SAP Project System

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Abstract

Organizations worldwide are adopting enterprise resource planning (ERP) systems. A number of studies discuss the implementation and success of such systems, but the objective of this paper is to explain the main functions and integration scenarios of SAP Project System (PS). We will discuss business processes that can be mapped using SAP Project System. SAP Project System supports comprehensive functions for planning, controlling, and organizing all the activities carried out during a project. It manages a project structures, dates, costs, and resources throughout the entire project lifecycle.

Key words Enterprise resource planning (ERP); SAP; Project System (PS)

1-Introduction

Due to the requirement to implement projects successfully within increasingly shorter periods and under continuously rising costs, project management methods and tools are becoming more important in the industry, as well as in the public sector. The various projects range from smaller cost and investment projects to development or plant maintenance projects to large-scale projects in plant engineering, construction, and mechanical engineering.

There is an abundance of project management software on the market that project managers can use for support in planning and implementing their projects. Many companies also use programs they have developed by themselves for individual aspects of project planning and implementation; however, only a few project management tools can map the entire lifecycle of a project completely and uniformly. A lack of integration options also frequently results in project data such as cost information or time data, for example, thereby having to be entered several times. All current project-relevant data and documents for project management are therefore only simultaneously available with most project management tools under certain conditions.

To avoid these problems, companies that already use an SAP ERP[1] system, such as an R/3, Enterprise, or ECC[2] system, are now increasingly using SAP PS to manage their projects and therefore benefit from the close integration of SAP PS with Accounting, Materials Management, Sales, Production, Human Resources, and so on. Since the early stages of SAP PS as a Real-time Cost Accounting Project (RCAP) in the R/2 system, the range of functions of SAP PS, and also the integration options available, has continued to grow. The experiences and requirements of companies from the different branches have been incorporated in this case into the development of SAP PS [1, p.13].

Since SAP PS offers functions for managing practically all types of projects (and often even in different ways, depending on requirements), most companies that use SAP PS only use a small portion of the available functions. Frequently, companies initially only use a few of the SAP PS tools (for example, to control their project costs) and then gradually use other options in SAP PS.

SAP PS is a project management tool that assists you throughout all the phases of your project. Through the high level of integration between SAP PS and other SAP application components, such as Logistics, Accounting, and Human Resources, SAP PS ensures that the necessary business processes are handled quickly and efficiently. SAP PS provides structures that allow you to map projects in SAP R/3 flexibly and with the appropriate structures. Using suitable tools and reports in SAP PS, you can plan and monitor dates, costs, revenues, budgets, resources, materials, and so on, for these structures.

SAP PS is an integral part of mySAP Product Lifecycle Management (mySAP PLM) Program and Project Management. Program and Project Management is a key area of the enterprise solution mySAP PLM that contains functions for product-related business processes to support the initial idea for a product, the design and engineering phases, the preparatory production processes and engineering change management right through to the maintenance and service.

mySAP PLM Program and Project Management not only includes project management (SAP PS) but also provides the Life-Cycle Profitability Analysis and Strategic Program Management tools for forecasting the cost of new products throughout their entire lifecycle and analyzing existing and planned product portfolios. The evaluations are carried out in the SAP Business Information Warehouse, which means that all the necessary information, for example from SAP Strategic Enterprise Management and non-SAP applications, can be integrated [2, p.267].

SAP PS supports comprehensive functions for planning, controlling, and organizing all the activities carried out during a project. It manages a project structures, dates, costs, and resources throughout the entire project lifecycle.

Both large-scale projects, such as constructing a factory, and smaller projects, such as organizing a trade fair, require the numerous activities involved to be planned, controlled and monitored precisely, systematically, and efficiently.

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[1] ERP = Enterprise Resource Planning
[2] ECC = ERP Core Component

Professional project management is becoming an increasingly important factor for boosting the competitive strength of companies, and not just for those whose success is based on project-oriented business processes. A project is an undertaking carried out by a company that is characterized by the uniqueness of its general conditions and constraints. These conditions include the objectives of the project, the time frame for executing it, as well as financial and capacity-related restrictions. Projects usually involve cross departmental and highly complex business processes, the results of which must often yield an extremely high level of quality. Projects are often cost-intensive and time-consuming. A further crucial factor is their strategic importance, which means that they can also represent a risk for the enterprise [1, p.10].

The term "project" is not specific to a particular industry sector and can, therefore, involve various aspects such as research and development projects, investment measures, make-to-order production, and more extensive maintenance tasks. Projects are normally given an appropriate structure to allow dates, resources, costs, budgets and payments to be planned, controlled, and monitored transparently. Hierarchies are often used for evaluating aggregated data, allocating budgets, and defining responsibilities. Project-specific organizational forms are usually created for projects that are integrated in an enterprise's business processes. These organizational forms are in a position central to the user departments involved so that all the tasks that occur when the project is executed can be properly controlled. However, this paper is for readers, who are interested in getting an overview of the functions and concepts of SAP PS, such as decision-makers in a company who are responsible for deciding to implement a SAP PS, for instance [1, p.11].

The structure of this paper reflects the individual phases of managing a project using SAP PS. Section 2, Structures and Master Data, describes how you can map projects in the SAP system using suitable structures. Section 3, Planning Functions, deals with the various functions of SAP PS available for planning the logistical and relevant accounting aspects of projects. Section 4, Budget, describes the functions of SAP PS available for budgeting. Section 5, Project Execution Processes, discusses typical processes that can be mapped in the SAP system as part of the execution phase of projects following approval, and the resulting quantity and value flows. Section 6, Period-End Closing, covers the periodic procedures available in SAP PS for the planned and actual data of projects. A key aspect of project management is the analysis of all project related data. The reporting functions of SAP PS that support you in every phase of project management process are introduced in Section 7, Reporting.

2- Structures and Master Data

The two structures provided by SAP PS for mapping projects in SAP are work breakdown structures (WBS) and networks. You use a WBS to organize a project in the form of a hierarchy, and so map the structure of the project. Networks, on the other hand, are used to represent the individual project activities together with their temporal and logical relationships, in other words, the flow of the project. You can map a project using just one WBS or one network. You can, however, also represent a project using a WBS and one or more networks in order to use the characteristics of both structures together. WBS consist of WBS elements that are arranged at various levels to produce a hierarchical model of the project activities to be carried out. Each individual WBS element can act as a controlling object in which you can plan and monitor costs, revenues, payments, budgets, and dates. A network represents the flow of a project. The individual tasks in the project are mapped as activities in a network. The temporal and logical dependencies between the various activities can be represented as links, also known as relationships. Activities form the operative basis for planning and controlling dates, costs, and resources (personnel, machinery, PRTs[3], materials). When activities are assigned to WBS elements, the dates and costs defined in the individual activities are totaled up (aggregated) at the WBS level, and can be evaluated. Activity funds already assigned are checked against the budgets of the WBS elements [3, p.18].

[3] Production Resources and Tools

Figure 1, illustrates a project can generally be divided into the following phases in simplified terms:

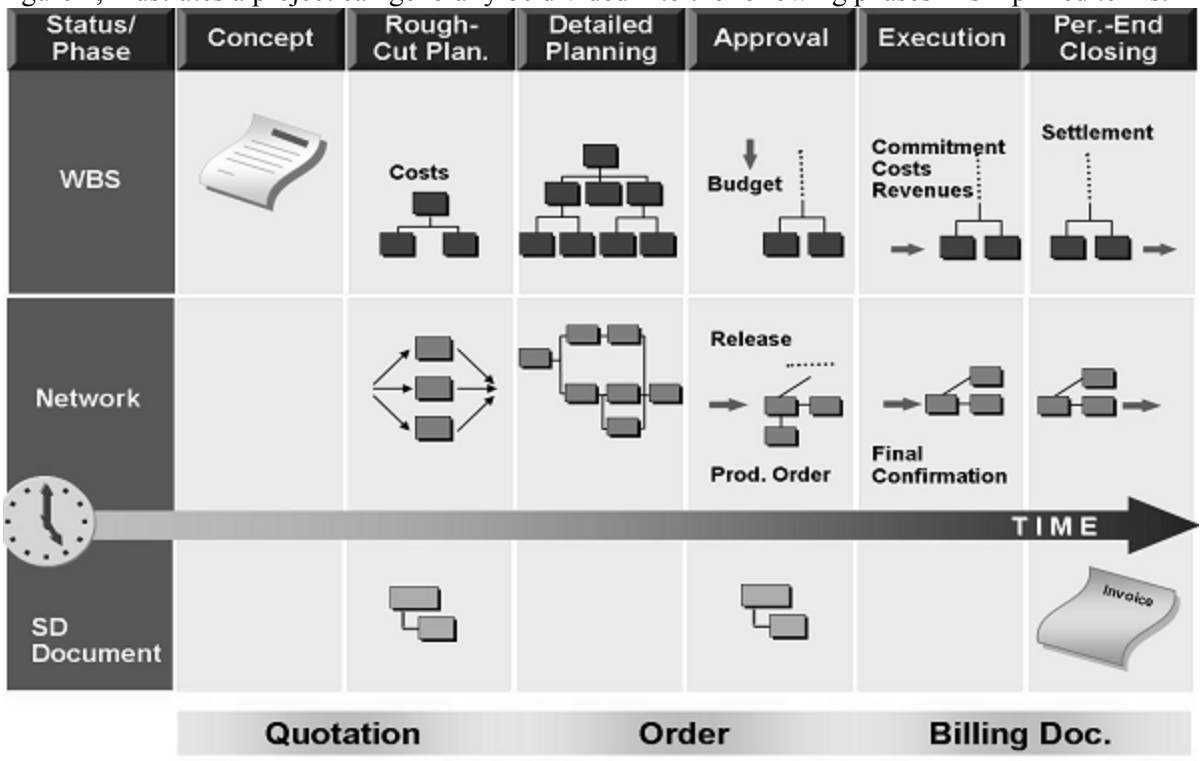

Figure 1: Phases in a Project

A high degree of precision is required when planning and coordinating large and complex projects. When planning the flow of a project, you will schedule deadlines and dates, make resources available, and assign funds. SAP PS gives you the support you need throughout all phases of the project [3, P.17].

2-1- Structure and Function of Work Breakdown Structures

A WBS is a model of a project, and shows the project activities to be carried out as a hierarchical structure. The various work packages in the project are described in individual WBS elements (WBS elements). You can further divide these elements at various levels until you reach the level of detail you require. The WBS elements are the objects that are actually used for planning and updating actual data. The focus here is on planning, controlling, and analyzing costs, basic dates, and budgets. Because the WBS is structured hierarchically, the data can be summarized and displayed for the corresponding higher-level WBS elements. When you create a wbs, you also have to create a project definition. The project definition is a framework for all the objects created within a project. The project definition contains data that affects the entire project (for example, start and finish dates, organizational data, and planning parameters). It contains default values that can be passed on to the WBS elements. The controlling area, which you specify when you create a project definition, is unique for the entire project. You specify it once you have created the project. You define organizational units such as company code, business area, profit center, and plant for each WBS element. According to figure 2 the "Tasks of the wbs" Diagram shows the various functions that a WBS can perform during a project [3, P.28].

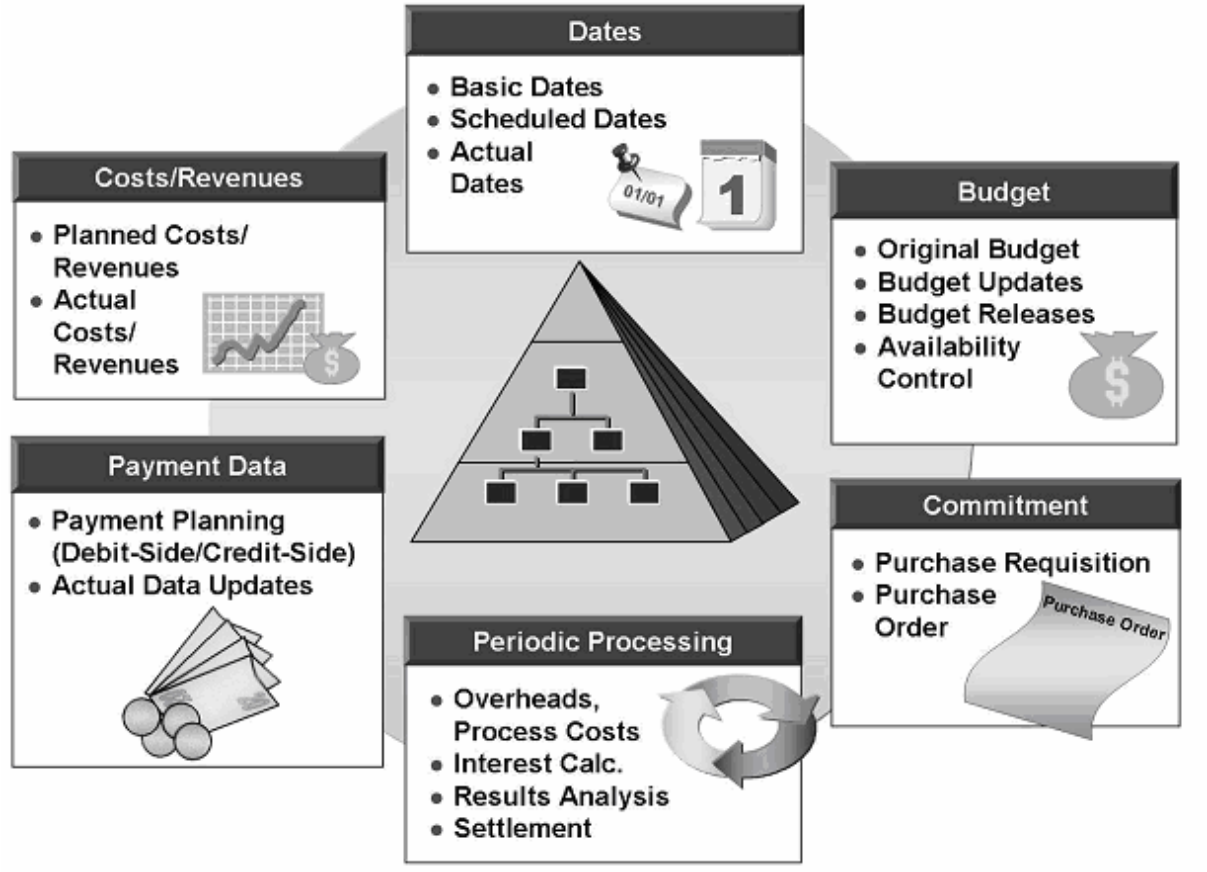

Figure 2: Tasks of the WBS

2-2- Structure and Function of Networks

Networks map the flow of the project. The focus here is on describing, planning, controlling, and analyzing costs, scheduled dates, resources, and material requirements. The basic elements that go to make up a network include activities and relationships that describe the tasks and temporal dependencies between the various tasks in a project. SAP PS supports the following activity categories:

- *Internal processing*: for capacities to be staged in your own company
- *External processing*: for tasks to be assigned externally
- *Service activities*: for procuring external services
- *Costs*: for planning additional primary costs

Activities are linked to each other by means of relationships – these results in a causal and temporal activity sequence. In this way, networks form a quantity structure for planning dates (automatically via scheduling), costs (automatically via costing), resources (internal activities and external services), and for planning material requirements (by means of assigned components).

You use the activities in the network to plan the labor, capacities, materials, tools, and services you require to carry out various tasks in your project. By assigning milestones to activities, you can document events that are particularly important for the progress of the project and reference their respective dates in billing or invoicing plans, for example. During the project execution phase, commitment and actual costs are updated automatically to the network activities as a result of various business transactions (for example, confirmations, ordering processes, goods issues, incoming invoices). Key functions of networks and activities are shown in figure 3.

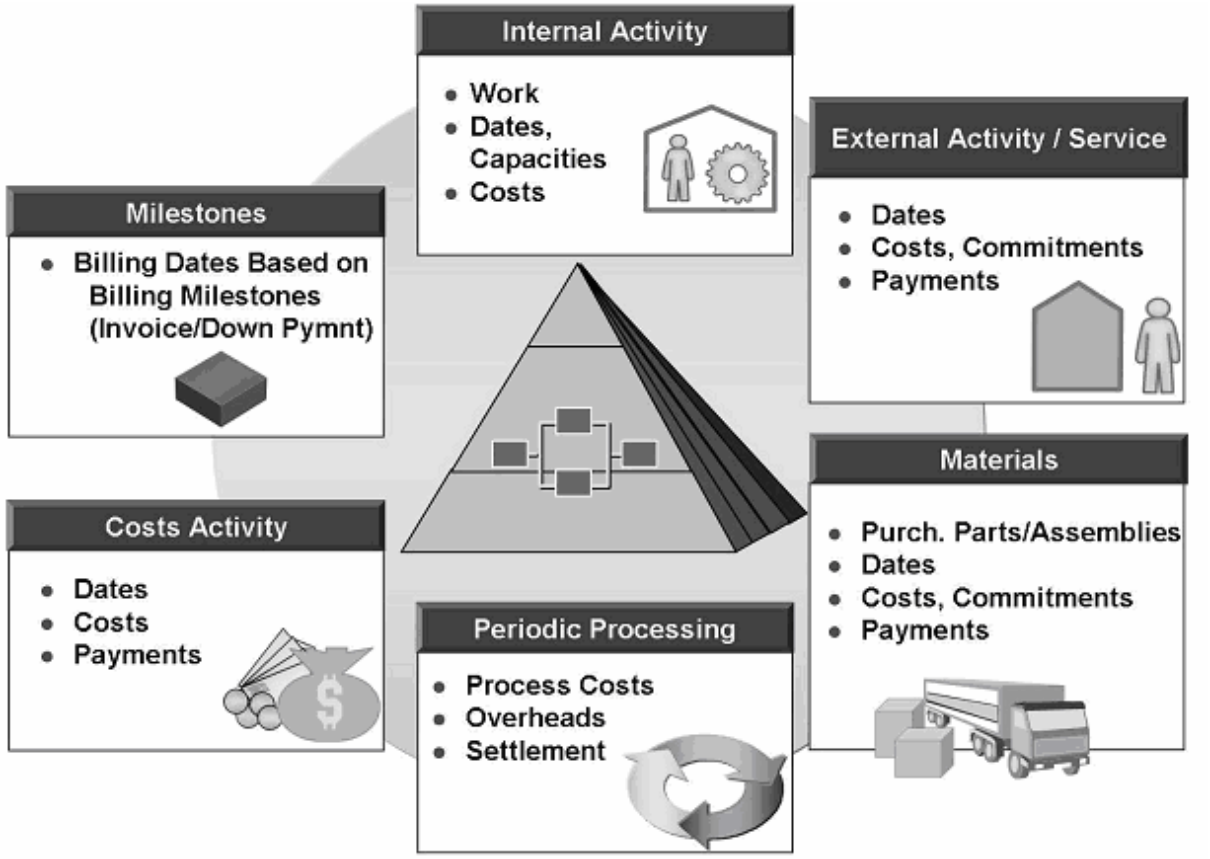

Figure 3: Tasks of the Network

3- Planning

During the planning phase of a project, dates must be set, resources made available, and material and funds consumption planned [4. p,65].

3-1- Date Planning

The project planning board is a tool in SAP PS that enables you to process the entire project structure (WBS elements, activities and the objects assigned to them in an integrated environment). The project planning board is based on an interactive SAP Gantt chart. The Gantt chart comprises a table and diagram area, and shows not only the hierarchical structure of your project but also the corresponding situation with regard to dates. By choosing different points on the project planning board, you can call up detail screens for objects or change the field selection and time settings. When you click the right-hand mouse button, all the functions available at the cursor position are displayed. When using the project planning board, you can display or hide specific objects (activities, relationships, or milestones), as well as use different filter, sort, or grouping functions. You can configure the project planning board in such a way that it only displays what you need.

3-2- Scheduling

In projects with networks, you can carry out scheduling to automatically derive the activity dates and WBS element dates. The scheduling parameters determine how scheduling is carried out. Networks are always scheduled forwards and backwards. The scheduling type in the scheduling parameters specifies the direction in which you begin scheduling. The system determines the earliest dates of the activities by means of forward scheduling, and the latest dates by means of backward scheduling. The difference between the earliest and the latest dates of an activity are referred to as floats. Floats can be zero or negative, which means that the activity in question is "critical".

3-3- Resource Planning

PS distinguishes between the following resources:
Internally-processed activities are used as a basis for planning work carried out within the company. You must enter work data for an activity so that the system can plan capacities for a project and calculate costs for activities. You need to specify the amount of work involved and the work center that is to perform the work. Work is the output to be provided by machines or personnel in order to complete an activity. A work center is the place where an activity is carried out or work output is produced. Work centers contain data for costing activities. Work centers also contain the scheduling and capacity data required for scheduling and capacity planning. You can determine how much of the work center capacity is used for the activities (in the project planning board too, for example). If necessary, you can use the project planning board or graphical/tabular capacity planning table to level capacities. You can also distribute the work among employees. When you confirm activities during the project execution phase, you consume capacity requirements and enter actual dates and costs.
Service procurement via Purchasing is mapped in networks by means of the activity types *external processing* and *service*. If you commission an engineering office to design a machine, for example, you can create an externally-processed activity (or externally processed element).
A service activity triggers a similar purchasing process, but can also contain a hierarchy of planned services to be purchased, and value limits for unplanned services. The "goods receipt" for services involves two steps: entering the service and accepting the service.

3-4- Material Planning

Materials establish the link between SAP PS and Sales and Distribution (SD), Materials Management (MM), and Production Planning and Control (PP). A suitable material in a sales document item, for example, can be used to generate project structures automatically (assembly processing). Material requirements in projects form the basis for procurement, whether the material is produced in-house (production) or procured externally (purchasing).
By assigning materials to activities, you can plan the necessary material requirements for a project. A distinction is made between stock items and non-stock items.

3-5-Cost Planning

Cost planning for a project in SAP PS using two different methods [5, p.35]:

- Manual cost planning in the WBS
- Cost planning using activities (network costing)

Manual planning in the WBS involves:

- Overall planning: The most basic form of cost planning whereby the costs for each WBS element are entered. You can break down your figures by fiscal year if you wish.

- Detailed planning of primary costs and activity inputs: This type of planning is based on cost elements and periods.
- Unit costing: For each WBS element, you use a profile for entering quantities (materials, internal activities, external activities, variable items, and so on). This type of planning is based on cost elements.
- Easy Cost Planning: Easy Cost Planning is a user-friendly method for carrying out cost element-based cost planning by means of a quantity structure. You can then use Execution Services to enter commitment and actual data relating to the planned costs.

3-6- Revenue Planning

The following methods can be used to plan revenues in your project:

- Manual revenue planning (structure-oriented, or on the basis of revenue elements).
- Revenue planning using PS billing plans. This type of planning is revenue element and period based.
- Revenue planning using SD documents (sales order items or even quotation items). This type of planning is revenue element and period based.

4- Budget

The budget is the approved and binding cost framework for a project within a particular period of time. Figure 4, illustrates the different budget management functions available in SAP PS [6, p.96].
You can use the *Maintain Original Budget* transaction to allocate funds for a project or part of a project. In the budget profile, you can specify whether funds should be assigned as overall values or distributed by year. Different budgeting views are available for displaying different values and checking the consistency of a budget. You can prevent users from maintaining the overall budget for a project by assigning appropriate user statuses. If you lock (freeze) the original budget in this way, you can only change it by defining supplements, returns, and transfers (referred to collectively as *budget updates*). You can use the *budget release* function to make funds available at various points within a fiscal year. You can use the *budget carryforward* function to transfer any funds not used up in the previous fiscal year to the budget of the new fiscal year.
When a project is being executed, various centers use the available funds. Commitments are created, and actual costs are incurred. Together with the costs of apportioned orders, both these forms of fund commitments result in what are referred to as assigned funds. The funds overview can be regarded as a passive availability control, although Project System also provides an active availability control. During the availability control, the corresponding assigned funds are calculated and checked against the budget. If certain tolerance thresholds are breached (shortfall in budget, budget exceeded), this can trigger various system reactions (a warning, for example, or an error message).

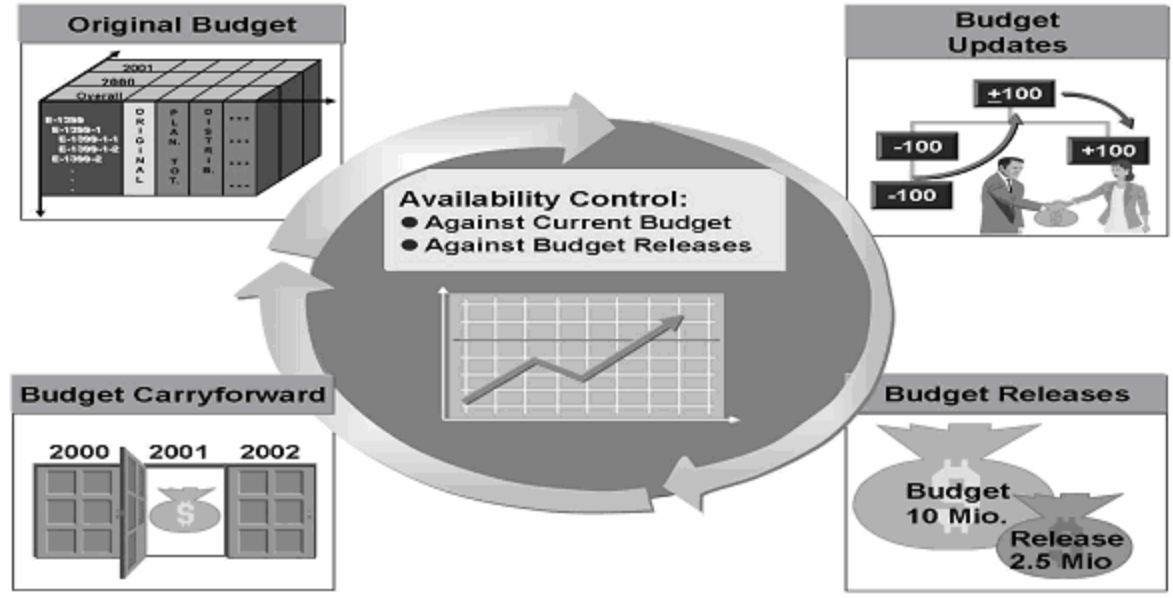

Figure 4: Budgeting Overview

5- Execution

The activities and processes planned at the beginning of the project are carried out during the execution phase. This includes, for example, entering the actual dates for starting and finishing work packages. The activities carried out by the employees in your company are documented using confirmations. Processes for procuring materials and services are triggered and the documents that result from this are assigned to project structures. Where appropriate, invoices are created and unplanned variances documented. The actual data generated is compared with the planned dates, costs, and so on [6, p.127]

5-1- Actual Dates for WBS Elements

During the planning phase, you entered basic dates for WBS elements by creating graphical time bars in the project planning board, for example. In the execution phase, you can set actual dates in the same way in the project planning board. The status Partially Released or Released must be set before you can enter actual start and actual end dates for WBS elements. To monitor dates in the project, you compare the basic dates with the actual dates, that is, you compare the planned dates with the actual dates or forecasted completion dates. You can use the project planning board or structure information system for analysis purposes.

5-2- Confirmations

Confirmations document the processing status of activities and activity elements in a network, and enable you to make forecasts as to how the project will progress. Various functions are carried out automatically by means of confirmations, such as posting actual costs, actual dates, actual labor and, if necessary, changing the activity status.

5-3- Milestone Billing and PS Cash Management

This shows you how to carry out milestone billing to control billing processes for sales orders using project milestones and also provides an overview of PS Cash Management, which you can use to monitor payment flows in projects.
The starting point for milestone billing is a sales order item with a billing plan whose dates stem from milestones of the assigned project .If you enter actual dates in the billing milestones (by confirming the assigned activity, for example), the billing lock imposed on the corresponding date in the billing plan is lifted. The unlocked date of the sales order item is then billed during the next billing run. Like the sales order item, the invoice document is assigned to a WBS element. This means that the actual revenues are posted in the project. The system flags the date in the billing plan as *Fully Processed.*
Project costs that affect receipts and expenditures (incoming and outgoing payments) are incurred as a result of purchasing or sales documents. To identify early on when payments are due during the project, you have to plan and monitor payments. The aim of PS Cash Management is to optimize cashflows to maximize project profits and reduce project costs.

6- Period-End Closing

Period-end closing involves various period-based business activities such as overhead application, results analysis, and settlement. These activities help you make sure that all the data that belongs to a period is determined and, where appropriate, made available to Enterprise Controlling. This section provides you with a brief introduction to various functions performed as part of period-end closing for projects. An overview of the most important period end closing procedures can be seen in figure 5 [6, p.156].

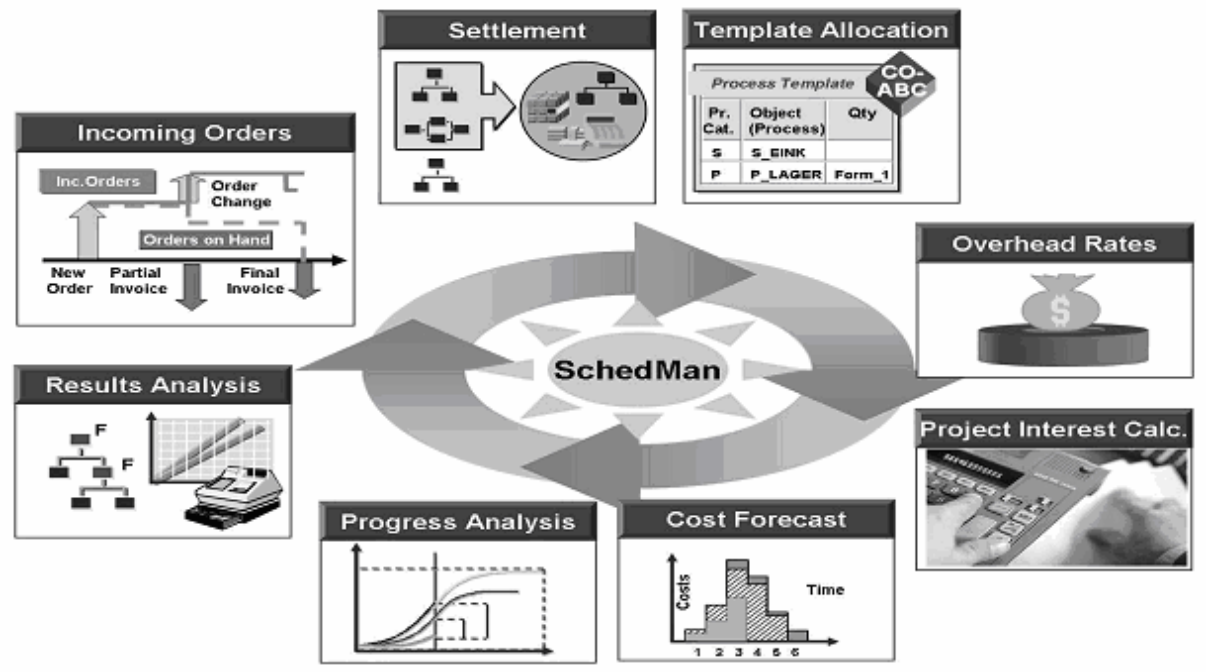

Figure 5: Period-End Closing Procedures

Overhead costing is used to allocate the overhead costs for supplying materials, machines, and labor by means of percentage or quantity-based overheads. Template allocation is another method for allocating overheads. This method does not allocate costs, but determines the quantities used by the receiver object. The costs are then calculated by valuating the quantities with a price. This enables costs to be determined according to cause.
Interest calculation plays an important role in long-running, cost-intensive projects. In SAP PS, planned and actual interest calculation can be used to calculate and update interest.
With cost forecasts, you can adjust cost planning to changing circumstances during the execution phase of the project. In a cost forecast, the system determines and valuates the remaining activities on the basis of the planned, forecast, and actual values in the network.
You use the progress analysis to compare the planned and actual progress of your project with the results actually achieved.
Results analysis carries out a period valuation of the project results. Data such as stock values, cost of sales, and reserves are calculated here.
When you settle your project, costs and revenues are transferred to Financial Accounting (G/L account), Asset Accounting (fixed asset), Cost Accounting/Profitability Analysis (order, cost center, profitability segment) or PS (WBS elements, network and activities). Settlement rules determine which portions of a sender's costs are allocated to which receivers. Settlement rules are stored in the sender objects and contain distribution rules and settlement parameters. They are required in order to settle the project.
The Schedule Manager is a user-friendly tool that enables you to plan and edit all period-end closing actions performed in the R/3 System. It contains a hierarchical representation of tasks in the form of a task list from the various applications (for example, Financial Accounting, Cost Center Accounting, PS, and so on). You schedule the tasks in the task list by dragging and dropping them on the calendar (if you schedule for a point in time in the past, you will be able to start immediately). The tasks can cover the following functions:

- ABAP reports (example: Generate Settlement Rules in Collective Processing)
- Transactions (example: Set Period Lock)
- Memory joggers (example: the note .Upon completion, inform those involved.)
- Flow definitions

A flow definition is created in the Workflow Builder and comprises individual flow steps. These steps include scheduling programs with variants in job control in the R/3 System and user interactions involving a user being sent information by e-mail. You can view all the information on an active or completed job that was scheduled in the Scheduler by calling up a monitor. Any errors that occur can be displayed in the monitor, investigated and, if necessary, corrected. When you restart the procedure, only the records that contained errors are processed.

7- Reporting

The project information system is a flexible, sophisticated tool with which you can monitor and control your project data. You can analyze individual projects, subprojects, or several projects together. Overview reports and reports for providing greater detail are available [7, p.15].
You can use the following information systems to evaluate important key figures for your projects:

- Structure information system
- Cost/revenue/payment (Controlling) information system, with hierarchy reports, cost element reports, and the SAP List Viewer for line items
- Capacity analysis
- Order report, lists of reservations, purchase requisitions, purchase orders pertaining to the projects, ProMan
- Stock/requirements overview

- Progress analysis, progress tracking
- SAP Business Information Warehouse (SAP BW)

The following reports and systems are available, in particular for cross-project evaluations:

- Project summarization
- SAP Executive Information System (SAP EIS)
- Profit Center Accounting reports

You can use SAP EIS to evaluate logistical and accounting key figures across projects. Reporting is performed using drilldown reports. You can define characteristics of your choice based on your project master data (project type, business area, or person responsible for project, for example). In Profitability Analysis, reporting is performed at profitability segment level. Reporting is based on value fields and characteristics. The reporting tools used are called drilldown reports. The reports allow you to evaluate project data and production data together. In Profit Center Accounting, reporting is based on profit centers and the profit center hierarchy. You can execute reports here that will enable you to monitor the success of your organizational structure.

Hierarchy reports are drilldown reports for evaluating the costs, revenues and payments of one or more projects. Reporting here is based on value categories. Hierarchy reports allow you to drilldown on the basis of various characteristics, and to call up line items and documents. Cost element reports enable you to evaluate project costs and revenues. The data is presented in a cost-element-based display. Interactive displays in Microsoft Excel are also possible. Line item reports enable you to evaluate line items and documents. These reports are particularly useful because they allow you to select columns, calculate subtotals, and to call up a full range of accounting documents.

The structure information system evaluates the structural and logistical aspects of projects; but you can also display costs, revenues, and other data in the structure. On the initial screen, you specify which data you want the system to select from the logical database in PS. You can select the data you require using dynamic selection or object statuses. In the structure overview, you can display and edit the entire hierarchical structure of a project (including documents, PS texts, networks, other orders, investment programs, and SD documents). You can navigate from the structure overview to individual overviews, detail screens, and detail screen lists. You can also access the individual overviews directly.

The structure information system is not merely a tool for displaying information. You can also create and change project structures (for example, project definitions, WBS elements, networks, and activities) from the reports. If you have a multi-level product structure with production and planned orders (assigned to WBS elements), the entire structure is displayed in the structure overview, and can be edited. You can also call up other assigned orders to display or change objects. From the information system, you can confirm activities, and initiate pools of confirmations or confirmation workflows. You can also go to the mass change transaction if you do not want to change an individual object, and create collective confirmations. Once you have made your changes, you can refresh the data (in other words, read it from the database again) to evaluate the changes straight away.

Progress Tracking use to track the progress of material components in PS networks and purchase orders in Materials Management by monitoring the dates of events you have defined. For example, you can define goods issue or goods receipt events to track components. You can enter or schedule the dates of the events manually or use customer enhancements to determine them from system dates or external data. Progress Tracking is a new function available with SAP R/3 Enterprise. Progress Tracking encompasses the entire range of functions for tracking the dates for material components in PS. It also provides a more flexible Customizing tool for making default settings, as well as a range of additional functions (status information, mass change, copying, filtering, printing, and analysis functions, for example).

Future research

How SAP's roadmap for program and project portfolio management will affect; discovering new functionality -cProjects/xRPM/cFolders; what will the new functionality provide and when should they be considered; tips and tricks; unveiling hidden functionality to enhance SAP PS.

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