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Comparative Market Analysis of Project Management Systems

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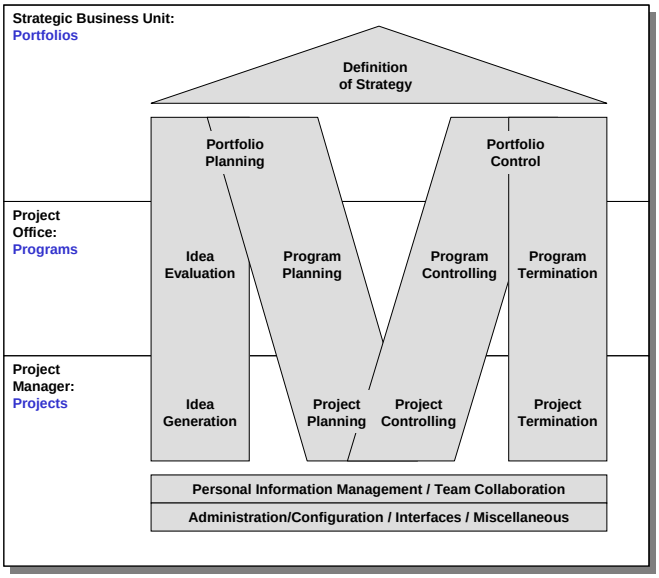
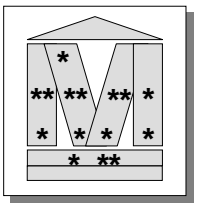
Quick Start Guide

Throughout the study project management systems are described and classified using the so-called *M-Model*, which is a conceptual software architecture that includes all project management tasks.





Above:

Icon used to illustrate the software functionality

Left:

M-Model

Each software evaluation contains an iconified M-Model with stars indicating the degree of functionality the software system provides with regard to the corresponding component of the M-Model.[1]

No Stars – No Functionality: No software support in this area.

One Star (*) – Basic Functionality: Limited software support in this area.

Two Stars (**) – Advanced Functionality: Advanced software support in this area. The software offers dedicated functionality but does not have the depth that ”power users” would expect.

Three Stars (***) – (Almost) Complete Functionality: Complete or almost complete functionality in this area. Users can expect to find elaborate functionality for the project management task.

[1]For a detailed description of the M-model please refer to chapter 3.2, p. 25.

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Chapter 1

Introduction

1.1 Context of the Study

Over the last decade more emphasis was placed on the general significance of project management for modern enterprises than ever. Globalization, the emergence of new technologies and increasingly strong competition in almost all industries force companies to constantly adapt their processes and products in order to meet the requirements of the market.[1] As a result, permanent organizational change, inter-organizational collaboration and knowledge work have become typical behavior patterns in today's economy. Projects to implement organization change, redesign business processes, and develop new products have therefore gained significantly in importance in everyday business. An ever increasing number of people work in project-oriented assignments.[2]

Project Management Software Systems are widely regarded as an important building block of today's project management.[3] The nature of such systems has changed considerably in the last decade and they are still developing from single-user/single-project management systems to complex, distributed, multi-functional systems that no longer cover project planning alone.[4] This development reflects a general change in the way projects are carried out today; inter-organizational, distributed projects that are part of enterprise-

[1] Perich (1993), p. 30–79; Picot, Reichwald, & Wigand (2001), p. 2–6.; Pells (1998); Vahs & Burmester (1999), p. 9.

[2] See the results of a representative study in which more than 70% of executives and qualified employees confirm that the significance of project work will increase; o.V. (1999), p. 92. Cp. also Balck (1991), p. 56.

[3] WHITE and FORTUNE have stated that more than 75% of project managers use standard project management software, cp. White & Fortune (2002), p. 7.

[4] See the results of previous studies on project management software, e.g. Dworatschek & Hayek (1992).

wide project management have become the norm in many businesses and companies. Software systems are one of the strongest enablers for such projects and help minimize frictions caused by geographically dispersed teams, time zones and organizational boundaries.

Unfortunately, the market for project management software systems is not transparent. Hundreds of vendors compete for millions of users of such systems and the variety of underlying technologies and concepts is wide. The reason that some systems are licensed is often because the vendor is the only one known for offering a specific kind of technology or functionality and not because they are the most suitable ones. A more suitable competitor may not be taken into consideration simply because he is not ”visible”.

1.2 Objectives of the Study

The objective of this study was to offer a solid foundation of information for decision-makers intending to buy or rent a project management software system. We have prepared an account of all project management software vendors known to us. For those who permitted us to evaluate their software we will offer a description of its functionality at a medium level of detail. Obvious weaknesses of a software system that can be stated independently of specific user needs will also be mentioned. However, we will neither offer a ”ranking” of software systems nor state any direct superiority of a specific software system. Instead, we will make the software systems easily comparable with regard to their functionality and technical architecture. The study can therefore be used to identify suitable software systems, offering the possibility of a rough pre-selection before vendors are contacted.

In contrast to other project management market studies[5], we have concentrated on a medium-level comparison of the systems. For example, you will not find any information about the time-scale of Gantt charts in this study. We believe that such information is of limited use for companies that are in an early phase of a software selection process. In this study, project management systems are compared by their functionality to support the overall life cycle of projects and their ability to provide all levels of management with the information relevant to manage not only one but dozens or hundreds of projects. In the study this is called enterprise-wide project management, which covers a lot more processes than single-project management.

As a consequence, the target group for this study is not project managers or project controllers who have to prepare the project plan for a single project. Rather, the study offers information that could be useful for project offices or top management who intend to streamline project management processes and improve the coordination of project

[5]Cp. Dworatschek & Hayek (1992); Voss (2002).

initiation, planning, execution, and termination.

1.3 Structure of the Document

Chapter 2 describes the research design of the study.

Chapter 3 contains a comprehensive presentation of the contents of the study and the evaluation criteria. Moreover, the conceptual foundation upon which the study is based is discussed in this chapter.

Chapter 4 contains the results of the study. Each software that has been analyzed is presented in an overview, and a detailed description is given.

Chapter 5 contains comparisons of the evaluated project management systems.

Chapter 6 contains information about project management software vendors who did not give permission for their software packages to be evaluated within the study.

Chapter 2

Research Design

2.1 Selection of Systems

Within the framework of this study we have only evaluated project management systems that run in PC environments under Windows and Linux. ERP systems with project management functionality are not taken into consideration.

The study does not analyze industry-specific functionality - only generic project management functionality is evaluated. Systems that are primarily designed for the following purposes are specifically not the object of the study: Professional Service Automation, Procurement Management, Executive Reporting (unless project management-specific).

The manufacturers and their software systems were identified in an Internet inquiry. Only those manufacturers were contacted whose systems were multi-project enabled, in the sense that they support a common resource pool. Altogether 72 manufacturers were contacted, 27 of whom decided to participate in the study and provide their software. Since one manufacturer provided two systems, this led to the evaluation of 28 software systems. The study was initiated in June 2002 and was completed in January 2003. Functionalities of new versions that have been released in the meantime were incorporated into the study.

2.2 Derivation of Evaluation Criteria

Within the framework of the study we focus on breadth and depth of functionality rather than non-functional quality criteria. For this reason, our evaluation scheme consists almost exclusively of groups of functionality that are useful for enterprise-wide project management. These functionality groups were created in two steps. First of all we followed a top-down approach and deductively derived necessary functionality for enterprise-wide

project management from a theoretical point of view using the so-called M-Model.[1] Subsequently we looked at the functionality the software systems offer (bottom-up approach). This was undertaken to make the theoretical findings more realistic and to validate them. Furthermore, it enabled us to ensure that the study reflects the functionality of state-of-the-art project management systems. The results of this phase were mainly summarized in the form of an adapted M-Model, as elaborated in chapter 3. This version of the M-Model was extended by functionality groups assigned to each process element of the model.

2.3 Evaluation of Systems

The evaluation of the software was carried out in a laboratory environment. We installed all systems on computers in our media lab or accessed the manufacturers' hosts via the Internet.

In most cases we obtained a short introduction to the software by a consultant or sales representative. These introductions typically took one to two hours. The majority of the less complex systems were analyzed without this initial introduction. However, we always had the support of the manufacturer and used it if problems arose. Some evaluations were carried out at the manufacturer's site since the complexity of the software installation and the hardware and software requirements forbade an installation in our media lab.

Evaluation was undertaken within the framework of the adapted M-Model. We analyzed the extent to which the software systems support the functionality, as expressed in the M-Model, by working with the system and its documentation. In a small number of cases we had to be advised by consultants. If problems occurred we contacted the manufacturer and did another iteration. With the help of iconified M-Models we summarized the findings for each software system, as explained on page 4.

In principle, the software systems are evaluated by stars expressing the extent to which the software offers a certain kind of functionality:

No Stars – No Functionality: No software support in this area.

One Star (*) – Basic Functionality: The software offers basic support in this area. The functionality is limited to the input and maintenance of necessary data and some simple reports.

Two Stars (**) – Advanced Functionality: The software offers advanced functionality in this area. The software distinguishes between different user roles and provides these roles with corresponding functionality. However, state-of-the-art project management techniques are not completely implemented as "power users" would expect.

[1] Cp. Ahlemann (2002).

Three Stars (***) – (Almost) complete Functionality: Three stars are given when the software offers an (almost) complete set of functionality necessary to perform a process step. Users can expect to find elaborate functionality for their specific role and state-of-the-art project management. The functionality has a high degree of configurability and allows seamless integration with other functionalities.

Generally, stars are not given for workarounds and functionality that was originally not designed to support the process step concerned. E.g., some manufacturers implement budgets by creating special resources. This is regarded as a workaround and is not considered in the study.

In order to be able to summarize the evaluation results at the level of the M-Model, each functionality has a percentage reflecting the weighting of the particular functionality regarding the aggregated evaluation (scoring model). Thus the aggregated evaluation result is

$$N_{sp} = \left| \left(\sum_{i=1}^{f_p} N_{spi} w_{pi} \right) + \frac{1}{2} \right|$$

where N_{sp} is the evaluation result of process step p and software s, f_p is the number of functionalities for process step p, N_{spi} is the evaluation result for software s, process step p and functionality i (the number of stars), and w_{pi} is the weighting of functionality i in process step p.

Example:

Regarding the process step ”Idea Evaluation”, the software system ”ProjectWorld” has been evaluated as follows:

- Creativity Techniques (10%): **
- Employee Suggestion System (30%): *
- Idea/Project Classification (60%): ***

The aggregated result is: $2 * 0.1 + 1 * 0.3 + 3 * 0.6 = 2.3$. This result is rounded to 2 so that the iconified M-Model would look like that in fig. 2.1.

The criteria weights are derived from empirical studies on the application of project management methods and processes and individual discussions with project managers and project management software manufacturers.

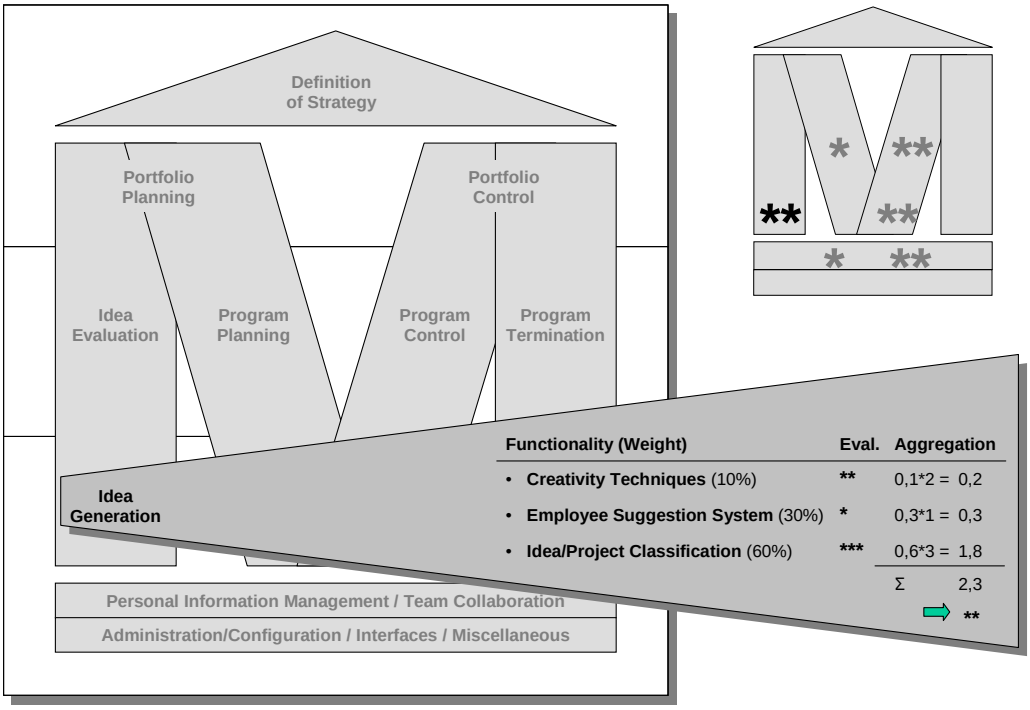

Figure 2.1: Evaluation example

2.4 Final Verification

At the end of the study the detailed evaluation results were presented to the manufacturers for final approval. The manufacturers were given the chance to suggest corrections which were verified by us and subsequently taken into account. The evaluation summary was not presented to the manufacturers in advance.

2.5 Clustering

Since project management systems differ significantly from each other with regard to their target group and functional focus, it does not make sense to compare all systems with each other. Instead, we created clusters of projects management systems with comparable functional focuses and target groups. Rather than applying statistical methods[2], we analyzed both the marketing message of the manufacturer and the functionality of the systems. In doing so we created six product clusters:

Plan-oriented Multi-Project Management Systems Such systems have strong functionality in the fields of scheduling and resource planning and are therefore suitable for large, complex projects which need detailed planning in advance.

Process-oriented Multi-Project Management Systems In contrast to plan-oriented systems, the software from this cluster focuses on quality and process management. Standardized project management with steady quality control and workflow support is the overall objective of these systems.

Resource-oriented Multi-Project Management Systems This cluster embraces those systems that concentrate on resource planning and offer almost no additional functionality. The objective is to manage a common resource pool, assign resources to projects and control the resource usage.

Enterprise Project Management Systems Systems that support the entire project life cycle, especially including portfolio planning and controlling, belong to this cluster.

Project Collaboration Platforms This cluster contains systems that have very limited multi-project support but offer a web-based team collaboration platform. Functionalities such as threaded discussions, document management, surveys, or shared task lists are typical.

[2]The random sample is too small to come to a valid conclusion for the entire population.

Chapter 3

Contents of the Study

Each product evaluation consists of two parts. The first part gives an overview of the product and the manufacturer. Furthermore, it summarizes the findings. The second part contains the detailed evaluation results. We recommend using the first part to become acquainted with the products and to carry out a pre-selection of products. The second part can then be used for a comprehensive comparison and product-selection.

3.1 Product Overview

Since most decision-makers do not only make decisions regarding the functionality, we also provide information about the technical architecture, software requirements, hardware requirements, Internet-ability and the manufacturer. This information was taken from the world wide web, brochures, manuals or was provided directly by the manufacturer:

Version The version number of the software that has been evaluated.

Appraisal Short appraisal of the software. This appraisal classifies the software as belonging to one of the product clusters explained in chapter 5, describes its target group, its functional focus and special technical aspects, if necessary.

Contract The general contractual conditions under which the software can be used. Typically, software licenses are offered that allow the licensee to install and use the software running on one's own hardware (self-hosted solution). Some vendors offer their software as an application service; the licensee can then access the software over the Internet, which does not require any additional hardware or software, e.g. for special servers (ASP). Alternatively, the software can be rented but has to be installed on local computers.

Architecture Short description of the technical architecture. The simplest architectures are file-based, which means that a monolithic software application accesses files that contain the project data. Advanced, so-called 2-tier architectures shift the data storage towards special database management systems. State-of-the-art 3-tier architectures are based on an additional third layer which comprises the complete application logic so that input/output, application logic and data storage are clearly separated from each other.

Client The software requirements for the client (the work place computer) are described here. Hardware requirements are only mentioned if standard personal computers are insufficient to run the software.

Server In analogy to the description of the client the software and hardware requirements for the server are described here.

Internet Ability Due to the fact that an increasing number of projects are carried out by teams working in multiple locations, the use of project management software over the Internet is gaining in importance. Although many applications offer web-based clients, complete Internet ability is not always automatically guaranteed. One can only speak of limited suitability for the Internet, especially if firewalls have to be reconfigured and proprietary browser plug-ins are required.

Installations The number of installations of the software is an indicator of the distribution of the software.

Product since This is the year in which the first version of the software was released. Preceding products are not taken into consideration.

Manufacturer Here, the manufacturer of the software is described. This comprises contact information, year of foundation, product and service portfolio, sales, number of employees, worldwide sales partners and plans for the following years. If certain information is missing in this section it was not revealed by the manufacturer or the sales partner.

Pricing This section contains information that gives us a first impression of the general pricing of the product. Due to the extent of typical price lists and general terms and conditions, we are frequently not able to present the complete pricing scheme.

References Reference customers as made known to the public by the manufacturer. This list does not claim to be complete.

Summary The summary gives a more detailed picture of the application than the initial appraisal.

3.2 Detailed Product Analysis

This section describes the M-Model, its elements, and the corresponding software functionality as it is analyzed throughout the study. The weighting of the functionalities are placed in brackets behind their title.

3.2.1 Overview: The M-Model as a Frame of Reference

The so-called M-Model is a conceptual software architecture which embraces all tasks related to the initiation, planning, execution, and termination of projects.[1] It describes the process of enterprise-wide project management (*project life cycle*) and explains the management levels involved.

Project Life cycle

Independent of their individual objectives, projects run through a series of phases which form the *project life cycle*. At a high level of abstraction, this life cycle consists of the following phases:[2]

Initiation In the initiation phase, project ideas are generated, collected, captured, and examined. Their feasibility, profitability and strategic impact are analyzed so that a final decision about their implementation can be made. This phase ends with a formal go/no-go decision made by the top management.

Planning In this phase the project idea is refined into a project plan and the necessary resources (financial, human and other resources) are provided. This phase is similar to the previous one, only it is more detailed. Since the final decision about the project has already been made the scheduling can be fixed, resource assignments can be made, the budget can be made available, and contracts with external suppliers can be arranged.

Execution This phase embraces the realization of the project idea using the resources assigned to the project. It his highly mechanistic; in its ideal form it only consists of an efficient implementation of the project plan prepared in previous phases. The execution of a project frequently leads to a vast expansion of the organization.

Termination In the termination phase the project results are installed and handed over to the project sponsor. In addition, the enterprise closes the project and tries to learn from the experiences made.

[1] Cp. Ahlemann (2002).
[2] For project life cycle phases cp. Morris (1983), p. 6–8.

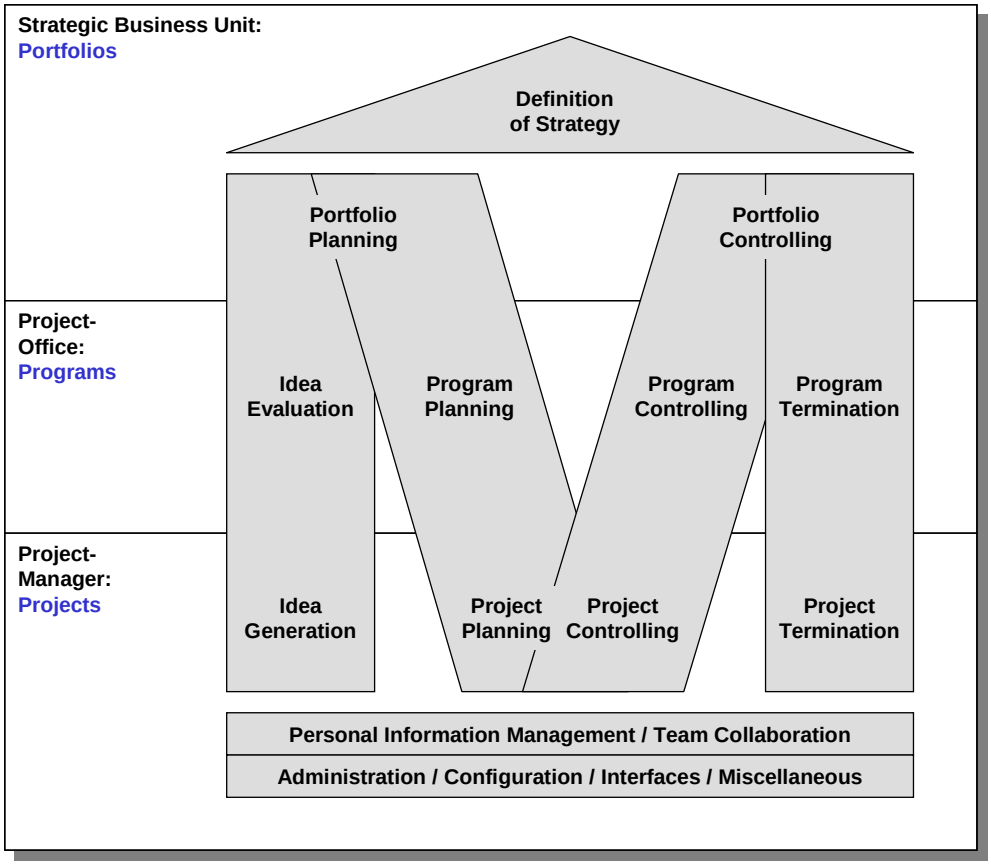

Figure 3.1: The M-Model

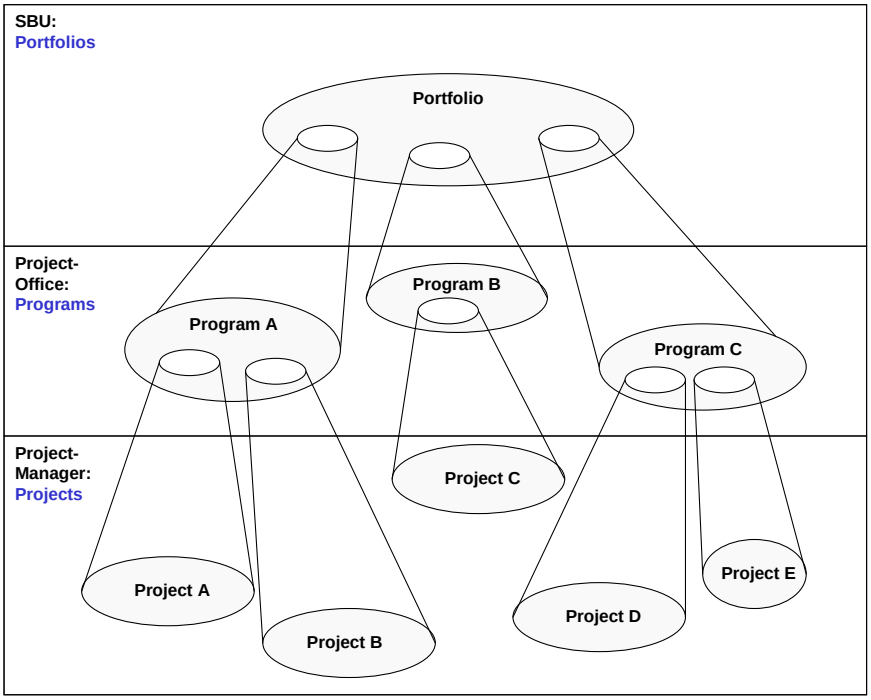

Figure 3.2: Management levels in the M-Model

These phases are reflected in the shanks of the ”M” and are further sub-divided into process steps as discussed in the following sections.[3]

Management Levels

Throughout the project life cycle different management levels are involved. Within the M-Model three different management levels can be distinguished:[4]

Project Manager At the level of operational project management the project manager is responsible for the planning and execution of a single project. This level is represented by the lower third of the M-Model.

[3]See fig. 3.1. It is not obligatory for all projects to run through all process steps. Even when a project has finished a complete phase it can still be reasonable to immediately terminate it due to its profitability, feasibility or strategic positioning. See Buttrick (2000), p. 57–59; Mantel & Meredith (1995), p. 202.

[4]See fig. 3.2. Cp. Morris (1983), p. 8–9.

Project Office The project office is established above the project level. Its primary planning object is the project program, a set of interrelated projects at the level of a department or a similar organizational unit at the medium level. Typically the grouping of projects to programs is done by their functional reference (e.g. all IT projects) or their overall objective (e.g. all projects affecting the launch of a new product).[5] The project office is responsible for the coordination of such a project program. It assigns resources to projects, collects control data and reports to the upper management levels. In addition, it assists project managers and assures that the project management standards are adhered to.[6] The project office is represented by the middle third of the M-Model.

Strategic Business Unit The management of a strategic business unit (SBU) is represented by the upper third of the M-Model. The strategic business unit is an organizational unit that allows strategic planning for a specific self-contained business area and that can typically be found in large, diversified enterprises.[7] In small- and medium-sized enterprises the management board is comparable to the strategic business unit.

Since higher management levels do not have the time to coordinate each individual project or program all programs of a strategic business unit are combined into a portfolio to increase the clarity of the project landscape and to reduce complexity.

The strategic business unit is responsible for the planning and controlling of the portfolio. Its task is to harmonize the business strategy and the project portfolio or, in other words, to derive a project portfolio from the strategic objectives of the business unit. In doing so, the SBU has to take financial and other resource constraints into account.

3.2.2 Idea Generation

The life cycle of a project starts with the generation of project ideas, which can either be the result of a systematic search or the output of an employee suggestion system.

[5]Cp. Patzak & Rattay (1998), p. 404. For different interpretations of the term 'project program' cp. Buttrick (2000), p. 139; Diethelm (2000), p. 23; Rickert (1995), p. 205.

[6]Cp. Burghardt (2000), p. 105–106. For the role and the tasks of the project office cp. Combe (1999), p. 367–368; Leveine (1999), p. 42. Some authors view a project office as only responsible for one

project, cp. Diethelm (2000), p. 213; Archibald (1983), p. 114–115; Mantel & Meredith (1995), p. 170–171; Wischnewski (2001), p. 59.

[7]Cp. Meffert (1998), p. 223-229; Hopfenbeck (1998), p. 490–491; Schulte-Zurhausen (1999), p. 297.

Regardless of their origin, all ideas need to be collected, captured and classified in order to be able to proceed to further process steps.[8]

Creativity Techniques (10%) Project management software can support the process of generating project ideas with functionality that helps to perform creativity techniques, such as brainstorming or brainwriting.

The easiest form of functionality consists of generic meeting support mechanisms like shared white boards and video conferencing. Advanced functionality in this area is more specific and is designed for special creativity techniques. Power users would expect a complete set of functionality for alternative techniques, including moderation support that is directly linked to the project database so that newly created ideas are automatically saved as potentially new projects.

Employee Suggestion System (30%) The second origin of project ideas is the employee suggestion system. Project ideas emanating from such a system are unplanned and can be uttered by any employee.

To simplify the operation of employee suggestion systems, project management software systems should at least offer an adequate input screen for a decentralized entry of such ideas over the Internet or Intranet. Sometimes standard dialogs for the creation of new projects can also be used. However, this requires normal employees to be relieved from the complexity of the overall project management system. Complete functionality in the area of employee suggestion systems also comprises tools for the screening of new ideas using check lists. In addition, complete systems offer automatic notification of the employee who created an idea.

Idea/Project Classification (60%) Once project ideas have been created and captured they need to be classified for further processing. Especially in large enterprises, hundreds of ideas and projects are initiated, planned, executed or terminated simultaneously, which makes it difficult to gain an overview of the situation. Classification allows the flexible grouping of project ideas and projects according to different criteria. E.g. one classification might follow the product line, indicating which project affects which product. Another classification might be based on the location, the functional area, the complexity or other criteria.

Project management systems with basic functionality allow the classification of projects by using one or two configurable fields. Advanced systems offer multiple or even unlimited fields for classification. In both cases the fields should be ”look-up-fields” that allow

[8]For a general introduction to idea generation see Vahs & Burmester (1999), p. 137–138; Burghardt (2000), p. 29–30.

the selection of a value from a configurable set of pre-defined values. Complete functionality allows the set-up of unlimited classification hierarchies that consist of values that can be assigned to the projects or project ideas, respectively.

Classification systems only develop their full potential when they can be used for filtering, sorting and grouping in forms and reports.

3.2.3 Idea Evaluation

Usually enterprises generate a lot more project ideas than they can implement. In addition, many of the ideas do not meet the requirements that are placed on new projects. E.g., they do not comply with the strategic orientation of the enterprise, they are not profitable, or they are not feasible due to financial and personnel constraints. For this reason, each newly created project idea has to undergo a comprehensive examination, consisting of a detailed qualitative description of the project, a profitability analysis, a rough time schedule, a risk analysis, and a resource usage estimation.[9]

Project Proposal Workflow (10%) In many enterprises project ideas are not only examined by one person but by multiple experts. In such cases project proposal workflows are instantiated that consist of several process steps reflecting the various stages of examination.

In its simplest form, project management systems support such workflows by a status field indicating which process step has already been completed. Advanced systems enable the persons involved to be notified. Complete support in this area consists of the ability to define a role-based workflow and to capture the results of the examination in special configurable forms.

Resource Usage Estimation (35%) The resource usage estimation is a necessary precondition for any profitability analysis.

In its simplest form, it consists of a rough estimation by an expert, which is then recorded in the form of a role-/skill-based or resource type-based resource plan; the determination of concrete resources is not yet reasonable at this stage, since it is not clear whether the project will be executed or not. A necessary condition for such preliminary planning is the existence of skill and resource directories, which are best organized in a hierarchical manner. Advanced project management systems support the resource usage estimation by offering specific estimation procedures, such as the function point method. Complete functionality in this area allows the definition of proprietary estimation procedures based on past project data.

[9] For a discussion of the idea evaluation cp. Vahs & Burmester (1999), p. 182–187; Burghardt (2000), p. 61–86; Jenny (2001), p. 467; Buttrick (2000), p. 87–98.