

Re-engineering of the Project Planning Process

Strategic Implementation of Project Management Software

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Abstract

This paper presents a model for re-engineering of the project planning process from being manually performed to be computer supported. The primary objective of this study is to facilitate the implementation of project management software packages in order to make use of the full potential of the software. Earlier studies show that the current use of computer supported planning among project managers of building projects is focused on print-out of schedules and the use of more advanced planning functions is limited. This study shows that only education and support is not sufficiently for project managers to adopt computer supported planning. Successful implementation of project management software also requires clear objectives of the computer supported planning and specified requirements and requisite level of planning details. This paper presents an approach on a strategic implementation of computer supported project planning on basis of the surplus values related to the use of project management software. The results are based upon a case study at one of Sweden's largest construction companies.

Keywords

Computer support, project management, project managers, project planning, scheduling, software implementation, software support, surplus value.

Introduction

In the management of projects, planning and scheduling are important instruments of control. After years of recession in the Swedish building sector, national contractors focus on the planning and scheduling of projects, in order to improve production productivity. The implementation of computer supported project planning is one move in this effort. Earlier studies show that the implementation of computer supported planning has not reached its full potential. Contributing reasons were explained due to insufficient software training, as well as the lack of software and planning support.

In this study the project managers of ten building projects were given training in planning and the use of software, as well as support. One year after the initial training, the use of the planning software was charted. The results show that training and support are not sufficient to reach an efficient usage of project management software. The objectives of computer-supported planning has not been made clear and differs between company management, project managers and software suppliers. Well-defined requirements on computer supported planning have not been specified.

The company management needs to enforce the implementation of computer supported planning towards clearly defined objectives for the planning process. The company management is responsible for creating the necessary basis for the software implementation by providing sufficient and adequate training, support as well as



clearly specified objectives. This report presents an approach to the strategic implementation of computer supported project planning, on basis of the surplus values related to the use of project management software. The purpose is to facilitate the implementation of project management software packages in order to adopt full potential of the software.

Method

The report is based on a case study at one of Sweden's largest contractors. On initiative of the company management, the implementation of project management software packages at ten building projects have been studied. The project managers at the building projects were initially given a four-hour lecture on planning theory, comprising the basic planning concepts of activities, events, relations, resources and calendars as well as an introduction of the CPM-method. The project managers further attended a one- or two-day course on the planning software provided by the general software agent. Round-the-clock support was available to all project managers during the initial four-month implementation phase. The results of this paper are based on an investigation of the planning performed by the project managers, under a period of four month, directly after the training program. The investigation was followed-up one year after the initial training program. The study consisted of field surveys and interviews at the construction sites of the building projects. Additional interviews with representatives from the company management as well as the software suppliers were carried out continuously.

The implementation of project management software has been studied from the perspectives of three parties involved in the implementation; the company management, the project managers and the software suppliers. The company management includes all levels of managers working in the line organisation of the company, in positions superior to the project managers. The project manager is the site manager responsible for the accomplishment and management of a project. The project manager is the practical user of the project management software system, since he is responsible for, and personally undertakes, the actual project planning. The software supplier represents the companies selling project management software packages. These companies are general agents for one or a number of software packages. They also offer consultancy services and provide software training and support.

Results

Lasting Effects of Education and Support

This study shows that only training and support is not sufficient when implementing computer supported planning, which has been the case in the investigated company. The lasting effects one year after the initial training program were very limited.

The extent to which the planning software were used corresponds to the results of earlier surveys, which show that the capacity of the software packages is only partially used in the practical planning process. Very few project managers use their project management software as a powerful planning tool. Instead, the software is mainly used to create schedule layouts. Most project managers who use project management software has not adopted a planning procedure according to the

planning strategy of computer supported planning. They still produce a number of different schedules with no interrelation, although the schedules represent the same project. The information fed into the software are generally limited to the start time and duration of activities. Further on, activity relationships are seldom specified or documented in the software. Consequently, software functions such as what-if analysis, activities with or without lag, and other principal planning operations are not obtainable in the software. No project managers use work breakdown structure, what-if analysis, earned value, resource levelling or other sophisticated planning techniques provided by the software.

Project managers generally consider the software being difficult to handle and time-consuming to work with. They find it hard to see the advantages of planning functions provided by the software. Their most obvious requirements relate to print-out functions. Many project managers thus choose to use software packages that they are familiar with, e.g. Excel, for simple and rapid creation of schedules.

It is evident that the training has failed to instigate a re-engineering of the planning process to adapt to a computer supported planning method. Despite the fact that the training has focused on the CPM-method, which requires a project network with linked activities, this has not been adopted by project managers after completed training. Consequently, none of the analysis functions, nor any other sophisticated functions of the software, are available. Interrelated activities can be considered a necessary prerequisite for exploring the full potential of a project management software package.

Very few of the project managers are of the opinion that their planning has improved as a result of training and the access to support, and only few feel the need to develop their planning skills. They believe their planning to be satisfactory for the management of their projects, and thus lack the incentive and motivation to re-engineer their planning process.

Background Reasons of the Current Situation

The insufficient software usage, according to the conclusions of this study, relates to vaguely defined requirements regarding project planning. The unclear requirements are caused by indistinctly formulated objectives for the planning process, as well as the company management's vague knowledge of the capacity of management software. The knowledge of and interest in planning among company managers monitors to a large extent with what skill and quality project planning is undertaken by project managers. Under these circumstances, it is up to each project manager to personally formulate the extent and contents of the planning required for the management of each project. The software training has not resulted in sufficient understanding and motivation among project managers to adopt and use the planning software efficiently of their own accord. The software training has too strongly focused on single software functions, which has not led to an increased understanding of the practical use of computer supported planning as a means of monitoring a project.

Strategic Implementation of Project Management Software Packages

Definitions and Objects of Project Planning

The survey shows the need to clearly define the goals and contents of project planning in order to specify requirements on the computer supported planning. The purpose of planning and managing any project is to achieve a clearly defined set of project goals or objectives. Thus, the planning objectives is monitored by the goals of the project. The goal of a project has three aspects: time, cost and quality. Those aspects are interdependent and must therefore be controlled simultaneously. The quality concept describes the contents of the project. In terms of planning, the quality concept of a project is expressed in activities. The cost of a project is generated by the resources necessary for the realisation of a project. The time concept is related to the concepts of quality and cost per definition. Project planning constitutes one aspect in the management of projects towards set goals. Planning implies optimising the relationship between the time and cost of a project, as well as obtaining the specified quality requirements.

The demarcation between computer-supported planning and other control systems affects the definition and contents of planning. In the definition of planning objectives, the contents and level of details regarding the time, cost and quality concepts need to be defined. Decisions concerning the definition of time, cost and quality demarcate computer supported planning to other monitoring systems. For instance, it can be decided that costs related to materials and machines involved in the project shall be processed in a cost control system and not in the planning software. It has to be specified which parts should be monitored by the planning software as well as the contents of these parts. This can be a decision about whether all kinds of craftsmen constitutes a common resource unit, or should be divided into smaller parts such as carpenters, concrete workers and bricklayers.

The table exemplifies the basis for decisions of the level of details and contents.

Project Aspect	Contents	Level of Details
Quality (Activities)	Production Activities	Main Contractor, Subcontractor
	Supporting Activities	Tendering, Ordering, Inspections
Cost (Resources)	Main Contractor Employees	Project Managers, Craftsmen,
	Subcontractor Employees	Electricians, Heat and Sanitation
	Construction Material	Bricks, Concrete, Reinforcement
	Working Material	Scaffolds, Moulds
	Machines, Equipment	Cranes, Dumper, Drilling Machines
Time	Time Aspects of Defined Quality and Cost Concepts	

Table 1: Basis for Decisions of the Planning Contents and Level of Details

An extensive level of details regarding the computer supported planning makes the accomplishment of stated project objectives more reliable. It must, however, be related to the work effort, training and support involved in more detailed planning.

Specified Requirements on Basis of Surplus Values

The requirements on computer supported planning can be specified on basis of the objectives of planning and the definitions of contents and level of details. The study shows that understanding and motivation are crucial for the project managers to adopt computer supported planning. With the use of surplus values as a basis, the

advantages are accentuated, and the understanding and motivation are clearly emphasised together with requisite requirements.

This paper presents an approach to the implementation aspects of computer supported planning based on the surplus values of project management software packages. This angle of approach requires that the major surplus values of computer supported planning are identified and briefly described. The identified surplus values are categorised according to whether they relate to the planning objectives of time, cost or quality. In the table below an example of a surplus value for each category is described together with the related requirements. The code Q SV1 corresponds to "Quality Surplus Value number 1".

Quality	Code	Q SV1
	Surplus Value	Critical Activities and Activities with Float
	Description	Which activities affects the project duration and which activities can get delayed, and in that case how much can they get delayed, without delaying the project.
	Requirements	All activities of the project should be logically linked in the same project network.
Costs	Code	C SV2
	Surplus Value	Earned Value vs. Actual Costs and Budget
	Description	Earned value of the project relatively the actual costs and budget for estimating of cost trends and profit margin.
	Requirements	Activity input on planned resource usage. Progress information on actual resource usage and earned value.
Time	Code	T SV1
	Surplus Value	Activity progress related to target dates
	Description	Project status related to the original plan. Which activities are on schedule, which are late or ahead? Progress consequences on project deadlines and finish date.
	Requirements	All activities of the project should be logically linked in the same project network. Progress reports on commenced activities (actual start, remaining duration and %-done).

Table 2: Examples of Surplus Values with Descriptions and Requirements

Each surplus value requires a definite set of project management software functions to be fulfilled. The identified surplus values are not interrelated but one surplus value that requires an extensive set of software functions automatically enables other less comprehensive surplus values. The table below exemplifies how surplus values, categorised by time, cost or quality, can be structured in a matrix with their respective required software functions. The surplus values are arranged whit the most extensive surplus value, within each category, to the right. Consequently, the required software functions of a surplus value range all the surplus values on the left.

Software Functions	Surplus Values	Quality		Cost		Time	
		Q SV1	Q SV2	C SV1	C SV2	T SV1	T SV2
1		X	X	X	X	X	X
2				X	X		X
3		X	X		X		
4			X		X	X	X

Table 3: Matrix Structure of Surplus Values and Required Software Functions

Model of Strategic Implementation, Steps and Levels

The company subject to the case study has on basis of the surplus values of project management software described the implementation, by steps and levels, of developed computer supported planning routines. The implementation model presented exemplifies the introduction of gradually increasing requirements and developing planning levels within the company. In the model, the starting point represents the current status of the project planning process within the company.

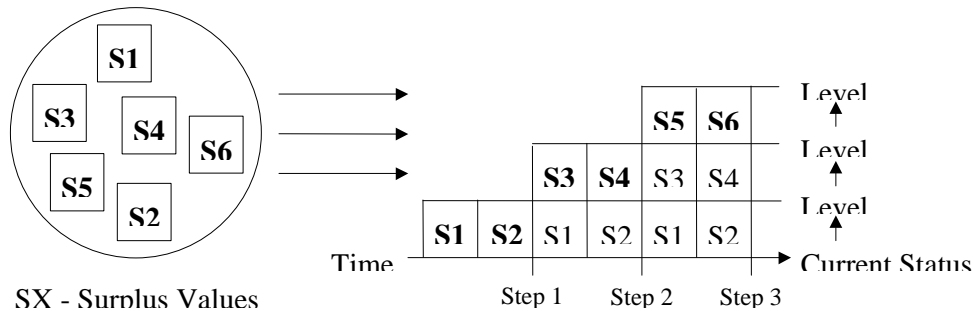


Figure 1: Implementation Strategy, Steps and Levels

The case study company has defined four steps in the implementation of project management software.

1. Getting all project managers to use the management software provided by the company
2. Resource planning using the management software
3. Linked activities in every established project network
4. Linked activities in one project network

The purpose of the first step is to get every project manager familiar with the software. The study shows that 50 % of the project managers find the management software package provided by the company being too complicated and many choose software packages intended for other purposes. The second step involves planning of resources. Project managers tend to treat resources as activities instead of allocating resources to their respective activity. This is especially significant for resources like cranes, scaffolds and similar. The planning of craftsmen are often divided into the categories of wood and concrete, but are dealt with manually and rarely managed in the software package. A majority of the project managers enter activities in the management software without adding the activity dependencies that exist between them. When not using linked activities non of the analysis functions, or other sophisticated software functions, can be used. Linking activities can be considered a crucial condition to gain full potential of the management software package. Project planning without computer support, traditionally includes drawing-up of a number of different schedules with various contents and levels of details. Still, when using computer support, project managers produce different schedules with no interconnection. The first step in the introduction of activity links therefor extends activity relationships within each established network of the project. This will, in the final step of implementation, be followed by a fully linked network of all project activities.

The software implementation levels constitute a gradually developed planning process. The horizontal steps describes the contents of the computer supported

planning and, consequently, it affects the development within each level of implementation. Finally, within the software implementation steps and levels, appurtenant surplus values, specified requirements and software functions can be displayed within the implementation model.

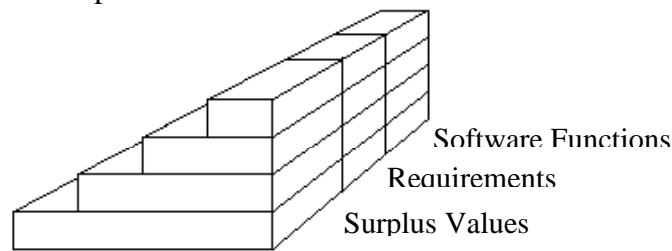


Figure 2: Aspects of Software Implementation Steps and Levels

The software implementation can be described on basis of all aspects depending on the need to emphasise certain information to concerned participants.

Conclusion

The approach to planning software implementation emphasising on the surplus values of the computer support does not require a deeper understanding of planning terms, advanced theories or software functions. The company management, project managers as well as software suppliers, can use surplus values as a communication platform on the basis of their individual backgrounds, knowledge and experiences.

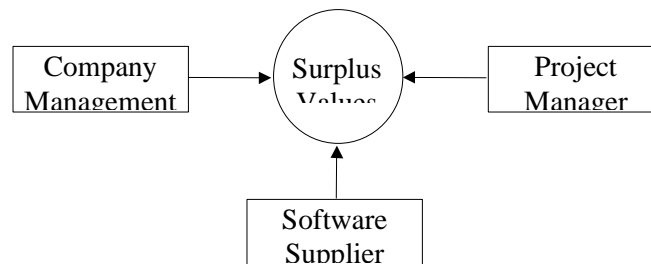


Figure 3: Surplus Values as a Communication Platform

Surplus values interrelates with specified requirements and necessary planning functions. The specified requirements provides a basis for the planning aspects of the company's quality system. With clearly defined requirements, the company can monitor whether the planning performance fulfils set objectives . The quality system also contributes to maintain a set level of planning and prevents retrogression.

The required software functions of the implementation model provides a foundation in the selection of which software package to introduce. Each level in the model corresponds to a set of software functions that can be compared with the capacity of existing planning software packages on the market. In the decision of which software package to introduce, immediate and future needs can be estimated from the required software functions of the implementation steps and levels. Each level of the implementation model requires training and sufficient software as well as planning support. The model thus provides the basis for deciding on the proportions and direction of the required training program.

The presented software implementation model does not take into consideration the different types of projects that the company undertakes. The need for computer

supported planning corresponds to the size, complexity and uncertainty of a project. Consequently, there is a need to define the objectives of each project separately, which affects the requirements on the planning performance and the software functions needed.

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