooperation between the actors involved and affected by PPM, how to integrate in the decisions all the actors who have valuable knowledge and how to minimize subjectivity [4, 3, 15, 13].

4 EMPIRICAL RESULTS IN PROBE BY MILESTONE 1

In order to get information concerning how the three companies currently work with Project portfolio management a pre study was carried out. The pre study was conducted with qualitative research interviews with 30 respondents in total, among them general managers, business unit's managers, products managers and project leaders. With the aim to facilitate the analysis, the information gathered in the interviews was classified in three categories. First, *contextual parameters* are identified, that means those factors that in some way affect Project portfolio management and that should be taken into account when designing and running the process. Secondly, the category *procedures of today* was chosen with the purpose to know how companies are currently managing their portfolios and to understand what project portfolio management encompasses and how the different parts are linked together. Information regarding handling and selection of ideas, comparison of projects, strategies for new products and resource allocation was outlined. Finally, *current problems and opportunities for improvement* regarding project portfolio management that were identified in the three companies are stated, to get general directives when designing a practical-oriented solution.

Contextual parameters

The findings in the pre study show that there are some factors, that in spite of not being directly related to the PPM process, should be taken into account to develop models and solutions that are suitable for each company situation and characteristics. Some of this factors and how they affect portfolio management are presented as follows:

Market: markets dynamics and companies market position condition the decisions within portfolio management. The three companies shown different scenarios depending on the business units and the types of products that were considered. In some cases they operate in open markets that conditions the new product strategy (e.g. create market niches) and means uncertainty when estimating profitability of new products. In other cases a lead position means that new product strategy must defend this position hindering competitors to introduce their products in the market by for example giving priority to a low profitable project. Regarding markets dynamics, customers' needs are suitable to change fast, making projects lead-times a factor of high risk.

Product complexity: The technical complexity of products condition the project selection, since the contribution from different parts to the product profitability is difficult to state. In addition, components may be developed by different business units, so companies need a way to compare and prioritize several projects among different business units. Technical complexity demands specialized competence that sometimes exist only among few people. Thus, in spite of assured founding a resource problem can arise when few people must work in several projects at the same time.

Customers: how early customers come in the development process is a factor affecting project portfolio management. In companies with customers appearing very early, for example making an advanced order, the promised delivery date becomes a driving criterion for project prioritization.

Product development organization: two different ways to organize product development were identified. The first way is to have a product development department for each business unit. With this way business unit managers have a firm control over the development resources. The other way is to have a central development unit which takes orders from the different business units. Here the development manager is the one who decide over resources after some kind of agreement with the different business units.

Company size: managing project portfolios includes the use of support tools and multiple decision-making steps. Company size conditions the capability of recollecting information, making analysis and running available support tools. At the same time small companies may face the situation that few people is involved in most of the decisions steps of PPM process. Thus, companies must consider when designing their portfolio management process how to assure that the right decisions are made when just few people is taken them.

Past changes: in companies without maturity in managing portfolios in a structured way the introduction of a formal process means an organizational change. In that case, it is important to know the company's history about which changes have been done in the recent past and which others formal processes that may be related with project portfolio management process have been introduced before. In the companies studied all of them had introduced recently structured models for managing of individual projects. In which grade these models are accepted and well functioning would affect the way to manage the portfolio of projects.

Procedures of today

This pre study has shown that the three companies have a more or less structured process for handling and selecting ideas to new products, however, not all the steps of the formal decision process are taken. Discussions and analysis preceding selection are carried out in an informal way out of the formal forums and informal decision makers, often experienced people, participate in the process. In addition there are no formalized criteria to evaluate new ideas and it is a lack of communication of the basis of decisions to project leaders and other people affected by portfolio selection.

Concerning prioritization of projects neither work procedures nor explicit criteria exist in the companies. No comprehensive picture of projects within the companies is made, thus restraining the possibility to prioritize projects among different business units, none of the companies use visualization tools to evaluate the balance of the portfolio selected, and analysis does not take into account the interdependency between projects or the resource constrains. Also similar to the three

companies cancelling of projects not happen often and in case that this occurred the decision would be taken centrally by the general manager or the board of directors.

A high grade of centralization of the decisions was established in the three companies. Final decisions are taken of general managers or board of directors while managers of products lines, business units and development departments carry out discussions and analysis and prepared information basis for the directors.

As a result of lacking of formal criteria to evaluate new ideas is not possible to assure that resource availability is taken into account in all the decision to start a new project. In some cases the decision to start a project is taken before analyzing if there are enough resources. As a consequence some projects are decided but never done, some ongoing projects suffer shortages of resources and dissatisfaction arises among those who work in the development projects.

Interviewees report that a strategic alignment is conducted in informal ways when deciding to start a development project. Neither formal procedures nor checklists were used to support this activity.

There are not widespread tools to support the project portfolio management in the whole companies. In one company a model was developed to support project selection but it is not used. A common understanding among the interviewees is that tools are needed, however, must be tailored to the companies and aligned to other processes.

Current problems and opportunities for improvement

The results of this pre study show in the three companies the absence of a framework that includes all the activities, participants, criteria and tools that constitute the management of the portfolio of projects. Specially, an understanding about how the different related processes contribute to the process and how to encompass them in a general project portfolio management process is needed. Thus, is not possible to assure that all the decisive criteria are taken into consideration when evaluating and selecting new ideas. Another consequence is that the companies are not able to communicate the basis of the decisions and frustration arises between project leaders when their resources are cut down without clear explanation. Therefore, a map over the different actors` requirements on project portfolio management is needed. Interdependence among projects and scarce development resources means that a comparison and prioritizing of projects among different business units is needed. Particularly, tools to support the balance of the portfolio are needed.

5 DISCUSSION AND CONCLUSIONS

Empirical results

The contextual parameters outlined from the interview analysis, show clearly that PPM is a complex process and that the development of new work procedures in the companies must address a variety of factors. Findings concerning procedures of today show that without a formal and established PPM process it is not possible to assure that the resultant portfolio is the optimal. One reason to this is that decisive criteria are not systematically taken into consideration in project selection and prioritization. In addition, frustration arises between project leaders when the projects they work with become under prioritized without clear explanations, because of a lack of a basis for decisions.

The processes studied (handling and selection of ideas, comparison of projects, strategies for new products and resource allocation) seemed to be interrelated in a certain way, all of them contributing to PPM output. PPM process should be explained and consequently designed and run by considering how those processes are connected and in which grade they are encompassed by the whole PPM process. Regarding support tools it was confirmed that an introduction plan should be designed and that such tools should be related to a more general project management process in order to be accepted and effectively used.

Furthermore, through the interview analysis, also a special category of challenges to solve when developing and running PPM processes have been identified. Those challenges are related to an organizational dimension of PPM complexity that is highlighted by research literature.

- General managers and boards of directors are involved in several steps of the decision process. People in these high positions of a company's hierarchy have a kind of work that is not easy to structure and express as a process. Therefore is considered necessary to explore the characteristics of these high positions in order to set how to integrate them in a formal decision process.
- Comparing and prioritizing projects among different business units means that more stakeholders and interests are involved. Thus, a model for managing portfolio of projects should take into account this kind of conflicts that would arise.
- PPM includes handling new ideas, which means to be close to the innovation process. Innovation is often associated with a lack of structure and formality and people involved in those process react when changes are directed to introduce more formal ways of working. It is a challenge to design a structured process for handling new ideas without affecting the conditions for a creative environment.
- Subjectivity arises in the phenomenon studied when decisions are taken trough informal discussions and experienced people influence by their opinions. A way to minimize the risk of subjectivity without hindering to make use of the experienced people is needed.

Evaluation of Probe's Design Research methodology

Mainstream literature on PPM agrees that the subject is complex and not yet well defined and explained. A deeper understanding of PPM in practice is needed, particularly how the way of evaluation of ideas and projects affects both the process and the results of designing. Literature also states that tailor-made solutions in the form of tools and models, which take into account organizations' specific situations, are needed. Design Research includes designing research methodologies that need to be justified and tested.

Thus, one of the purposes of this paper, to evaluate Probe's methodology in Design Research, is going to be done according the major research needs that is identified as most relevant to develop new working procedures for industry. Table 1 is describing these needs together with the empirical results from the pre study in ProBe, and the elements from ProBe's research methodology.

Table 1. A comparison of research needs from literature, empirical results in ProBe and ProBe research methodology.

Research needs stated in literature	Pre study results and implications	Relation to methodology or activities in ProBe research project
Which are the contextual factors to consider in development of PPM models and tools? Which of them are context-specific or universal?	Contextual factors were identified and its influence in PPM explained. From these cases context specific factors can be derived.	A deep understanding of the included cases can be gained by action research. The network of companies includes different businesses and types of companies.
Which processes encompasses PPM and how are they interrelated? How does PPM really work in practice and how do the practical problems arise?	It was evidenced that PPM encompasses several processes and information about how they are interrelated was gathered. An understanding of the significance of informal processes, centralization of decisions and lack of communication was established.	Action research and the half structured interviews allow researchers to gain an understanding of existing activities and related processes. The real practice is studied deeply. Complexity can be covered.
How are support tools chosen and integrated to the PPM process?	Problems when introducing support tools were identified and analyzed.	Interviews are effective in problem identification.
Tailor-made models for companies' specific situations	Empirical evidence of unsystematic working processes, potential for	The action learning strategy (learning cycle) supports the development of

are needed.	improvements, willing to change and awareness about PPM importance was gathered. Results show companies' problems and opportunities for improvement.	suitable solutions and practical knowledge. Practitioners take part in the model and tool development. Attending a network function as a process management, triggers motivation and enhance learning.
How is PPM's organizational complexity such as politics, power, subjectivity, informal decision-making, etc., going to be managed?	Several challenges and obstacles to solve related to organizational complexity were identified	The use of different methods within the scope of action research will provide nuanced pictures of PPM in practice for the participating companies, e.g. interviews and observations.

The analysis of the empirical results together with the comparison of research needs identified in literature show that ProBe is focusing on issues that is of highest relevance to companies. From the beginning ProBe was designed to meet these needs and the evaluation by Milestone 1 show that the research approach and the selected methods are relevant. The conclusion can be made that ProBe project focuses on significant problems, and that the different components of the research methodology contributed to obtain relevant findings regarding understanding complexity within PPM and developing customized solutions. It is also stated that ProBe project can continue according to established plan. However certain factors should be carefully considered during completion of the project, which is discussed below.

The work on defining how contextual factors affect the performance of PPM must go on, however, a reasonable level of ambition must be taken in ProBe. From the continuing research nuanced pictures of process, organization and changes within the companies can be given, though the project can not answer questions on e.g. differences between business sectors on a general level. To do this ProBe would need to grasp over a much larger quantity of companies, which is contradictory to the goals of making changes in the collaborating companies.

Former research as well as the empirical result from the pre study in ProBe, addresses the importance of a company wide perspective in defining a PPM process. PPM must be related to adjacent processes and boundaries defined. Also, guides on work procedures should include more than the actual activities, e.g. communication channels. In this work an important goal is to balance the need of structure with keeping openness to informal procedures that many times keeps much knowledge. As a stepwise change procedure is taken it is judged that the companies will find natural ways to keep this openness. The final results of ProBe concerning methods and tools should also include guides for implementation to support such factors.

So far a positive result is met in ProBe by the large commitment among the companies to carry through changes. This result is gained by a careful preparation of the study and an appropriate selection of companies. At the present, by milestone one, the companies are requesting suggestions on tools and methods in order to start a more qualified PPM. The ProBe **research plan** is most likely well suited to meet the needs of the companies; however, a task for the researchers will be to carefully guide them towards a systematic change work without expecting that a new PPM method can be developed for tomorrow.

Change need a lot of efforts and it is an obvious risk that companies expect to receive solutions from the researchers, though it is a shared responsibility. Researchers should not take the role of consultancies but stick to leading the change process and not owning it. However, an equally important matter to question is if the researchers really participate from within or stay observers. A more extreme form of action research is Participatory Actions Research (PAR) as described by [18]. PAR means that researchers and practitioners should in collaboration identify problems, seek reasons to problems and develop solutions together. ProBe will continuously evaluate which form of action research that is most efficient in each company case.

On a more general level for research in PPM it can be stated that this research **methodology** should gain much from a complement in quantitative research. The over all understanding of PPM need a screening though a larger quantity of companies from different business sectors and different products.

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