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Introduction to the
Dynamic Item Processor

SAP R/3 Release 4.5B/4.6B/4.6C/4.7/ECC

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Contents

1 Introduction

The Dynamic Item Processor (DIP) offers an integrated way to process cost- or quantity-based data at the interface between CO and SD. In SAP R/3, ERP, and ECC, the DIP is used for the flexible handling of resource-related billing. But it is also used for results analysis, quotations for service orders and pricing for projects.

This paper is aimed mainly at consultants and people in companies customizing the dynamic item processor. Additionally, this paper describes the wide range of possible enhancements for this processor offered by customer enhancements to adapt the technical tool to the company's business processes.

The focus is on the technical implementation and customizing and not so much on the business process for which there is only a short overview at the beginning. The technical settings are clarified by examples of real business processes.

All functions described here are based on the dynamic item processor in R/3 Release 4.6C. In chapter 5, you can find an overview on the differences between 4.5A/B and after release 4.6C.

The enhancements after release 4.6C are summarized in chapter 5.1. In this chapter, you will find cross-references to the respective enhancements.

Please understand that we deliver this paper only in English. No other languages are available.

2 Overview

2.1 Business Processes

The Dynamic Item Processor is a tool for the selection, summarization and grouping of cost or quantity based data for CO objects. This data is transferred to SD, where sales documents can be created or just the powerful pricing engine is used for generating pricing information. The main processes covered by this tool are resource-related billing and the calculation of sales prices. The DIP can process single objects like service orders or sales orders but it can also work on complex structures like projects or order networks. The processes are described in the following chapters.

2.1.1 Resource-Related Billing of Sales Documents, Service Orders and Projects

In Resource-related billing, the DIP is used to select the resources actually used of a service order or a sales order to generate debit memo requests. As this is very often a periodic process, resource-related billing keeps a document flow of the values already billed or rejected . Only the open values, calculated by subtracting the already billed and the rejected values from the total values, are offered to the user online.

You can define which values should be billed, postponed, or rejected. You can also define manual prices for the billing. This data can be saved for further processing without creating a debit memo request. When you reopen this saved data, you can continue with your work. It is even possible to refresh the data which means that all manual changes are kept but the original costs are read again.

If amounts were rejected in previous runs, you can undo the rejection via menu path: Edit → Undo Rejection. In the following pop-up, you can enter amounts, quantities or percentage.

In the final debit memo request additional data can be entered (i.e. texts for each item).

It is also possible to create both a debit memo request and a credit memo request. So, values which were billed wrongly to the customer can be easily credited to him. If only a debit memo request has to be created, values to be credited appear as negative values in the sales document.

Debit or credit memo request items and their corresponding resources can be rejected or reopened in the sales document by setting an appropriate reason for rejection. The reason for rejection can be customized, that the costs are available again as open for billing (see note 131288).

The billing process includes not only single objects (sales order, service order). It is also possible to bill an order network (sub orders assigned to a main service order or an order network assigned to a sales order) and even a whole project. In the last case, the project must be assigned to a sales order via WBS element.

If a WBS Element is entered in sales order item, which isn't a billing WBS element the system is looking upward in the hierarchy towards a billing WBS Element. In standard, all items, which are processed in DIP at the same time, have to own the same DIP Profile. A&D solution is different, there an enhancement was made to process several items with different DIP Profile at the same time.

For the billing of service orders some additional specials has to be observed. They are described in chapter 2.1.3.
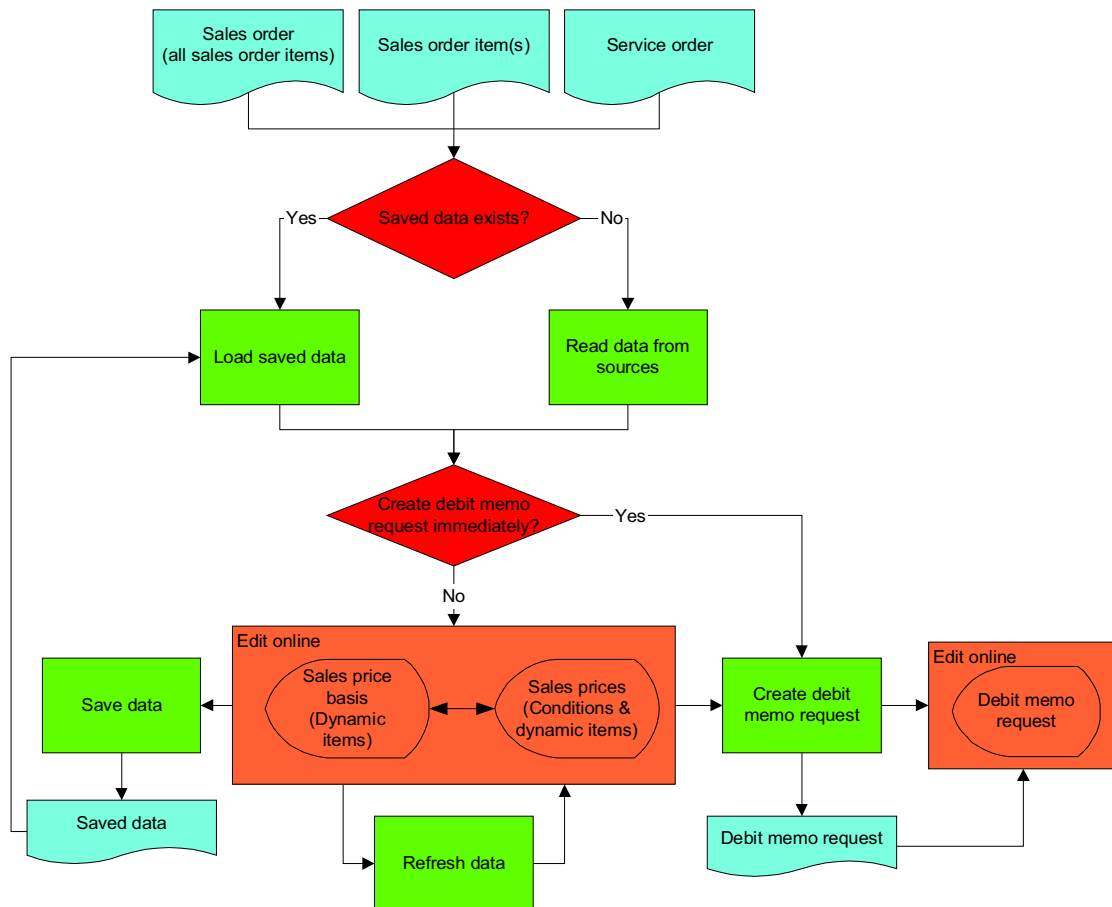
Figure 1: Business Process of Resource-Related Billing

From SAP R/3 Enterprise 4.70, you can process resource-related billing for internal orders with revenues.

Direct resource-related billing is now possible for internal orders with revenues using a sales document without cost collectors. The process is based on the current solution for resource-related billing for projects/WBS elements.

To use the new functions, you must define in Customizing for sales document items that account assignments are possible for internal orders. To do this, go to:

Transaction SPRO → SAP Reference IMG → Controlling → Product Cost Controlling → Cost Object Controlling → Product Cost by Sales Order → Control of Sales-Order-Related Production/Product Cost by Sales Order

2.1.2 Resource-Related Results Analysis

Resource-related results analysis is a variation of results analysis that uses the DIP to calculate the results analysis data.

There are two valuation methods for resource-related results analysis:

1. Derive Cost of Sales from Resource-Related Billing of Dynamic Items (valuation method 14).The cost of sales (COS) is the sum of the billed costs and the rejected costs. The work in process (WIP) is the cost not yet billed. The revenue affecting net income is the actual revenue.

2. Derive Revenue from Resource-Related Billing and Simulation of Dynamic Items (valuation method 15). COS is the sum of the billed costs, the costs not yet billed, and the rejected costs. The simulated revenue for the costs not yet billed is updated as revenue in excess of billings. The revenue affecting net income is the actual revenue plus the revenue in excess of billings.

COS and revenue affecting net income can be transferred to profitability analysis using settlement. The inventory values WIP and revenue in excess of billings can be posted to financial accounting and profit center accounting using settlement.

Note that the billed costs in resource-related results analysis differ from the billed costs in resource-related billing. Billed costs in resource-related billing are costs transferred to debit/credit memo requests. In resource-related results analysis, the costs are billed in a period if there is a debit/credit memo and the posting date of the actual revenues is inside the period of results analysis. Otherwise, the costs are not yet billed.

Resource-related results analysis differs in one point from other methods of results analysis. Costs are only considered as WIP or COS, if they are selected during resource related billing. If you narrow the selection, i.e. if you want to exclude the overheads from the billing process, they do not appear as WIP or COS in results analysis.

Resource Related Billing

Resource Related Results Analysis
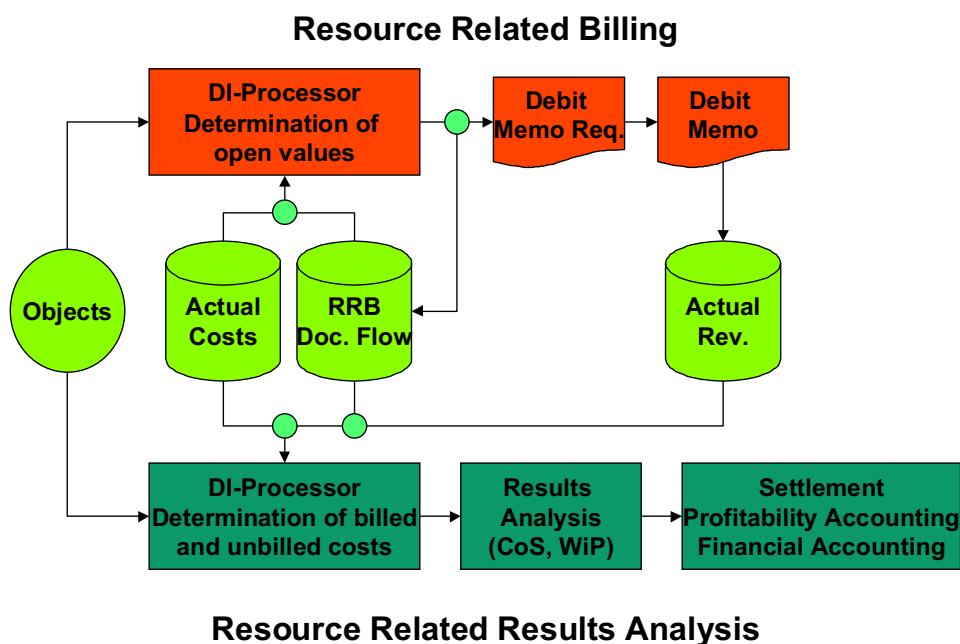
Figure 2: Business Process of Resource-Related Results Analysis

2.1.3 Quotation Creation and Resource-Related Billing for Service Orders

2.1.3.1 Normal Process for Quotation Creation

Quotations for service orders are created based on planned costs. The rest of the process is similar to resource-related billing. You can change online which costs should be copied to the

pricing and the quotation. Of course, it makes no sense to say costs should be billed now, later, or never. The changes affect only the basis for the calculation of the prices, such as the quantity of work hours intended to be used for the order. You can also add or change prices. Finally, you create the quotation. Note that it is only possible to create one quotation for a service order. If you want to create another one, you have to cancel the old one.

There is one major difference from resource-related billing: it is possible to create several pricings before you create the final quotation. At the start of the transaction, you can select one of the pricings to change or create a new one. After you create the quotation, no new pricings can be created and no further changes can be made to the existing ones.

In the service order master data, it is possible to accept the service order afterwards. When you accept the service order, the quotation is copied to the sales document type, specified in the usage 'resource-related billing' of the DIP profile, but no actual resource-related billing takes place.
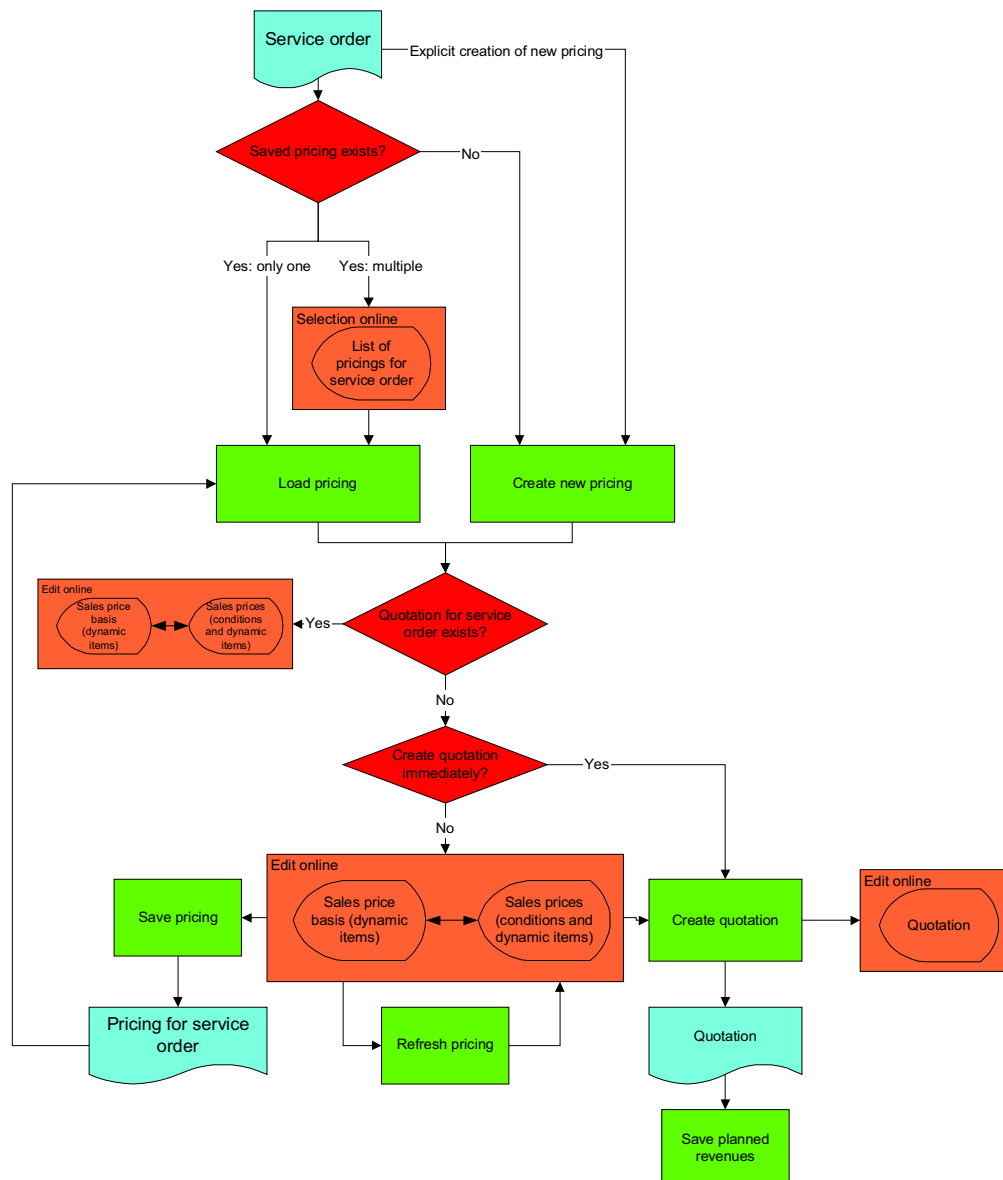
Figure 3: Business Process of Quotations for Service Orders

2.1.3.2 *Quoting and Billing of Service Products*

The quoting and billing of service products is a special business process. The system creates a debit memo request or a credit memo request with the service product as main item and the resources to be billed as sub-items. The service product is either defined in the service order or it is taken from the material number of the sales order items. Whether the main item or the sub-items are relevant for billing is defined by the *billing form* entered in the service order or the sales order item:

- *Fixed rate:* The main item is normally relevant for billing. The price can come either from automatically determined pricing conditions or as a result of the summarized costs of the sub-items (if the customizing is set so that costs are transferred to the debit/credit memo request items).

- *Costs:* The sub-items are normally relevant for billing. The price is the sum of the prices of these items, which can be determined by pricing conditions or by their costs (if the customizing is set so that costs are transferred to the debit/credit memo request items).

The dynamic item characteristic *'Product'* has to be set as relevant to activate this business process (see chapter 3.1.2).

Until release 4.6C only one sales order item with service product can be processed at a time. As of SAP R/3 Enterprise Core 4.70 you can create a billing request to multiple sales order items with service products. The individual items can also have different billing forms at the same time. It's not possible to create credit memo requests with fixed rate billing.

2.1.3.3 *Billing Form and Relevance for Billing*

When using the service product process, the billing form in the sales document item or the service order influences the relevance for billing of the sales document items. When you combine quoting and billing of service products, the relevance for billing can differ from the description in chapter 2.1.3.2. Table 1 shows an overview for the relevance for billing of the sales document items.

Billing Form	Quotation creation		Resource-Related Billing			
			Quotation exists		Quotation not exists	
	Main Item	Sub-item	Main Item	Sub-item	Main Item	Sub-item
Fixed Rate	Not relevant	Relevant	Not relevant	Not relevant	Relevant	Not relevant
	Relevant	(None)				
Costs	Not relevant	Relevant	Not relevant	Relevant	Not relevant	Relevant
None	Not relevant	Relevant	Not relevant	Relevant	Not relevant	Relevant

Table 1: Billing Form and Relevance for Billing

The relevance for billing is an internal date for determining the right item category type. Therefore, not the relevance for billing determines if an item affects the total quotation or billing value. In fact, the setting of the 'Statistical value' field in item category, found by the item category assignment, determines the relevance of the item for the total price. For relevant items, an item category must be found which defines a not statistical item. For not relevant items, an item

category must be found which defines a statistical item. How to set up the item category assignments is described in chapter 3.5.3.

2.1.4 Pricing for Projects

There are three business processes for Pricing for Projects. The first one is the pricing based on an inquiry in SD and is run in its own transaction (DP81). The second one is the pricing based on Easy Cost Planning integrated in the Project Builder. The third one (transaction DP82) is pricing similar to DP81, but without inquiry (available since release R/3 4.6C). The needed data for DP82 is taken from project definition as it's done in the second business process. The processes use the DIP but the pricings created in Project Builder cannot be edited in DP81 and vice versa.

2.1.4.1 Pricing for Projects Based on an Inquiry

As the title of this chapter says, it is necessary to create an inquiry which is account assigned to a project before performing any pricing for projects. From the inquiry, the system takes the DIP profile (entered in the inquiry item under Sales B) to perform the pricing. Other data is taken from the header, such as the partners and the sales area for the determination of conditions and for the quotation created later.

It is possible to create pricings not only for operative projects, but also for simulations. The only limitation is that there must be at least the billing WBS elements in an operative project and the planned revenues from the quotations must always be updated to the operative project. To get planned revenues for a simulation, you have to use billing plans which can be created out of the pricing.

There can be several different pricings for a project in parallel. The pricings are assigned to the billing WBS elements. The handling of different inquiries and existing pricings is supported by the system in such a way that you do not have to remember any inquiry numbers or pricing numbers. You can work with project definitions. If there is only one inquiry assigned to the project, the system uses this inquiry and does not display a popup or things like that. The same happens if you have only one saved pricing for your project: It is opened for editing. If there are more than one pricing, the system offers a popup where the users can select the one to be loaded.

There can be also several different quotations, but if you have activated the update of planned revenues from quotations, you have to consider chapter 2.1.4.3.
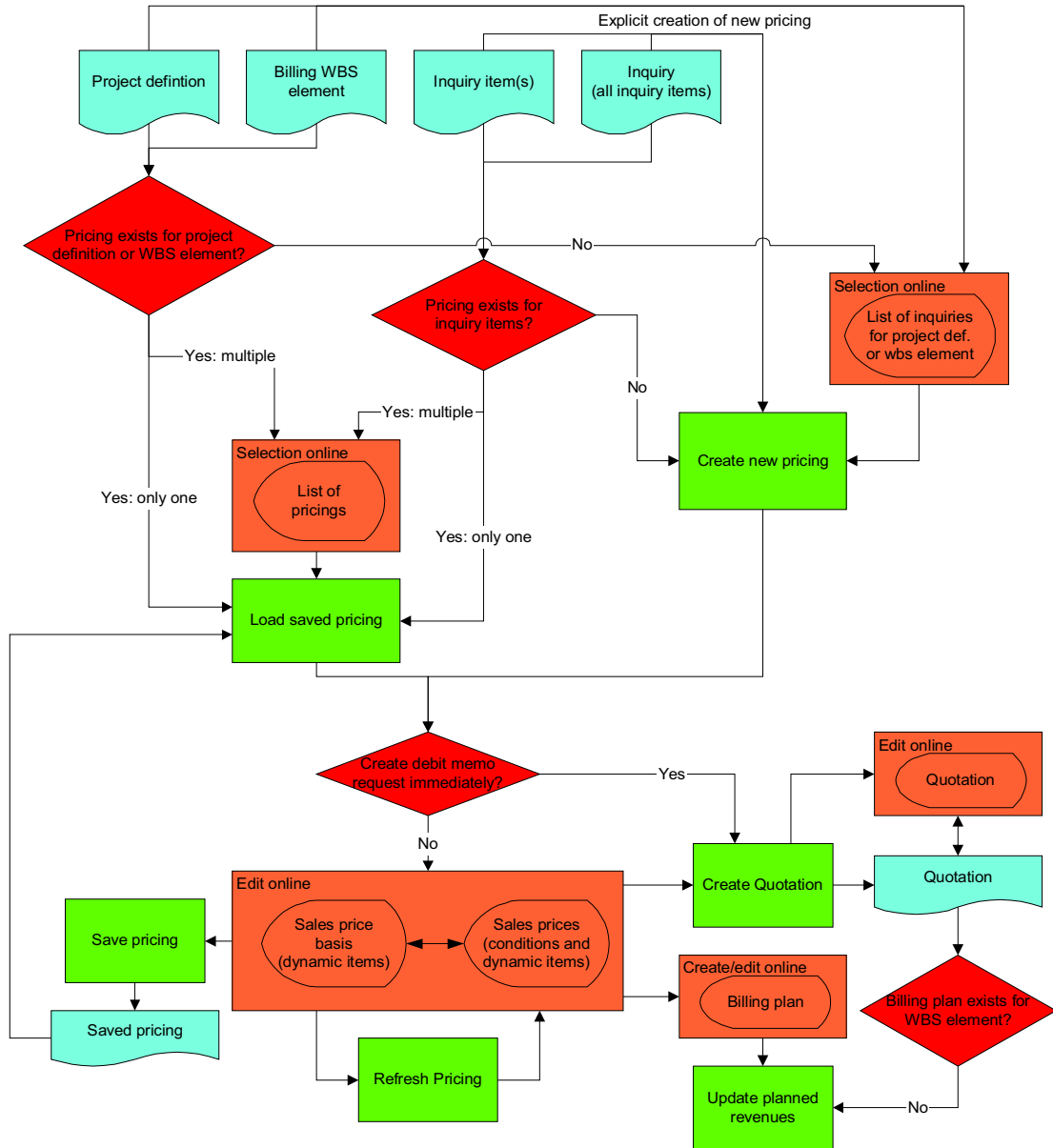
Figure 4: Business Process of Pricing for Projects Based on an Inquiry

2.1.4.2 Pricing for Projects Based on Easy Cost Planning in Project Builder

Besides the process in the previous chapter, there is another business process for Pricing for Projects using the central maintenance tool for projects in R/3 - the Project Builder. The goal of this integrated approach is to offer a facility for creating project structures, calculating costs (using Easy Cost Planning), and calculating sales prices in a single transaction.

Changes of the structures are reflected in costing and pricing. Also changes of costing are updating pricing if switching the view.
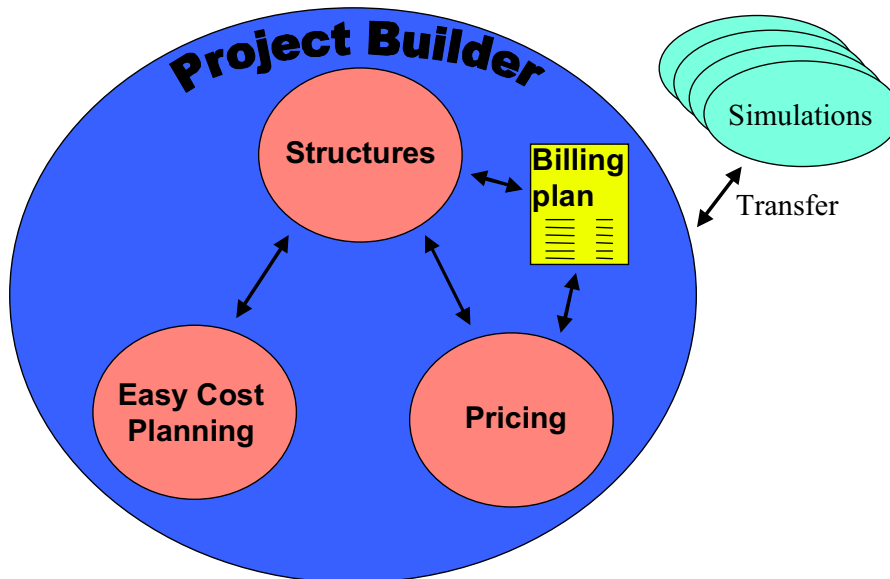
Figure 5: Business Process of Pricing for Projects in Project Builder

The big advantage of the pricing in Project Builder is that there is no longer any need to create a separate inquiry in SD. Some additional values have to be maintained in the project definition to get the pricing to work. In the control data section, the sales area (sales organization, distribution channel, division) and the DIP profile must be set. Additionally a sold-to party must be added to the partners which requires a partner determination procedure. If you add other partners to the project definition, they are also copied to the simulated or final quotation. Note, however, that no partners from the WBS elements are copied.

In the DIP profile, only the source 'Easy Cost Planning' can be used for this process. As a result, in Project Builder it is not possible to perform a pricing based on costs planned on networks, orders or the cost planning for projects (transaction CJ40).

If you copy a project to another project, the sales pricing isn't copied as well.

Like in transaction DP81, you can create or update a billing plan based on your calculated sales price. The billing plan will be saved even if you do not save the pricing for your project. The billing plan can also be accessed from the Project Builder.

In Project Builder, each project can have only one pricing. This is easier for the user to handle, but it means you must transfer projects to another simulation if you want to create a different pricing while keeping the old one. Easy Cost Planning and the Pricing for Projects are transferred together with the structures.

2.1.4.3 Update of Planned Revenues for Projects

The update of planned revenues for projects is not specifically related to the pricing, but as the pricing is a way to calculate planned revenue automatically, it should be mentioned how the system updates the planned revenues.
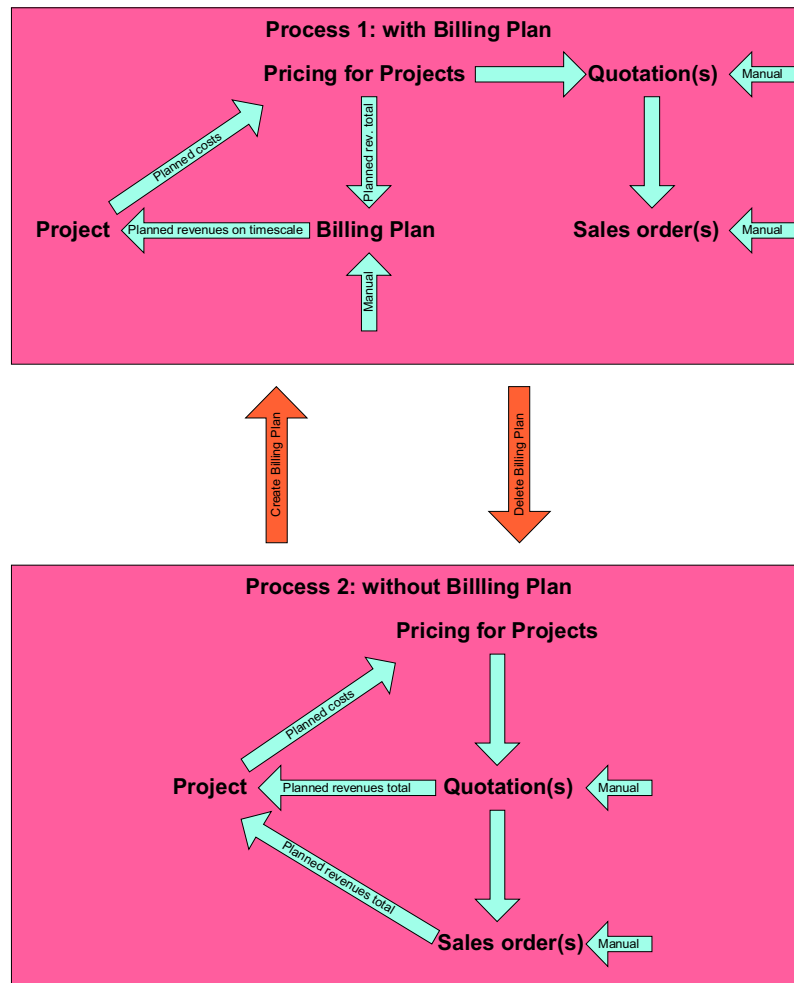
Figure 6: Business Process of Update of Planned Revenues for Operative Projects

If you are using simulations, the only way to get planned revenues is by using billing plans. If you have operative projects, the planned revenues can come either from sales documents (quotations and sales orders) or from billing plans.

Thus there are two processes for the update. The first is the one with billing plans. If a WBS element has a billing plan, the planned revenues come from the billing plan distributed on the time-scale. Planned revenues from sales documents are not updated for the WBS element. The second process is without billing plans. If the WBS element does not have a billing plan, the planned revenues are updated from the sales document. The period of the planned revenues is the period of the billing date in the quotation. The update happens only if the update for sales documents is activated in the customizing for projects. So, the creation or deletion of billing plans is the switch between these two processes.

Another point is the CO version, to where the costs and revenues are updated. Revenues from sales documents are always updated to version 0, but it is possible to define a version to where the costs calculated using Easy Cost Planning are updated. You can also choose a version for the planned revenue update. If you set the switch, the update is to the same CO versions as the costs from Easy Cost Planning, otherwise the planned revenues are updated to CO version 0.

You can find this switch at the same point in customizing like the setting of the CO version for Easy Cost Planning.

2.1.4.4 Additional Programs for Pricing for Projects

There are two additional programs for pricing for projects, which you can find in OSS notes.

1. Report STRUCT_QUOTATION_FROM_PRICING (Note 319646)

With this report, you can create a structured quotation for your project pricings based on an inquiry. The report creates main items for each of your inquiry items and appends the items from your project pricing as subitems.

You can enter a project definition and a version key as parameters. The system searches all pricings for this project and shows a list of them on screen. You can select those pricings for which you want to create a structured quotation. After creating the quotation, a result list of the quotation is displayed including all errors occurred in processing. By clicking the quotation number, the quotation will be displayed.

With the transaction DP81 you can create a new sales pricing. The items of this sales pricing are assigned to the inquiry items by report "STRUCT_QUOTATION_FROM_PRICING". The items of the inquiry show a net value of 0. Below the inquiry items you can find the quotation items, which are called "Lower – Level – Items" in this context. In other words, you can see which inquiry item causes the corresponding quotation item. Via column "Higher Level Item" you can also determine the belonging of the quotation items to the item of the inquiry.

Please be aware of how the system creates the quotation. It is not a single transaction unit. Instead, the system creates a quotation with the first main item and its subitems. This unfinished document is saved. The other main items and subitems are appended later. Since there are several committed database updates, an error between these updates can leave an incomplete document in your system. If this happens, please delete the document.

2. Report QUOTATION_FROM_PB_PRICING (300936)

In Release 4.6C, pricing for projects is integrated into the Project Builder. For technical reasons, it is not possible to create a quotation from this integrated process. With this report, you can create a quotation for the project pricing created in the Project Builder. An item is created in the quotation for each item of your pricing. You can enter a project definition and a version key as parameters. The system searches the pricing and creates the quotation. Afterwards, the quotation is opened in edit mode. Since 4.70 it is possible to create a quotation in CJ20N directly.

2.1.5 Resource-Related Down Payments

As of SAP R/3 Enterprise PLM Extension 2.00 you can use the billing plan and down payment request together with resource-related billing. You can use the billing plan to create DMRs or down payment requests and DMRs in the desired order.

This enhancement offers you the following advantages:

- You can create resource-related down payment requests based on work performed.

- You can use the billing plan in the sales order to create DMRs.

Please pay also attention to the following notes:

- Resource – related down payment processing (858877)

- Consulting note for resource – related down payments (858702)

- Customizing for the resource – related down payments (858703)

2.2 Technical Process

The dynamic item processor makes a selection, summarization and grouping of data over several levels. You can use the DIP profile to customize how this is done. Every input object must have a DIP profile.

The technical process starts with the **selection of the objects** to be processed. The input object must be able to collect actual and/or planned revenues. These are in most cases service orders or sales orders. The entry object can be also the starting point of a complex "billing structure", which means, that all objects connected in a hierarchical way to this entry object are processed together. So it is also possible to process a service order network, a sales order with assigned internal orders or a project assigned to a sales order. The last is different from the others because, when you use projects (for example, for resource-related billing) costs and revenues are handled on the project. The sales document is only for carrying the necessary SD data (sales organization, partners) and the DIP profile.

The second step in the technical process is the **selection of the source data** to be processed. In most cases, planned or actual costs of the objects are selected, but it is also possible to use statistical key figures, cash, or user defined external sources. Additionally, these sources can be combined and used together. For each source, selection criteria can be specified. They are either handled directly at the database (example: the selection of cost elements) or in the DIP itself (example: the selection of cost centers). The first way has the big advantage of reducing the data transfer from the database to the application server. Which way is used depends on the selection characteristic and the source. It is possible that one source can handle a selection parameter directly on the database level, but the other source has to handle it on the application server. When you define your own sources, it is very important that this source can handle a lot of the selection characteristics directly on the database side to achieve a good performance.

After the selection, the **summarization of the source data to dynamic items** takes place. All selected data has a number of characteristics and values. In the DIP profile, you specify which characteristics are relevant for the creation of dynamic items. Some characteristics are selected by default and cannot be removed: object, transaction currency, unit of measure, and posting period (only for resource-related billing). All non-relevant characteristics are cleared and only the relevant ones are used to define a characteristic vector for each source data line. The values of equal characteristic vectors are summarized. The DIP processes four values: quantity, amount in CO area currency, amount in transaction currency and amount in object currency. It is possible to have dynamic items with quantity or amount only and also with both quantity and amount. So sources can be roughly differentiated into quantity-based sources (like statistical line items) and cost-based sources (like actual line items). These sources can be used together in a single DIP profile.

Every dynamic item is then assigned to a material number by the **material determination**. In the DIP profile the assignment rules are specified. These assignment rules are specified based on one or more relevant characteristics.

In resource-related billing, the next step is the selection of the already billed values. The **total values are balanced with the document flow to determine the open values**. The open values can be then transferred to the billing documents.

The next step is the **summarization of the dynamic items to sales document items**. It is clear that only dynamic items with values to be transferred to the sales document are summarized. All dynamic items with equal material number (from the material determination) are summarized in one sales document item. This summarization can be suppressed dependent on the material or the characteristics.
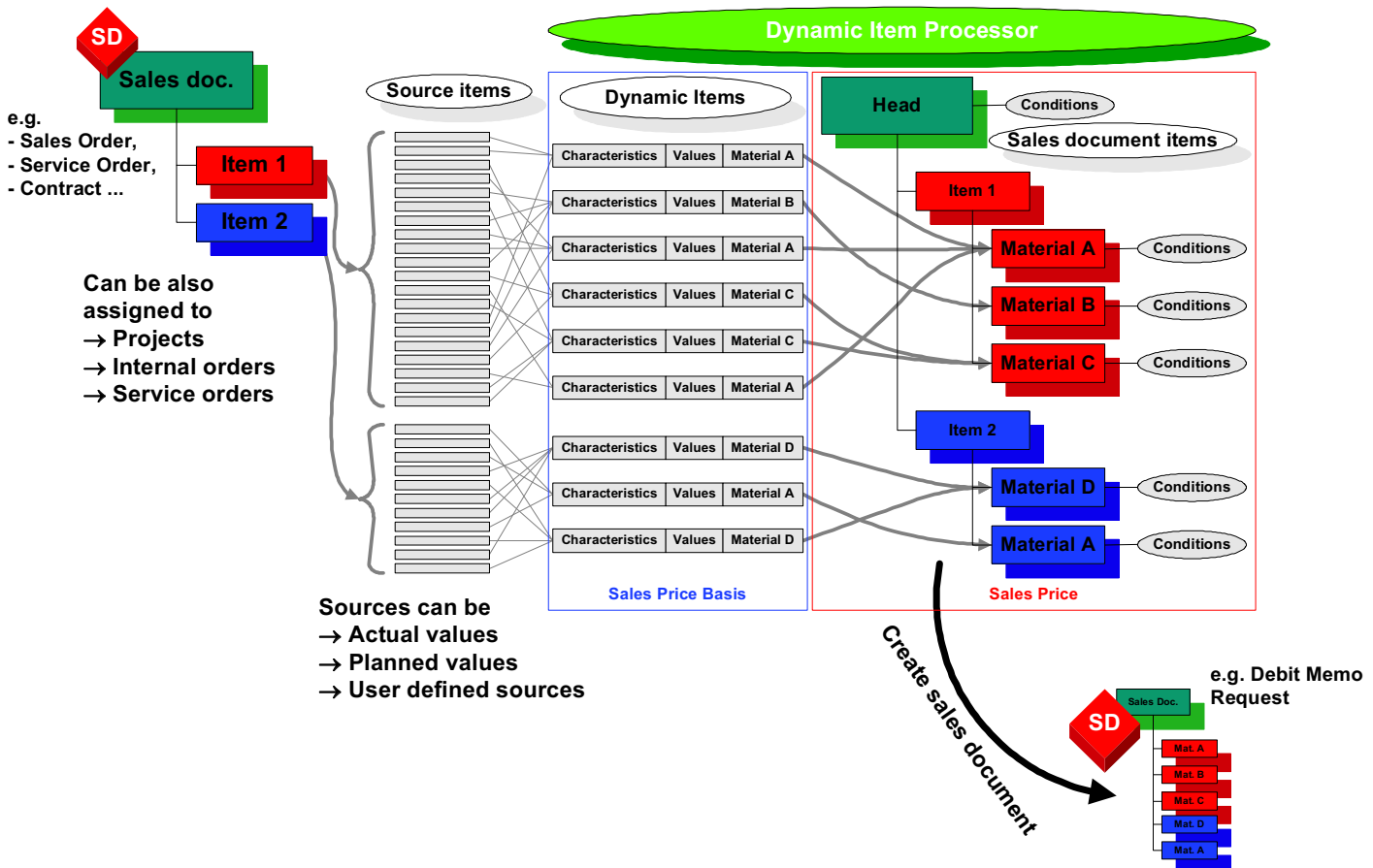
Figure 7: Overview of the Dynamic Item Processor

In resource-related billing, the **sales document item are then distributed to the debit memo request or the credit memo request**, if both sales document types are specified in the DIP profile. If the quantity is negative, the sales document item is credited to the customer. If no quantity is available, the sales document item is credited if the amount is negative.

Both **the quantity and the amount can be copied to the sales document item**. For the quantity, a sign in the material determination line must be set. For the amount, a condition for costs must be defined for the sales document type. If the transaction currency is available, this amount is copied to the sales document item using the condition for costs. Otherwise the CO area currency is used. However, it is also possible to use always the CO area currency by deactivating the blocking of summarization over the transaction currency.

The system then **simulates the sales document** which is later created. By simulating the sales document the automatic conditions are determined. Also, all authorization checks are performed for the creation of the sales document type.

In online **processing**, the user can change the values to be copied to the sales document in the sales price basis view and the prices in the pricing procedure in the sales price view. Every change (for example, of the amount to be billed) immediately updates the calculated price.

Finally, the user performs the **creation of the sales document**. All manual prices are copied to the sales document. In resource-related billing, the document flow for billed and rejected values is updated.

2.3 Initial Screen of DP91

If you start transaction DP91, the initial screen in figure 9 is shown. In this initial screen you have to enter a sales document or contract number. You can also use the search functionality to find the corresponding sales order or contract. To reduce the number of cost records selected and processed, you can set the period from which onwards the cost records are selected. This could improve the performance significantly. To do this, choose menu Extras → Set Period.

A new pop-up window called "Set Period" appears in which you enter the values in "From Period" and "From Fiscal Year". For more details on always display "From Period" pay attention to modificatoin note 433462.

Figure 8: Initial Screen of Resource-Related Billing Request DP91

The user parameter "Process Open Item Only" indicates that only the source data record that have not been fully billed are processed. A dynamic item is not fully billed until the source resource minus billed and rejected resources equals zero. If the indicator is not selected, all dynamic items are processed. Unfortunately, to find out which records are fully billed, all records have to be selected first.

Together with "Process Open Items Only" please take notice of note 387659 for details on set- / get-parameter "Rejected expenses as open items". If the parameter is maintained with X, the system considers rejected expenses to be open so that dynamic items with rejected amounts are processed as well.

2.4 The New User Interface

As of Release 4.6, the user interface has been completely overhauled. The new and forthcoming control technique was used to give the user a better overview of the several steps of the process. The general functionality of the user interface is described in the documentation.

A screen is now available for the hierarchical display of the dynamic items called "Expenses". Another screen shows the sales document structure, called "Sales Price".

In the *Expense* screen, you define from the structuring which and how many of the items are to be billed, rejected, and postponed. This result will influence the sales document.

In the *Sales Price* screen you define conditions for each item in the sales document. Starting from Release 4.6C, you can also access the dynamic items.

The following information is valid for both screens:

- In expanding the hierarchical structure the system follows this logic. The same goes for the collapse logic:

    -       Expand the node of this icon for one level (The systems keeps in mind the expand level. So, if there was already a deeper expand, this expand level is shown again.)

    -       Expand the complete sub tree of the selected node.

    -       Expand the complete tree.

- To adjust the width of any column simply click the header of the column. This feature is also valid for the sales price screen. It is available since release 4.6C.

- The search function on the overview tree finds any description you type, regardless of strings or numbers.

- The icon displays a screen with the legend for all used icons in the overview tree.

- To store the sequence and the width of the columns, use the drop-down menu from the last button of the overview tree. This functionality is built in Release 4.6C or see note 202603.

- The paging buttons directly above the hierarchy work for the tree only. To page in the table, use the paging buttons next to the table.

- The search function finds any entry in the hierarchy display but only text entries in the table.

- Starting with Release 4.6C, it is possible to refresh the stored data with new values by selecting from the menu "Ressource-rel. billing" the entry "Refresh …".

- The old function for simulating a sales document is in the "Goto" menu ("Simulate sales and distribution docs").

The following is valid for the "Expenses" screen.

- To access the data of a characteristic, double-click the textual description in the hierarchy display. Afterwards this characteristic is shown in the first line of the table view. It will stay in this first line, regardless of paging down or up.

- Only the selected characteristic and its direct successors are shown in the table view.

- If there is no textual definition for a characteristic, one way to access the data is to select the icon of the characteristic and double-click it. The other way is to change the displayed text using the "Description" tab page in the settings screen.

- In the table view for "Amount", "Quantity" or "Percentage" you may double-click one of the activated columns of "to be billed", "postponed" or "rejected". This deactivates the column and activates the column that was formerly inactive.

- If you double-click any other column, you get the detail screen for this characteristic.

- With the menu entry "Undo rejection" in the "Edit" menu, it is possible to call back rejections made in earlier calls of the resource-related billing process. A new screen containing the rejections is shown. You can simulate your entries. The screen behaves in the same way as the main screen.

- You can switch between different hierarchies without accessing the customizing with the menu entry "Switch hierarchies …" from the menu "Edit". All entries marked for structuring in the DIP profile are accessible. You have the same possibilities as in customizing:

  - Change the sequence of the characteristics
  - Change the set and their attributes (part sets, upper sets, single set)
  - Change the "from" and "to" levels
  - Show or hide single values

If you select the user-defined settings and hit [✓] the settings are valid for this call of the DIP only. If you select the save button [💾], the settings are written to the database and are available whenever you access the DIP in the future, regardless of whether you store the data from the DIP.

Besides the data displayed on the tab screens, the following information is also stored in the database and applied in the next call of the DIP:

- The height of the hierarchy control for the expense screen and the sales price screenWhich tab strip was selected for the expense screen and the sales price screen

- Which columns in the table view are active for entry

2.5 Archiving CO Line Items

As of SAP R/3 Enterprise Core 4.70 you can archive CO line items for orders and projects when you bill them according to resources if you maintain the following customizing transaction correspondingly. In this way, you can significantly improve the performance of your entire system by reducing the number of records selected via source actual costs – line items.

To be able to use the enhanced archiving function, you must enter residence times for the CO line items and residence times for dynamic item processor sources (DIP sources). To do this for DIP sources, use the activity Residence Time of the DIP Source in the IMG for creating quotations and billing:

Transaction SPRO → SAP Reference IMG → Project System → Revenues and Earnings → Integration with SD Documents → Creating Quotation and Project Billing → Residence Time of the DIP Source. (Examples are given in documentation to customizing point).

3 Customizing

The main part of customizing for the DIP is done in the DIP profile. However, as the DIP creates (or simulates) sales documents in SD, the customizing of sales documents and pricing should be also considered when setting up the business processes. As the DIP uses materials, all settings for them are also important when working with the DIP. A smaller part is the set-up of results analysis.

This paper focuses on the set-up of the DIP profile and related customizing points.

3.1 DIP Profile (ODP1)

The DIP profile contains the most important customizing for the DIP. Here, you define which data is read, how this data is summarized, and how the items in the sales document are created. The DIP profile itself must be entered in the service order, the sales order item (in detail screen 'Sales B') or in the project definition.

3.1.1 Usage

The DIP knows two different usages. The usage can be used to handle different business processes with the same profile.

The first usage is *"Billing and Results Analysis"*. Two sales document types can be specified: one for debit memo requests, the other for credit memo requests. The decision on which items are debited or credited is based on the sign of quantity and amount. If only one sales document for debit memo requests is specified, all items are debited, but negative quantities or amounts with opposite signs. It is not possible to set up a profile with only an entry for the credit memo request, nor should you specify a sales document type of a credit memo request in the column of the sales document type for the debit memo request. If you are using both credit memo requests and debit memo requests, take care to customize your sales document types and the item categories correctly. You can find a short description of this in chapter 3.5.

The second usage is *"Quotation Creation and Sales Pricing"*. Here, only one sales document type can be specified for the created or simulated quotation. Normally, there should be no negative items in this document, but if there are, the negative items are treated as they would be in the single document case of billing usage.

The *'Warranty check'* indicator is only processed during billing or quoting of a service order. It is not processed during billing of service orders related to a sales document item. If the indicator is set, the user exit in enhancement ICSV0005 is called where a reason for rejection can be specified. This reason for rejection is automatically inserted in all created sales document items.

With the *'DI w/ material' indicator*, you can control how the system processes dynamic items for which no material was found during the material determination. If the indicator is cleared, the systems raises an error about the missing material. If the indicator is set, dynamic items without a material are removed and no error message is given. This indicator is very useful for reducing the customizing effort in the source selection screen (see 3.1.2.2). When the sign is set, you define the items to be billed only by the material determination and not by the source selection.

Another business process where this sign is useful is the billing of a project with different sales document items - for example, for billing in different currencies or two different business partners. Look at the following situation: You set up two different order items account assigned to the same

WBS element. You want to bill different costs by using different profiles with a different selection. If you bill the first items, everything looks all right, but when you bill the second item, the system reopens the costs already billed with the opposite sign, because it finds flow entries of your objects but not the original cost. To overcome this problem, you set the '*DI w/ material*' indicator in both profiles and specify a material determination, which finds a material only for the costs you want to bill through this profile.

The disadvantages of this indicator should also be mentioned. Performance can slow down because the system reads data from the database, which in fact is not needed. Additionally, you could **miss some of costs you want to bill** because no message is shown when the material determination fails. Keep this in mind when working with this setting.
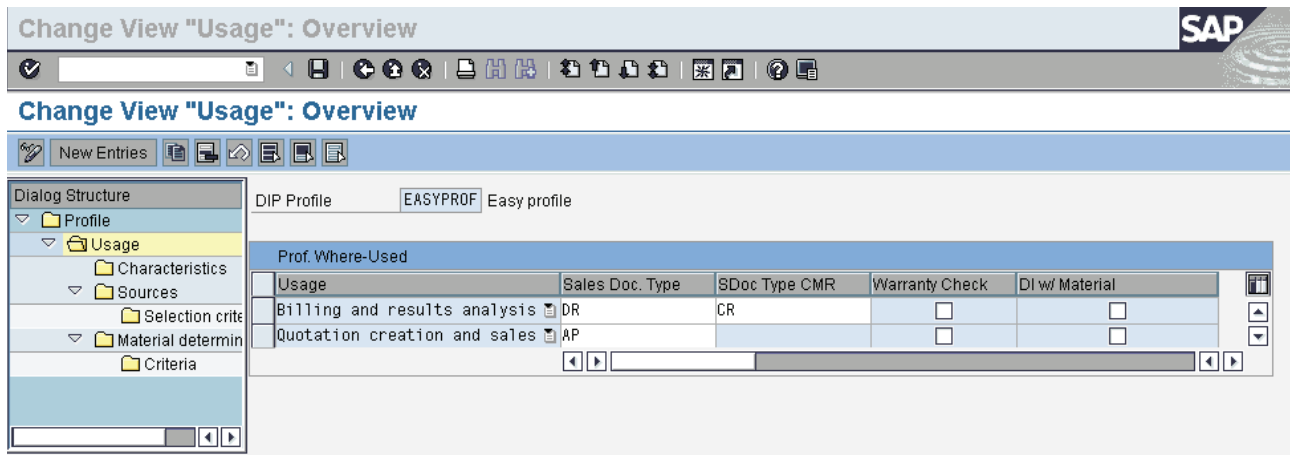

Figure 9: DIP Profile: Usage

3.1.2 Characteristics

The characteristics section is the most important part of the DIP profile. Here, you set up which characteristics are used and how they are used. The settings here also have an effect on the amount of data processed and therefore on the performance. You also set the default structuring for dialog processing.

Generally, the system distinguishes between two types of characteristics:

- **Independent characteristics** are filled directly from the source data (if the source data can provide the characteristic).
  Example: cost element, cost center.

- **Dependent characteristics** are derived from independent characteristics. For example, the object type is derived from the object number.

You can add your own characteristics of both types by using customer enhancements (see chapter 0). The user defined characteristics are processed like any SAP characteristic.

For information on which characteristics are provided by the different sources, see chapter 3.1.2.2.

3.1.2.1 Use of Characteristics

At first, you have to define the *relevant characteristics* of your profile. Only these characteristics are filled from the sources. The relevant characteristics also define the first summarization of the source data to dynamic items. All source data with equal relevant characteristics is summarized to one dynamic item. Therefore, the more characteristics are activated in the profile, the more dynamic items are created. This can result in a 'line item processing': for example, if you mark the characteristics 'Document number' and 'Posting Row' as relevant for source 'Actual Costs - Line Items', you get one dynamic item for each CO line item . By selecting all other characteristics provided by this source as relevant, you get the most detailed dynamic items, but system performance is not as good.

Most of the characteristics are optional, but some are required, dependent on the profile usage. In both cases, the 'Object number', 'Transaction currency', and 'Unit of measure' characteristics are required. For usage 'Billing and Results Analysis', the 'Period' is an additional required characteristic. This is because the document flow for resource-related billing is stored periodically.

The "Mat. Determination" indicator defines the characteristics to be used in the criteria for the material determination (see chapter 3.1.4). You can select all characteristics here, but this may make the material determination unclear. It is better to select only those characteristics you really need.

A very important indicator is the "No Summarization" indicator. Normally, the system summarizes dynamic items to one sales document item if they both have the same material found in material determination. If this indicator is set, the system does not summarize two dynamic items if they differ in this characteristic, even if they have the same material number. Therefore, the indicator has to be set for a characteristic if you want to use it in SD - for example, to show the personnel number in your invoices. If the indicator is cleared, the system has to clear the characteristic in the sales document item because its value is clear. A better example is the characteristic "Unit of measure'". You can only show the quantity in the invoice, if you do not summarize using different units (such as PC and H). Therefore, this indicator is set by default for the characteristics "Transaction currency" and "Unit of measure" but it can be switched off for both.

The 'Structuring' indicator marks the characteristics for the default structuring in the sales price basis view. Structuring is described in chapter 3.1.2.2.

Some of the characteristics have a meaning not apparent at first glance:

- The *"Object number"* is an internal technical representation of the processed cost objects. It is a generic value never shown to the user on screen. However, it has the advantage of processing all different object types (WBS elements, networks, sales orders, service orders,...) using only one field. All conversions to representations familiar to the user are done by the program, but it makes no sense to use the object number in criteria for source selection or material determination.

- The *"Material"* has to be selected as a relevant characteristic if you want to transfer it from the source to the sales document item (see chapter 3.1.4 for this function).

- The *"Product"* invokes a quite different business process called 'Quoting and Billing of Service Products'. The system creates a dynamic item for the service product in the sales order or service order and builds a sales document structure with one main item and several sub-items. For more details, have a look at chapter 2.1.3.2.

- The *"Cost element"* must be a relevant characteristic if you want to perform resource-related results analysis.

- The *"Accounting Indicator"* is used in confirmations for service orders. If it is copied to the sales document, it is shown automatically under view 'Sales B' of the sales document item. Remember to set the 'No summarization' indicator for the characteristic; otherwise it is not copied to the sales document item.

- If you change the accounting indicator in resource related billing, the system updates the pricing. If the change to the accounting indicator requires a new structure for the sales document - for example, if new items have to be created -, this is also done automatically. If you have defined other things, such as determination of the item category usage dependent on the accounting indicator in a customer enhancement, you have to call menu item "Simulate sales document" to activate the changes.

- If you are using the accounting indicator to determine different line ids in results analysis, you should know that the accounting indicator from the source data is used and not the ones entered in the dialog of resource related billing. Changes in dialog of resource related billing affect only one debit memo request created in the following.

- The *"Billing Form"* is taken from the input object master data (sales order or service order). It controls the business processes for billing and quoting of service products. These business processes can only work if the sales document item knows the billing form. Therefore, please mark the sign "No summarization" for this characteristic.

- Remember to select the "No summarization" indicator for the *"Transaction Currency"* if you want to copy the amount in transaction currency to the sales document item.

- Remember to select the "No summarization" indicator for the *"Unit of Measure"* characteristic if you want to copy the quantity to the sales document items.

Figure 10: DIP Profile: Use of Characteristics

3.1.2.2 Structuring

With the structuring tool of the dynamic item processor, you can define a hierarchical display of your dynamic items on one or more of the profile's relevant characteristics. It is even possible to change this structure online. Therefore, you have a tool for the flexible display of the costs to be processed. In the DIP profile, only the default structuring is defined. It is used when you start working with an object with this profile.

Select the *"Structuring"* indicator if you want to use a characteristic for your hierarchical overview. If you choose more than one characteristic you have also to define a 'Sequence' number telling the system in which order the structuring should be done.

Next, you have to enter a set in the field 'Set ID'. A set is a flexible structure for organizing hierarchies also used in report writer. To maintain sets, you can use transactions GS01 (create), GS02 (change), and GS03 (view). You can also use the green arrow in the column next to the set name to create, change or display a set. Just enter a set name and press the button. If the set exists, it is opened for edit; otherwise you can create it. If you are in display mode of customizing, the set is opened in display mode. Sets are always created with reference to a field of a structure or table in the ABAP data dictionary. Here, the program uses the structure AD01ATTR containing all possible characteristics of dynamic items. You should also use this structure if you are using the mentioned set maintenance transactions.

For some special characteristics, you can also use sets from accounting: cost element groups, activity type groups, cost center groups or statistical key figure groups. They use the same internal technology but are marked as special accounting sets. Therefore, they can be used in the DIP, but sets generated for the same table field using the general set maintenance transactions cannot be used in accounting.

The remaining fields define the exact outline of your hierarchy:

- *Partial sets* tells the system to expand the nodes of the set.

- *Single values* (Radio Button) displays only nodes for each value of the characteristic.

- *Upper Set* shows the root node of the set only.

- *From level / To level* can be used together with *Partial sets* to display a part of the set.

- *Single values* (Checkbox) can be used together with *Partial sets* or *Upper set* to display set nodes **and** nodes for the value of the characteristic.

The settings for the *Object number* differs from other characteristics. You can only set the *Sequence* and the *To level*. This is because the hierarchy is defined here externally, i.e. by a project structure or an order network.

The behavior of the settings becomes clearer with a small example:

Situation: You are billing a sales order item. The profile has the cost element as a relevant characteristic and you also want to structure according to a cost element group. The DIP creates four dynamic items with cost elements 400000, 405000, 410000, and 415000. Your set SET-KSTAR is shown in Figure 11.
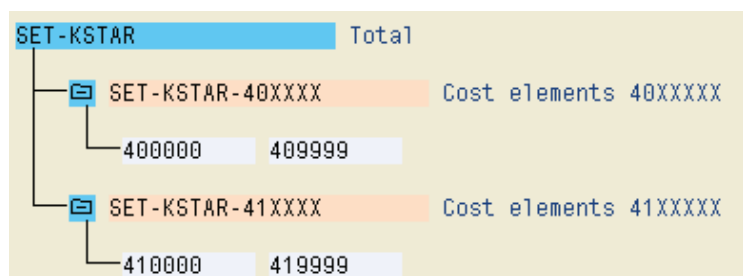
Figure 11: Example Set for Structuring

The result for each structuring setting is shown in Table 2.
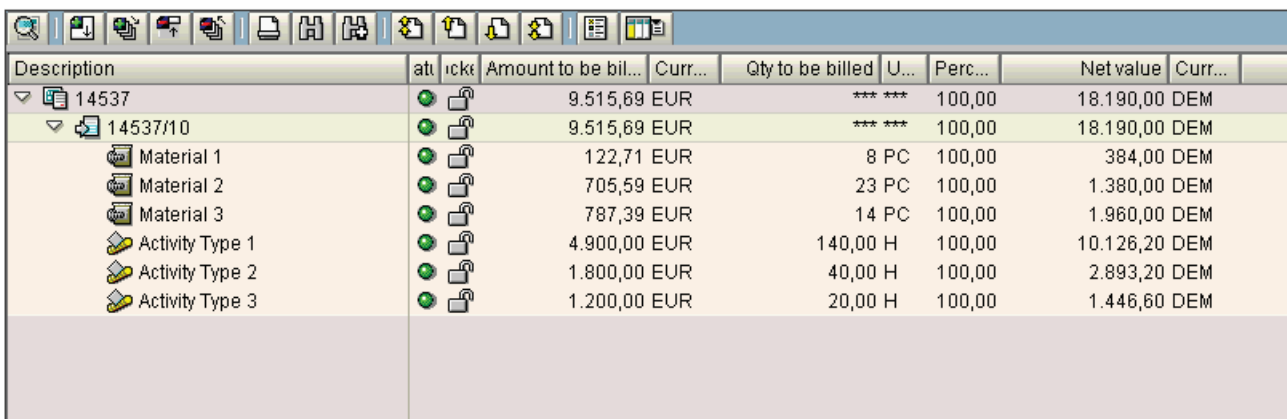
Ex.	Partial sets	Single values	Upper set	From level	To level	Indiv. values	Result

A	⦿	○	○	1	99	☐	▽ SDH 5921
							 ▽ SDI 5921/10
							  ▽ Total
							   Cost elements 40XXXXX
							   Cost elements 41XXXXX

B	⦿	○	○	2	2	☐	▽ SDH 5921
							 ▽ SDI 5921/10
							  Cost elements 40XXXXX
							  Cost elements 41XXXXX

C	⦿	○	○	2	2	☑	▽ 5921
							 ▽ 5921/10
							  ▽ Cost elements 40XXXXX
							   400000
							   405000
							  ▽ Cost elements 41XXXXX
							   410000
							   415000

D	○	⦿	○				▽ 5921
							 ▽ 5921/10
							  400000
							  405000
							  410000
							  415000

E	○	○	⦿			☐	▽ SDH 5921 ▽ SDI 5921/10 Total

F	○	○	⦿			☑	▽ 5921
							 ▽ 5921/10
							  ▽ Total
							   400000
							   405000
							   410000
							   415000

G	⦿	○	○	2	2	☑	▽ 5921
							 ▽ 5921/10
							  ▽ GB20
							   ▽ GB201
							    ▽ Cost elements 40XXXXX
							     400000
							    ▽ Cost elements 41XXXXX
							     410000
							   ▽ GB202
							    ▽ Cost elements 40XXXXX
							     405000
							    ▽ Cost elements 41XXXXX
							     415000

Row G note: **Additionally, the object number is added to the structuring. The sequence is first object number, second cost element.**

Table 2: Structuring Examples

Another example shows the possibilities of structuring using individual values.

Situation: You are billing a sales order item. You want to bill material and labor to your customer. The profile has material number and activity type. You want to see in structuring a sum for each material and each activity. Therefore, we use these two characteristics for structuring. We set for both the sign 'Single values' and use quite simple sets: They must have only one node with all values, but excluding the initial value. The sequence of the structuring is first activity type, second material number. The result for this example is shown in Figure 12. You are probably wondering why the materials appear before the activity types although the structuring is the other way around. The reason for this behavior is the initial value of the characteristics. The dynamic items of the materials have an initial activity type. The sequence sorts the dynamic items first for the values of the characteristic activity type. As the initial value is always before a non-initial value, the materials are displayed first.

Description	att	ıcke	Amount to be bil...	Curr...	Qty to be billed	U...	Perc...	Net value	Curr...
▽ 🔲 14537	●	🔓	9.515,69	EUR	*** ***		100,00	18.190,00	DEM
▽ 14537/10	●	🔓	9.515,69	EUR	*** ***		100,00	18.190,00	DEM
Material 1	●	🔓	122,71	EUR	8	PC	100,00	384,00	DEM
Material 2	●	🔓	705,59	EUR	23	PC	100,00	1.380,00	DEM
Material 3	●	🔓	787,39	EUR	14	PC	100,00	1.960,00	DEM
Activity Type 1	●	🔓	4.900,00	EUR	140,00	H	100,00	10.126,20	DEM
Activity Type 2	●	🔓	1.800,00	EUR	40,00	H	100,00	2.893,20	DEM
Activity Type 3	●	🔓	1.200,00	EUR	20,00	H	100,00	1.446,60	DEM

Figure 12: Structuring Using Single Values

Figure 13: DIP Profile: Structuring by Characteristics

3.1.3 Source Selection

In the sources view, the source data to be processed is specified. SAP delivers nine sources for the different business processes.

- *Actual costs - Line items:* This is the most commonly used source for resource-related billing. It offers the most detailed data to create the dynamic items.

- *Actual costs - Totals records:* This source can also be used for resource-related billing. It has the advantage of being faster than the line items, but you cannot use all of the characteristics offered by the line item source.

- *Statistical indicators - Line items:* This is a source for actual statistical key figures. It can be used to bill; for example; kilometers.

- *Statistical indicators - Totals records:* The same as for the actual costs - faster but with fewer characteristics.

- *Funds - Line items:* The funds source can be used for billing payments and down payments. These payments refer to CO value types 57 and 61.

- *Funds - Totals records:* Faster but with fewer characteristics than the line items.

- *Planned costs - Totals records:* This source can be used for pricing or quotation creation. The system reads all planned costs.

- *Planned Statistical indicators - Totals records:* A source pricing or quotation creation based on planned statistical key figures.

- *Easy Cost Planning:* This source can be used for pricing for projects. In fact, it is the only source that can be used for pricing in Project Builder. It is also possible to select the data from Easy Cost Planning for a pricing based on an inquiry.

- *Intercompany Line Items (since Extension 2.00): This source is used for transaction DP93 only.*

For all sources, the system does not read values from settlement. The reasons are the internal settlements when processing projects. If you want to bill costs from an internal order whose costs are settled to a sales order, you have to assign the internal order directly to the sales order. The system then recognizes this connection and reads the costs from the sales order and the internal order. Another way to overcome this problem (by using a customer enhancement) is described in chapter 4.1 (see note 204874, too).

For the cost sources, all revenues postings are excluded automatically from the selection. Technically, this is not done by business transactions. The system checks the cost element category and excludes all postings of categories 11 (Revenues) and 12 (Sales deduction).

It is possible to use a source more than once. If you do, you have to enter the selection criteria for each source selection line to prevent the source data being read twice. You can also combine different sources in one profile. However, you have to take care to use characteristics from all sources to recognize the data. For example, if you combine actual costs and statistical indicators, the characteristic cost element cannot be filled for the indicators, so you should also use the characteristic statistical key figure.

Figure 14: DIP Profile: Sources

You can use the *Percentage* field to define a default for values to be billed. If it is set to 75%, the column with the values to be billed is set to 75%, the remaining 25% is set to the column with the values to be rejected. If you perform the pricing or quotation creation process, the default percentage is used to fill the "Transfer amount" column. These suggested values can be overwritten by the user. The default percentage is not used in results analysis.

The *Apportionment reason* can be used to write rejected costs to a different line ID in results analysis. It can be only set in the profile and is transferred directly to accrual for all rejected costs selected by this source selection line. It is displayed on the screen, but cannot be changed by the user during resource-related billing or results analysis.

The last three columns are only active for source *Actual costs - Totals records*. With the *Costing sheet* and the *Overhead key*, overhead can be calculated during resource-related billing. With this option, you can bill other overheads as you are using internally. If the sign *Only base* is set, only the calculated overheads are processed, but not the original costs selected by this source line. Therefore, the actual costs without overhead can be selected from the line items with one source selection line. With another selection line, overheads can be calculated based on costs read from totals records.

You can enter selection criteria for each source selection line. In the criteria view, all relevant characteristics (except the object number) are displayed. If no criterion is specified for a characteristic, the system ignores values of this characteristic when reading the source data. Therefore, no entry means all values of this characteristic including the "initial value". Sets from Report Writer and groups from accounting can be used. With the green arrow on the right, sets with the set maintenance tool can be created, changed, or viewed. The procedure is the same as that described in chapter 3.1.2.2. If a source is used in more than one line, the selection criteria must be set in such a way that selection does not overlap. For more details, see chapter 3.1.6.
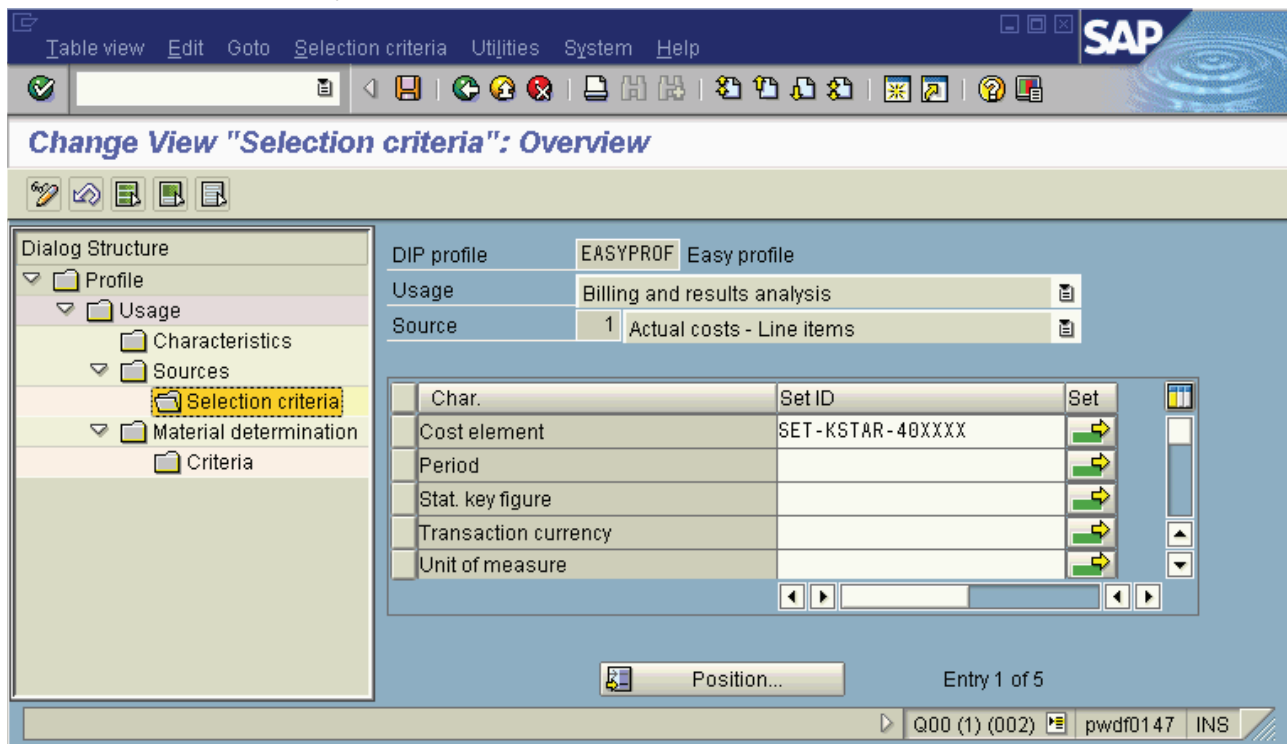
Figure 15: DIP Profile: Sources - Selection Criteria

Some of the criteria can be used directly on the database to speed up selection and data transfer amount between the database and the application server. All other criteria are checked on the application server. Which characteristics can be evaluated on the database depends from the

source. An overview can be found in chapter 3.1.6. It is also possible to add selection criteria by means of a customer enhancement described in chapter 4.1.

Rememeber that if you narrow the selection of actual costs in resource related billing, you get only these costs in results analysis. In consequence, the COS in results analysis can be smaller than the total costs, even if resource related billing tells you that all costs are billed.

3.1.4 Material Determination

The final step in the profile definition is to set up of material determination. For all dynamic items, a material has to be found to process them further. The rules for finding the materials are specified in this part of the profile. The materials can either be listed here or they can come from the source if provided.

In addition, the material number found here also affects on the summarization of dynamic items to sales document items. All dynamic items with the same material number are summarized to one sales document item, if no other setting in the profile switches the summarization off, for example, the *'No Summarization'* indicator in the characteristics view (chapter 3.1.2.1),

As of SAP R/3 Enterprise Core 4.70 it's possible to increase the "Material Determination Lines" per DIP profile. You can define more than 999 material determination lines in the DIP profile now.
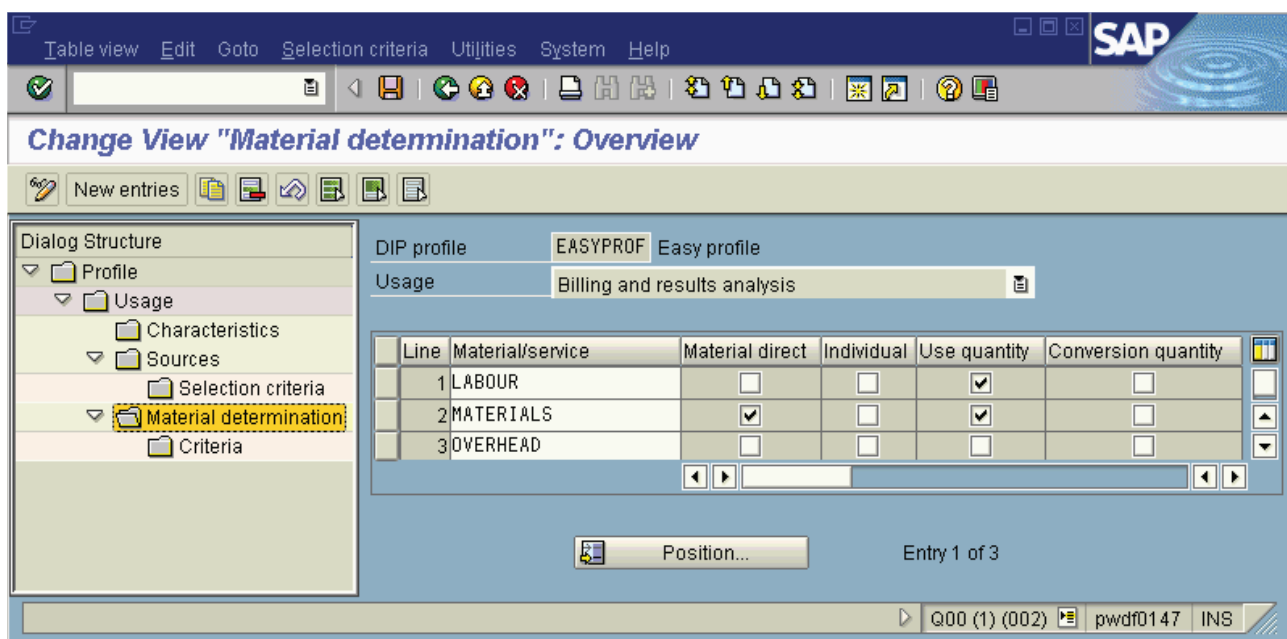
Figure 16: DIP Profile: Material Determination - Indicator 'Use Quantity'

You can enter a number from the material master in the *'Material/service'* column.. You cannot use any services from the service master here. It is best to use service materials here, because the fewest data has to be maintained for them. For more information, look in chapter 3.4.

With the *'Material direct'* indicator set, the characteristic material of the dynamic items is used instead of the material specified here. Please make sure that the 'Material' is switched on as a relevant characteristic. Otherwise, this sign has no effect. If you are sure, that all dynamic items assigned to such a line with this sign set have a material number, you can leave the material column blank.

The *'Individual'* indicator forces the system to create a single line for each dynamic item, even if their material numbers are equal. This has no effect on the characteristics transferred to the sales document items.
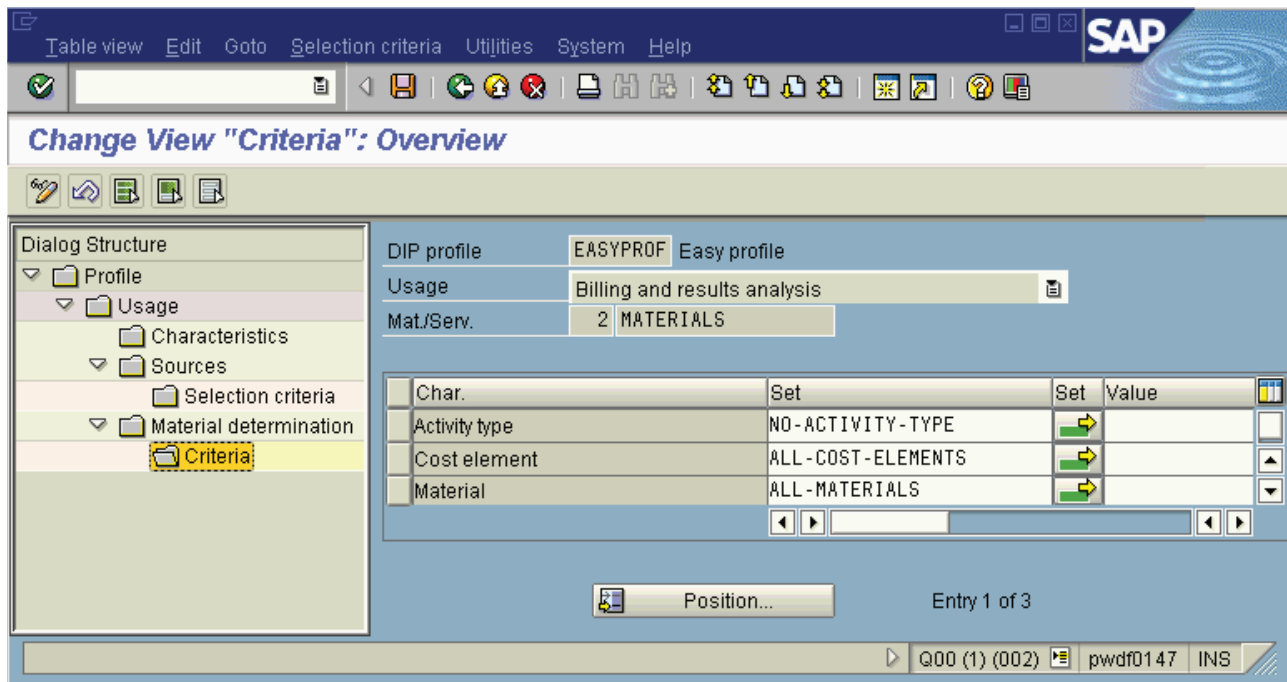
Figure 17: DIP Profile: Material Determination - Criteria

Normally, the unit of measure of the dynamic items is used in the sales document items. Therefore, a conversion rate must be set in the material found here, if the unit of measure differs from the base unit of the material. Sometimes, your internal unit of measure is different from the one you want to use in your billings; for example, confirmations are done in minutes, but the invoice should show hours. If you set the *'Conversion quantity'* indicator, the system uses the sales unit from the material and converts the quantity. If no sales unit is specified, the base unit is used instead.

For all of your material determination lines, criteria can be set to define the relationship between dynamic item characteristics and the material of this line. In fact, criteria have to be specified, because the case of only one material (where the criteria can be left blank) is rare. The criteria of the lines should not overlap. If they do, the system will work, but you get probably some unexpected materials for your dynamic items because the first line whose criteria match the characteristics of the dynamic item is taken.

In the criteria view for the material determination line, all characteristics are shown for which the sign 'Material determination' is set in the characteristics view. Unlike in the selection criteria, a set or a single value can be entered. We recommend that you use sets, but as there is sometimes the need to relate each single value of a characteristic to a material (for example, each activity type is billed with a different material), you can also enter single values. It is not possible to enter both. The same concerns apply to the sets as to the selection criteria or the structuring. With the green arrow, you can also maintain your sets.

Until release 4.6C, if the dynamic item has a quantity, it can be transferred to the sales document item by setting the sign *'Use quantity'*. In fact, the system transfers the quantity that results of the summarization of the dynamic items. Therefore this indicator only takes effect if 'No summarization' is set for the 'Unit of measure' in the characteristics view. If 'Use quantity' is cleared for the particular material determination line or 'No summarization' is cleared for the unit

of measure, the system simulates the quantity 1 (if costs are greater than zero) or -1 (if costs are less than zero).

Since release 4.70 the control options for transferring quantity and costs are enhanced. The original sign "Use Quantity" was therefore renamed as "Transfer Quantity/Costs".

The sign "Transfer Quantity/Costs" determines how the quantity/costs from the source are transferred to the items in the sales document.

In the DMR the resource items have either costs or quantities or costs and quantities. Depending upon your business processes and the type of resource item (working time, materials, and delivery route) you can bill expenditures based on quantity or costs and then determine the prices correspondingly. In addition, you must define whether costs and/or quantities should be transferred to the sales and distribution document items.

You have the following possibilities:

- **Space - transfer costs only**
  The system transfers only the costs to be billed to the sales DMR and sets the quantity to 1 in the DMR item. Resource items are transferred if the costs do not equal to 0. Resource items with a quantity not equal to 0, but costs that equal to 0 are not transferred. Resource items with costs to be billed that are less than 0 are shown as credit memo items.

- **X - transfer costs and quantity**
  The system transfers the costs and quantities to be billed. If no quantity exists, or if the quantity is 0, the system sets the quantity to 1 in the DMR item. Resource items are transferred if the quantity or the costs are not equal to 0. Resource items with quantities to be billed that are less than 0 are shown as credit memo items **even if the costs > 0**.

- **A - for costs <> 0: transfer costs and quantity**
  Resource items are transferred if the costs to be billed are not equal to 0. Resource items with costs to be billed that are less than 0 are shown as credit memo items. The system transfers the costs and quantities to be billed. If a quantity does not exist or if the quantity is 0, the system sets the quantity to 1 in the sales and distribution document item.

- **B - for quantity <> 0: transfer costs and quantity**
  The system transfers the costs and quantities to be billed if the quantity to be billed does not equal 0. Resource items with a quantity to be billed that is less than 0 are shown as credit memo items.

- **C - transfer quantity only**
  The system transfers only the quantity to be billed to the sales and distribution document. Resource items are transfered if the quantity to be billed does not equal 0. Resource items with costs not equal to 0, but quantities equal to 0 are not transfered. Resource items with a quantity to be billed that is less than 0 are shown as credit memo items.

Remark: The term resource item is not the same as dynamic item in this case, but rather it is a billing request item to be generated. Dynamic items with costs or quantities to be billed < 0 can be shown as debit memos if they are summarized with other dynamic items, so that the total costs and quantity is greater than 0.

If you want to bill based on costs, choose the space, X or A option. Pricing should be set so that the net value is determined from costs plus surcharge.

If you want to bill based on quantity, choose the option B or C. Pricing should be set so that net value is determined from the quantity multiplied by the price. You can enter prices manually or find them automatically using pricing. You should not use the option X if you bill based on quantity, because the system sets the quantity to 1 for a quantity of 0 to be billed, in order to transfer the costs.

If you want to transfer costs to the sales and distribution document, you must define additionally a cost condition for the type of sales and distribution document to be created in Customizing (ODP4).

The above options for the resource items in the resource-related billing document are valid analogously for the planning expenditures to be transferred to sales pricing for projects and quotation creation for service orders.
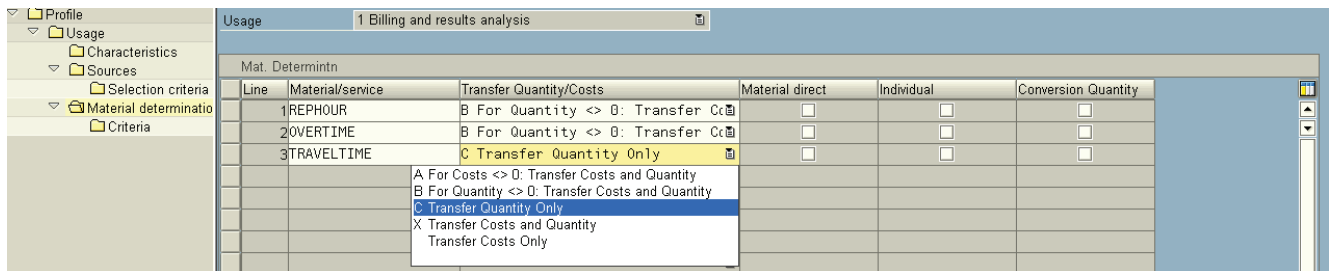
Figure 18: DIP Profile: Material Determination – Indicator Transfer Quantities /Costs

3.1.5 Criteria for Source Selection and Material Determination

For both the source selection and the material determination, criteria can or must be entered. As was already said in chapters 3.1.3 and 3.1.4, the criteria should not overlap if more than one source selection line or material determination line is specified in the profile. If only criteria for one characteristic are used, this is quite easy. It is best to create a hierarchical set with a top node and subsets and use the subsets in the criteria. You can use the check and help functions of the set maintenance tool to check that no value occurs more than once in the total set.

If more than one characteristic is used for the criteria, it is important to know that a blank field for a characteristic means 'all values including the initial value'. Therefore if in one line a set is specified for a characteristic but in another line, the criterion for this characteristic is left blank, an overlap occurs. Generally, if a set is specified somewhere for a characteristic, in all source selection lines or material determination lines, a set or value must be set for this characteristic. Sometimes, sets with 'all values' and sets with the 'initial value' must be used to resolve the overlap.

Figure 19 Criteria Example: Material Determination

The following example for a set-up of the material determination should clarify this further.

We want to bill worked hours, used materials, and overhead to our customer. To do this, we use the source 'Actual costs - Line items' which provides the characteristic activity type, material, and cost element. These characteristics are marked as relevant in the characteristics view of the profile. We bill all worked hours with the same material to reduce the complexity of the example. The material in the invoice should be the same as in our source data. Next we create three materials for our billing: LABOR, MATERIALS and OVERHEAD. In the material determination screen, three lines with these materials are entered. For LABOR and MATERIALS, we set the sign 'Use quantity' to transfer the quantity to the invoice. Only for the MATERIALS, we set the sign 'Material direct', because we want to show in our invoice the used materials. Normally, the MATERIALS could be cleared but we left it showing us for what this line is used. The material determination view is shown in Figure 19.

Next, we have to think how we can identify the different costs from our source data and assign them to the right material. Labor costs have an activity type and a cost element but no material number. Material costs have a cost element and a material number but no activity type. Finally, overhead costs have only a cost element, but neither an activity type nor a material number. In fact, our overhead summarizes all other costs, but this keeps the example simple. As all of our costs have a cost element, we select the 'Material determination' indicator only for activity type and material in the characteristics view of our profile. These are the characteristics we use for our material determination.

Now, as we know how to identify our costs, we create some sets for our characteristics using the set maintenance tool:

- For characteristic activity type (Field LSTAR of structure AD01ATTR):

  – NO-ACTIVITY-TYPE: Set with initial value

  – ALL-ACTIVITY-TYPES: Set with all activity types

- For characteristic material number (Field MATNR of structure AD01ATTR):

  – NO-MATERIAL: Set with initial value

  – ALL-MATERIALS: Set with all materials

Do not use the "Insert all values"' function from the set maintenance tool. The line inserted by this function includes the initial value. Instead, for example, for the activity type, enter 000000 in "From value" and ZZZZZZ in "To value".

The resulting material determination criteria for the three lines are shown in Table 3.

Line	Material	Criteria
1	LABOUR	Char. / Set / Set / Value Activity type — ALL-ACTIVITY-TYPES Material — NO-MATERIAL
2	MATERIALS	Char. / Set / Set / Value Activity type — NO-ACTIVITY-TYPE Material — ALL-MATERIALS
3	OVERHEAD	Char. / Set / Set / Value Activity type — NO-ACTIVITY-TYPE Material — NO-MATERIAL

Table 3: Criteria Example: Material Determination Criteria

The example can be easily enhanced, for example by splitting the LABOR line to different billing materials determined by the activity type.

If we want to split the OVERHEAD into "real" overhead and "other" costs, we have to add the cost element characteristic to the material determination. Then we create a material called OTHER COSTS and add this as a new line to the material determination view. Next we create a cost element group with the root TOTALCOSTS and two nodes OHEADCOSTS and OTHERCOSTS. You enter the overhead cost elements (for example, from 660000 to 669999) below node OHEADCOSTS and all other cost elements below OTHERCOSTS.

SET-KSTAR	Total
SET-KSTAR-40XXXX	Cost elements 40XXXXX
400000 409999	
SET-KSTAR-41XXXX	Cost elements 41XXXXX
410000 419999	
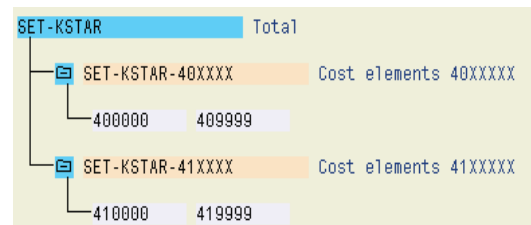
Figure 20 Set for Splitting Costs

Line	Material	Criteria			
1	LABOUR	Char.	Set	Set	Value
		Activity type	ALL-ACTIVITY-TYPES		Optional
		Cost element	TOTALCOSTS		
		Material	NO-MATERIAL		
2	MATERIALS	Char.	Set	Set	Value
		Activity type	NO-ACTIVITY-TYPE		Optional
		Cost element	TOTALCOSTS		
		Material	ALL-MATERIALS		
3	OVERHEAD	Char.	Set	Set	Value
		Activity type	NO-ACTIVITY-TYPE		
		Cost element	OHEADCOSTS		
		Material	NO-MATERIAL		
4	OTHER COSTS	Char.	Set	Set	Value
		Activity type	NO-ACTIVITY-TYPE		
		Cost element	OTHERCOSTS		
		Material	NO-MATERIAL		

Table 4: Criteria Example: Enhanced Material Determination Criteria

The sets OHEADCOSTS and OTHERCOSTS are used to separate the overhead, but for all other selection criteria, a cost element group must also be specified. Here we enter the set TOTALCOSTS. The new settings are shown in Table 4. At least, if the criterion of one characteristic of two lines does not overlap, the lines do not overlap. Therefore, the set TOTALCOSTS in lines 1 and 2 could be removed, because these two lines do not overlap and they do not overlap with the other lines. They have either a material number or an activity type which the dynamic items of line 3 and 4 do not have. Nevertheless, it is sometimes better to add such unnecessary sets to make the criteria clearer.

3.1.6 Characteristics Filled by Standard Sources

The characteristics are related in many ways to the sources. First, not all sources can provide and fill all characteristics. For example, it is useless to mark the statistical key figure as relevant if none of the statistical indicator sources is used.

	Actual costs - Line items	Actual costs - Totals records	Statistical ind. - Line items	Statist. ind. - Totals records	Funds - Line items	Funds - Totals records	Planned costs - Totals records	Planned Stat ind. - Totals records	Easy cost planning	Technical field name
Accounting indicator	AP	AP	–	–	–	–	AP ^{2}	–	–	BEMOT
Activity number *	–	–	–	–	–	–	–	–	AP	ASNUM
Activity type	AP	AP	–	–	–	–	AP	–	AP	LSTAR
Billing form ^{1}	(AP)	(AP)	(AP)	(AP)	(AP)	(AP)	(AP)	(AP)	(AP)	FAKTF
Business partner ** SRM	–	–	–	–	–	–	–	–	–	SERV_AGENT_ID
Business process	AP	AP	–	–	–	–	–	–	AP	PRZNR
Category ID ** SRM	–	–	–	–	–	–	–	–	–	CATEGORY_ID
Commitment item	–	–	–	–	AP	AP	–	–	–	FIPOS
Cost center	AP	AP	–	–	–	–	AP	–	AP	KOSTL
Cost element	DB	AP	–	–	–	–	AP	–	AP	KSTAR
Document number	AP	–	AP	–	AP	–	–	–	–	BELNR
Item number ** SRM	–	–	–	–	–	–	–	–	–	REF_OBJECT_ITEM
Log. system source ** SRM	–	–	–	–	–	–	–	–	–	AWSYS
Material	DB	AP	–	–	–	–	AP	–	AP	MATNR
Object number	DB	DB	DB	DB	DB	DB	DB	DB	AP	OBJNR
Object type	AP	AP	AP	AP	AP	AP	AP	AP	AP	OBART
Period	DB	A/D	DB	A/D	DB	A/D	A/D	A/D	AP ^{5}	POPER
Personnel number	AP	AP ^{4}	AP	–	–	–	AP ^{4}	–	–	PERNR
Plant	DB	AP	–	–	–	–	AP	–	AP	WERKS
Plant of work center	–	–	–	–	–	–	–	–	AP	AWERK
Posting row	AP	–	AP	–	AP	–	–	–	–	BUZEI
Product ^{3}	(AP)	(AP)	(AP)	(AP)	(AP)	(AP)	(AP)	(AP)	(AP)	PRODU
Product name ** SRM	–	–	–	–	–	–	–	–	–	ORDERED_PROD
Service number *	AP	AP	–	–	–	–	AP	–	AP	ASNUM
Stat. key figure	–	–	DB	DB	–	–	–	DB	–	STAGR
Transaction currency	DB	DB	–	–	DB	AP	DB	–	AP	TWAER
Transaction number SRM	–	–	–	–	–	–	–	–	–	REG_OBJECT_ID
Unit of measure	DB ^{6}	AP	–	AP	–	–	AP	AP	AP	MEINH
Value type	DB	DB	DB	DB	DB	DB	DB	DB	–	WRTTP
Version	DB	DB	DB	DB	DB	–	DB	DB	–	VERSN
WBS Element **	–	–	–	–	–	–	–	–	–	/CBAD/BILL_WBS
Work center	–	–	–	–	–	–	–	–	AP	ARBPL

Table 5: Characteristics

*)   In release 4.6C, 5.00, 6.00 and 7.00 this characteristic is called "Activity Number". But in release 4.70 it is called "Service Number".

**)   These characteristics are not available in released 4.6C and 4.70

SRM)   Special source is used for data retrieval form SRM system. Fields are only filled when this source is used.

When reading sources, some of the characteristics can be handled and evaluated directly at the database level but others cannot. Selection criteria, based on such characteristics are checked in ABAP on the application server. Source data which does not fit the criteria is removed from the selection. Obviously, performance is better if the characteristic can be checked on the database. For example, for source "Actual costs - Line items'", the cost element can be checked at the database, while activity types have to be checked at the application server. Generally, all dependent characteristics are checked at the application server.

Table 5 shows an overview of which source can provide the characteristics and how it handles them.

Legend for Table 5: Characteristics
–   Not provided
- **DB** Provided and selected on database level
- **AP**   Provided and selected on application server level
- **A/D** Provided, but only the year is used to select on database level

Remarks for Table 5:
1. The billing form is not taken from the source. It is taken from the sales order item or the service order.
2. The accounting indicator is taken from the service order for source "Planned costs - Totals records".
3. The product is only filled for the special dynamic item of the service product. This special dynamic item is filled with the following characteristics: Accounting indicator; Billing form; Unit of measure; Object number; Period; Product; Transaction currency; Plant.
4. Although the program could fill this characteristic, the source data itself does not provide it normally in 4.6C.
5. The period is derived from target start date of the operation for source Easy Cost Planning.
6. The field MEINB is taken from table COVP to fill the unit of measure.

3.1.7 Profile Check (ODP2)

With the profile check report, the settings and consistency of profiles can be checked. The check report looks for overlapping criteria and tests if all sets exist and if they are defined for the fields they were used for. If an error is detected, a red light is displayed. For the overlap check, a detail screen shows which lines are overlapping.

Since SAP R/3 Enterprise Core 4.70 a new analysis program for DIP profile is called via transaction ODP2. The new program checks for consistency in the profile, too. However, it can check only one profile per program run. It now offers more information, enables you to print the entire profile, and simulates material determination

If you want the check consistency for multiple profiles at the same time, you can use the program found in transaction ODP2A which was available until release 4.6C only.
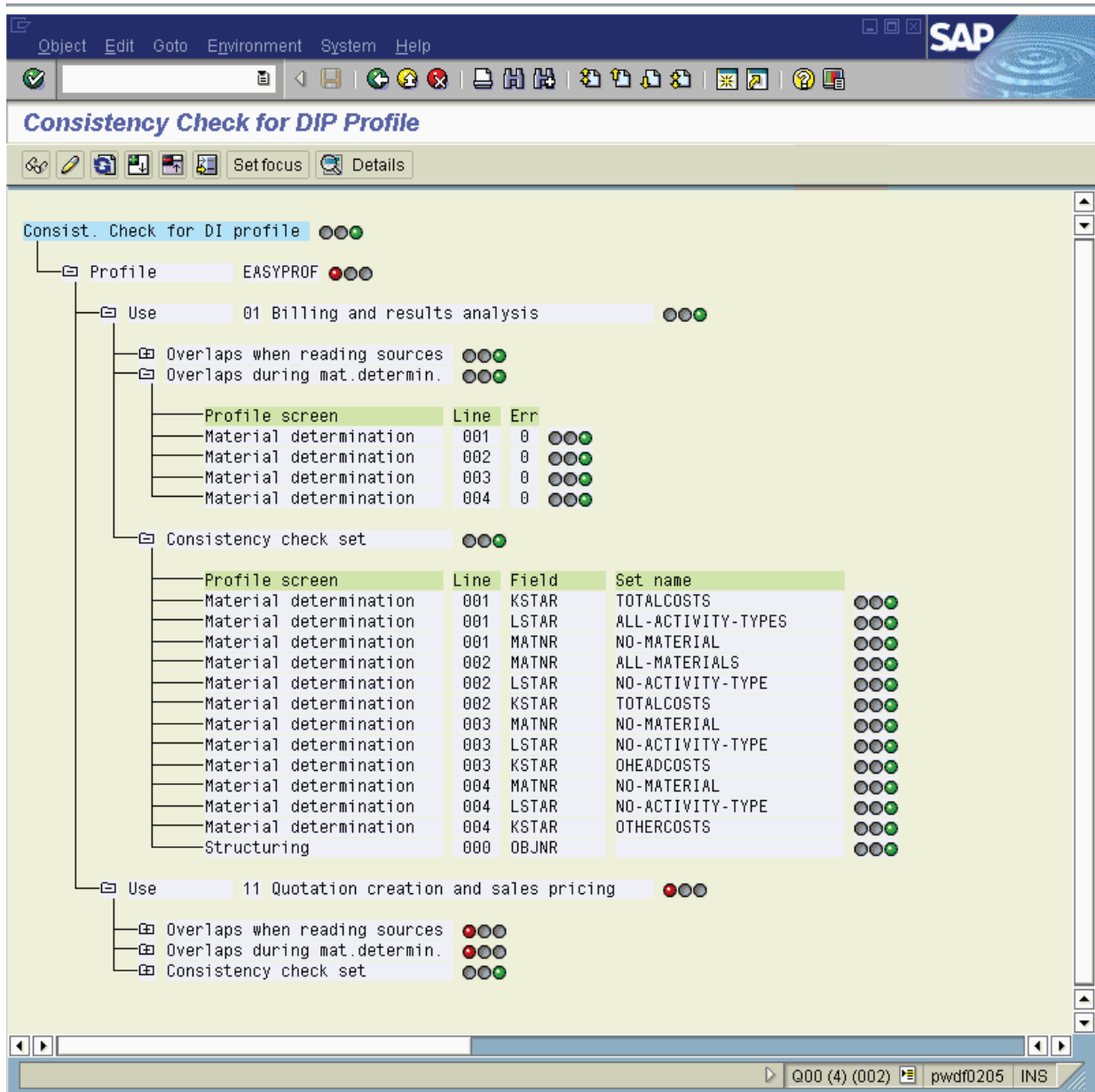
Figure 21: Profile Check (ODP2A)

3.1.8 Does and Don'ts if Changing the Profile

The settings in the DIP profile define your dynamic items. For the dynamic items, the document flow of resource-related billing is stored and also the pricing is stored with a logical connection to the dynamic item characteristics. Therefore if you change the profile while having already used it in any business process, you will see major impacts to your old data.

DON'T...:

- Adding or removing an independent characteristic (marking or unmarking it as characteristic) defines new dynamic items. As the old data is stored for the characteristic vector before the change some important logical connections are lost. In resource-related billing, the costs already billed are displayed twice: the total source value is shown as unbilled and the billed values are shown as billed but without a source value; they're open with the opposite sign. You load a pricing for the project but if you press the refresh

button, the old data disappears. You will also loose all manual price changes to the pricing.

- Narrowing the selection criteria of your sources could cause problems similar to those if you change the independent characteristics. If there is no source data for billed costs, they are shown as open with negative values.

- It is clear that you should not remove a source selection line or change a source in a line. The source is an implicit relevant characteristic. Therefore you should not change from source "'Actual Costs - Line Items" to "Actual Costs - Totals records" or vice versa.

- Changing the DIP profile can have the same impact as the last points if the changing of the profile includes a change of relevant independent characteristics or source selection.

- If you use a user-defined independent characteristic, take care that the value of it won't change in the future.

DO...:

- You can add or remove any dependent characteristic. This has no direct impact on the dynamic items or the document flow of resource-related billing.

- You can widen the selection criteria of a source selection line. This can only cause additional unbilled costs for orders or periods you thought already billed.

- You can split a source selection line into multiple lines without problems if the criteria of the new lines are the same as the criteria of the old line.

- You can change the material determination in any way. You can also change the characteristics to be used for material determination. The materials are newly determined every time you start resource-related billing or any other business process. Remember that a changed material can cause changed prices in an existing pricing of a project. Also, if you set the *DI w/ material* sign in the profile usage, you could lose unbilled dynamic items if the material determination fails after this change.

If it is really necessary to change the profile, it is often best to copy the old one and process old orders with the old one and apply the new profile only to new orders.

3.2 Apportionment Reason (ODP3)

The apportionment reason is a value that can be used to write cost of sales or work in process to different line ids in results analysis in transaction OKG5. The apportionment reason is entered in the source selection line of the DIP profile. So you can define different apportionment reasons for the selected costs. It is copied directly from the DIP profile to results analysis. Here, you can write unbilled costs from a source selection line to a different line ID than your billed costs.

3.3 Cost Condition (ODP4)

Billing or pricing can be based on quantities or amounts (costs). Therefore, these values must be copied to the sales document and the pricing procedure. With the sign 'Use Quantity' of the material determination line, the system knows, that the quantity should be used in the sales document and pricing. If a material price is found, the price of your billing or quotation can be calculated.

However, there are also some business processes where the costs are the basis for the pricing. Here, the costs must be copied to a condition of the pricing procedure. With transaction ODP4, such a condition type can be specified for each sales document type of your debit/credit memo requests or quotations. Take care that this condition is in the pricing procedure which is not only determined by the sales document type but also by other criteria like sales area or customer in transaction OVKK.

It is also possible to copy both the quantity and the costs to the pricing procedure. The only thing to do is to set the "Use Quantity" indicator and specify a cost condition. A problem with rounding errors arises if these values get too large. The system tries to find a price unit for the items. Sometimes, it can happen that the price unit exceeds 99,999, which marks the maximum price unit. Now the price unit is set to this limit and by multiplying the quantity with the price unit, a small difference occurs.

Example: A dynamic item has a quantity of 123,456,789 hours and an amount of 987,654,321.00 euros. The system creates a price unit of 80,000 euros per 10,000 hours. By multiplying the hours by the price unit, the condition in the pricing procedure displays 987,654,312.00 euros as the condition value.

The system can update three currencies of your costs: controlling area currency, object currency, and transaction currency. In controlling area, it can be set if all currencies or only the controlling area currency is updated. There is still the question which currency is copied to the pricing. If only the controlling area currency is updated, the amount in this currency is copied. If the transaction currency is also updated, it depends on the setting of the sign 'No summarization' for the characteristic 'Transaction currency' in the DIP-profile. If it is set, the amount in transaction currency is copied. If it is not set, the amount in controlling area currency is copied. By setting the sign 'No summarization' for the transaction currency, the system creates different sales document items if the transaction currency differs in the dynamic items. Therefore, the transaction currency and the amount can be copied to the sales document item.

Regardless of the transferred currency, the amount is converted to the sales document currency. The price date is used as the date for the change rate.

3.4 Materials

Materials are used both on the input and on the output side of the DIP. Therefore, some things must be considered when creating materials which are used by the DIP.

On the input side, materials can be read from sources and used as a characteristic, if the source provides the material number. However, although a source could provide the material number as a characteristic, it is not certain that you would really get it. For example, you want the material number of your project planning in a sales pricing. To get the planned costs, you set up your DIP profile with source "Planned costs -Totals records". This source can provide the material number, but for planned costs, the material number is only updated to the cost tables if the "Material origin"' indicator is switched on in the material master. The sign can be found in view "Costing 1" of the material master.

On the output side, it is necessary to define materials which can be used in the material determination of the DIP profile. These materials are transferred to the sales document items, regardless of whether the sales document is really created or just created as a simulation in background to get the pricing. Therefore, some of the sales view must be maintained in the material master for the sales area you are working in your business processes. At least, the views "Basic Data 1" and "Sales: sales org.1" must be maintained in the material master if the material is to be used in the material determination. If the material which was provided by the source

should be used directly, these views must also be maintained in its material master even if they are only used for pricing and are never sold or billed.

The possibility of transferring the quantity and its unit of measure from the dynamic items to the sales document items requires the proper set-up of the material used to bill this quantity. Here it can happen that the unit of measure of the dynamic item is not equal to the base unit of measure or the sales of the material master. Generally, the program would stop with an error message if no conversion is defined between these units. Take care that your conversion is set up correctly, especially for the easy convertible units like hours, minutes, and seconds.

The 'General item category group' ('Basis Data 1') is important for the item category assignment in SD customizing.

3.5 Customizing in SD

It is beyond the scope of this document to describe all possible customizing in SD that affects the business process covered by the DIP. For that reason, this chapter deals only with the parts directly influencing the DIP or respectively the sales document created by the DIP.

3.5.1 Sales Document Types

Generally all sales document types can be used in the DIP. There are no special limitations. SAP delivers some sales document types which can be used for the DIP: L2 and G2 for Resource-related Billing; AE for Quotation Creation for Service Orders; AP for Pricing for Projects.

3.5.2 Item Categories

For the item categories, some of the processes need special settings.

When creating both debit and credit memo request in resource-related billing, you need two different item categories. For the one to be determined for the credit memo request, the sign 'Returns' must be set to let the system know that the sales document item is a credit item.

For product processing, two different item categories must be also defined . One of the item categories is the statistical one which is either used for the main item or the sub-items, depending on the billing form.

3.5.3 Item Category Usage and Item Category Assignments

For dynamic items there are two item usages defined:

- SEIN—Dynamic item is relevant for billing

- SENI—Dynamic item is not relevant for billing

One usage is set automatically per item for the sales document items created by the dynamic item processor. The usage SENI is only used in product processing.

With the usage the item category assignments must be defined for each sales document type and item category group.

Example: You want to define the item category assignment for the business process Quotation Creation from Service Order. You have already customized the sales document ZQU and the item categories ZQUN and ZQUS, where ZQUS is a statistical item category.

For the non-product processing, the assignment for item category group DIEN has to be:

Sales Document Type	Item Category Group	Usage	Higher Level Item Category	Default Item Category
ZQU	DIEN	SEIN		ZQUN

For product processing the set-up is more complex, especially the customizing is different for the billing forms. For billing form "Fixed Rate'" the sub-items have to become statistical items:

Sales Document Type	Item Category Group	Usage	Higher Level Item Category	Default Item Category
ZQU	DIEN	SEIN		ZQUN
ZQU	DIEN	SENI	ZQUN	ZQUS

For billing form 'Costs' things look just the opposite because the main item must be the statistical one:

Sales Document Type	Item Category Group	Usage	Higher Level Item Category	Default Item Category
ZQU	DIEN	SENI		ZQUS
ZQU	DIEN	SEIN	ZQUS	ZQUN

The lines of the last two tables must be added for each item category group you want to use in the dynamic item processor to cover all business processes.

3.5.4 Copy Control

For the copy control, nothing special has to be customized. The only thing to mention is that no customizing for the copy of sales document items must be done, because the system copies only the sales document header to the new sales document type. From the item of the original document, only the account assignment is copied to the new items.

3.5.5 Reasons for Rejection

The reason for rejections can be used both in quotations and debit/credit memo requests. In the last case, the customizing of the reasons can have an effect on the billing. The reason for rejection has the sign OLI. This controls whether the billed costs or resources are open again for billing when a reason for rejection is set in the debit or credit memo request.

If the sign is cleared for the reason, the costs or resources are still treated as already billed. If the sign is set, they are available again in the resource-related billing process for new billing (see also note 131288).

3.5.6 Pricing and Pricing Procedure

Pricing is done by simulating a sales document in background. Therefore, the pricing procedure is determined the same way like creating manually a sales document with the same sales area and customer. All pricing options can be used in the DIP pricing.

Using the dynamic item characteristics for the pricing sometimes requires a little effort to work. Characteristics which are also known by SD (such as the plant) are transferred automatically to the sales document item. For other characteristics, customer enhancements have to be used. Remember that only characteristics with the sign 'No summarization' set are transferred to the sales document item and the user exits there.

It is possible to change the sales document to be created or used in the simulation. This can be done either in the profile, but also online. If this is done, all conditions of saved pricings gets lost if the newly determined pricing procedure does not know these condition types.

3.6 Customizing in Results Analysis

There is no special customizing necessary if you are using valuation method 14 or 15.

You can use the apportionment reason and the accounting indicator to determine the line IDs.

4 Customer Enhancements

4.1 Overview

Customer enhancements for the dynamic item processor can be divided between directly related customer enhancements and those originally based in other application but which can be called when the dynamic item processor is running. The enhancements in the second group are located mainly in SD and are called when you simulate or create a sales document. Such exits are called secondary customer enhancements while the direct enhancements are primary customer enhancements. Very often, these enhancements must be used in combination to implement a business process. An overview of enhancements is shown in Table 6 and Table 7.

4.2 Exits

All these exits are called during the different business process at a certain time. Some of them are only called for specific business processes. An overview with the sequence of the exit-calls is shown in Figure 22.

Enh.	Exit	Description
AD010001		Change object list and its hierarchy
	EXIT_SAPLAD13_001	Change texts for DI structuring
	EXIT_SAPLAD13_002	Typing nodes for single values
	EXIT_SAPLAD15_001	Change object list and hierarchy
AD010002		Delimit selection and/or filter determined data
	EXIT_SAPLAD15_010	Source filter (not available for all sources)
	EXIT_SAPLAD1C_002	Change COSEL - selection structure
AD010003		Create user-defined DI characteristics
	EXIT_SAPLAD12_003	Fill user-defined independent characteristics
	EXIT_SAPLAD12_004	Fill user-defined dependent characteristics
	CI_ATTRI2	Structure of user-defined independent charact.
	CI_ATTRD	Structure of user-defined dependent charact.
AD010005	EXIT_SAPLAD15_005	Read user-defined sources
AD010006		Menu exit: Change DI value
	EXIT_SAPLAD14_006	Exit: DP processor menu (screen 100) *)
	EXIT_SAPLAD14_008	Change text for menu exit *)
AD010007	EXIT_SAPLAD15_015	Change DI processing Information
V46H0001		SD customer functions for resource-related billing
	EXIT_SAPLV46H_001	Customer function when creating item
	EXIT_SAPLV46H_002	Customer function for partner changes
KKAG0004		Results analysis with dynamic items
	EXIT_SAPLADK0_001	Postprocessing: CO subkey dynamic items RA
	EXIT_SAPLADK0_002	Postprocessing of Results Analysis with Dis
	CI_ADK0_RA2	Additional fields of CO subkey to be filled
ICSV0005	EXIT_SAPLISDI_001	Determining reason for rejection - RRB

Table 6: Primary Customer Enhancements

*) only available until release 4.6C, replaced by BAdI "SMOD_AD010006", methods "EXIT_SAPLAD14_006" and "EXIT_SAPLAD14_006".

Enh.	Exit	Description
MV45AFZZ (Include)		User exits for modifications in sales document processing
	USEREXIT_PRICING_PREPARE_TKOMK	Include or assign a value to an additional header field in the communication structure KOMK taken as a basis for pricing
	USEREXIT_PRICING_PREPARE_TKOMP	Include or assign a value to an additional item field in the communication structure KOMP taken as a basis for pricing
	KOMKAZ	Structure with user defined fields for pricing communication header
	KOMPAZ	Structure with user defined fields for pricing communication item
	USEREXIT_SAVE_DOCUMENT	Update additional tables when saving a sales document
	USEREXIT_READ_DOCUMENT	Read additional tables when reading a sales document
	USEREXIT_DELETE_DOCUMENT	Delete additional tables when deleting a sales document
	VBAPKOZ	Structure with user defined fields for sales document item
KKAG0005	EXIT_SAPLKKAG_007	Determination of time frame and results analysis key

Table 7: Secondary Customer Enhancements (Selection)
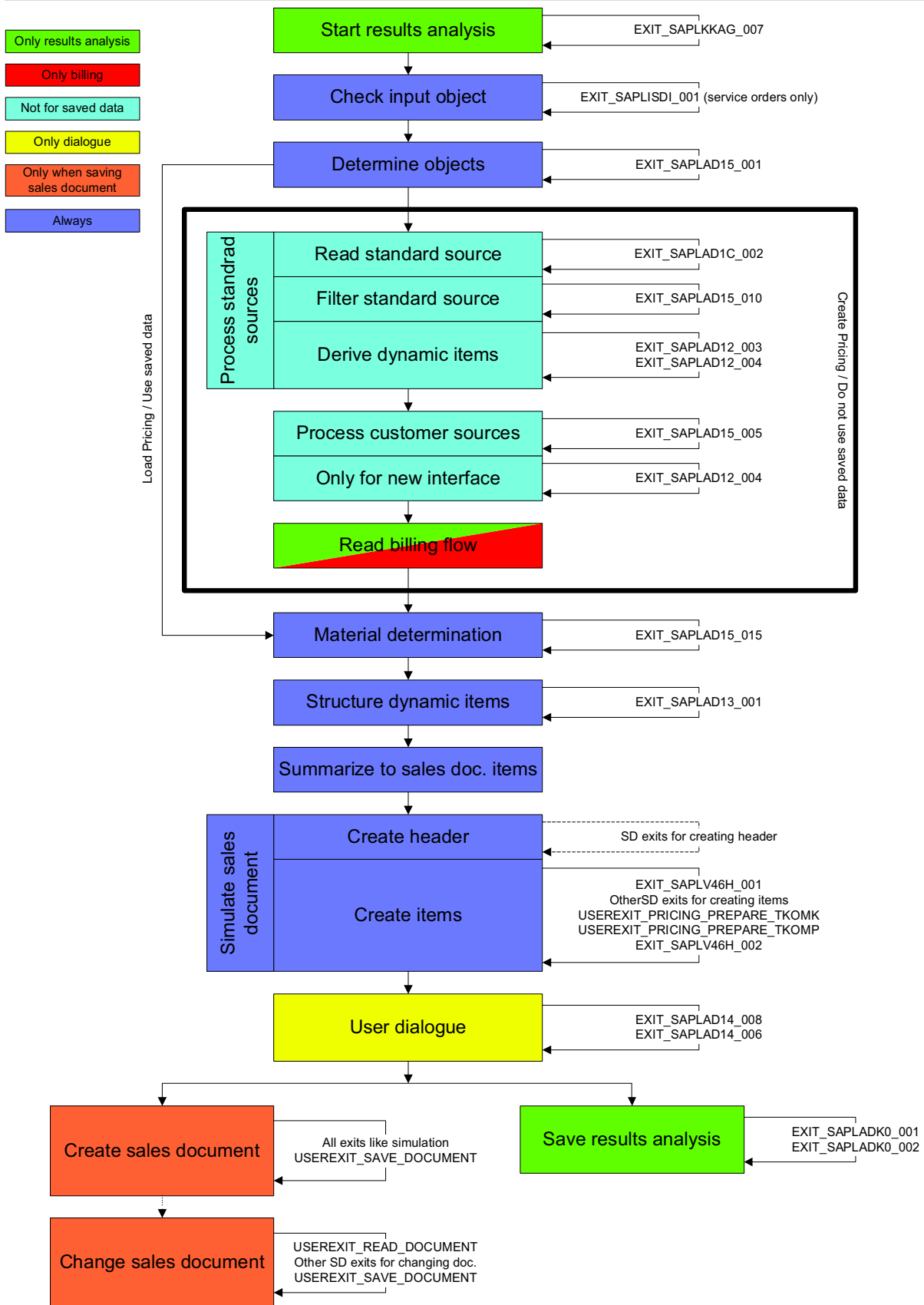
Figure 22: Calling Sequence of Customer Enhancements

4.3 BAdIs

As of *SAP R/3 Enterprise Core 4.7* new Business Add-Ins (BAdIs) are available. These BAdIs are developed for all customer enhancements and have the same status as customer enhancements, which are still supported. Only the customer enhancement AD010006 was migrated to BAdI SMOD_AD010006 and is available only as a BAdI. The BAdI methods are called at the same place as the exits.

In addition to the BAdIs with functions from customer enhancements, new Business Add-Ins are also delivered.

4.3.1 BAdIs within the Dynamic Item Processor (DI Processor):

- **DIP_AD010001**
  This enhancement is used to change the object list and the hierarchy setup. Furthermore you can change texts for structuring dynamic items.
  It contains the following methods:

  – EXIT_SAPLAD13_001: Change text in dynamic item structuring
    (Further information can be found in chapter 4.6)

  – EXIT_SAPLAD15_001: Change object list and hierarchy
    (Further information can be found in chapter 4.2.1)

- **DIP_AD010001_FLD**
  This enhancement is used for structuring according to single values and change characteristic value texts. The enhancement contains the following methods:

  – EXIT_SAPLAD13_002: Typing nodes for single values

  – EXIT_SAPLAD13_003: Change text for characteristic values

- **DIP_AD010002**
  This enhancement is used for filtering read data. The enhancement is not available for all sources. The enhancement contains the following method:

  – EXIT_SAPLAD15_010: Source filter (not for all sources)
    (Further information can be found in chapter 4.2.3)

- **DIP_AD010002_SEL**
  This enhancement is used to restrict selection. The enhancement contains the following method:

  – EXIT_SAPLAD1C_002: Change selection criteria
    (Further information can be found in chapter 4.2.2)

- **DIP_AD010003_DC**
  This enhancement is used to create user-defined dependent characteristics for determining dynamic items. The enhancement contains the following method:

  – EXIT_SAPLAD12_004: Fill user-defined dependent characteristics
    (Further information can be found in chapter 4.3.3)

- **DIP_AD010003_IC**
  This enhancement is used to create user-defined independent characteristics for determining dynamic items. The enhancement contains the following method:

  – EXIT_SAPLAD12_003: Fill user-defined independent characteristics
  (Further information can be found in chapter 4.3.2)

- **DIP_AD010005**
  This enhancement is used to create user-defined sources for determining dynamic items. The enhancement contains the following method:

  – EXIT_SAPLAD15_005: Read user-defined sources
  (Further information can be found in chapter 4.4)

- **SMOD_AD010006**
  This enhancement is used to change the values in the dynamic items (amounts and quantities). It contains the following methods:

  – EXIT_SAPLAD14_006: Function realized using the customer-specific menu entry
  – EXIT_SAPLAD14_008: Menu text for the customer-specific menu entry

- **DIP_AD010007**
  This enhancement is used to change dynamic item processing information (such as material determination). It contains the following method:

  – EXIT_SAPLAD15_015: Change Dynamic Item Processing Information
  (Further information can be found in chapter 4.5)

- **DIP_CHECK_INPUT_OBJ**
  This enhancement is used to check the access object in the DI processor. The enhancement contains the following methods:

  – CHECK_SALES_ORDER_ITEM: Check sales order item
  – CHECK_SERVICE_ORDER: Check service order

  (Please take notice of note 401942 for details on "BAdI: Check entry object in dynamic item processor")

- **DIP_GET_SEL_DATA**
  This enhancement is used for transferring selection data to other programs, which called resource-related billing, for example. It consists of one method:

  – GET_SELECTION_DATA: Transfer selection data to other programs

  Parameters of method GET_SELECTION_DATA:

Parameter	Description
IT_INPUT_OBJECTS	'01' for RRB '11' for Sales Pricing
FROM_SELECTION_SCREEN	In selection screen entered sales order, service order, WBS element, sales order item.

- **AD01_RRB_COLLECTIVE1**
  This enhancement is used to modify the output list for collective processing for resource-related billing (DP95, DP96 and DP97). The enhancement contains the following methods:

  – FILL_ADDITIONAL_FIELDS: Change or add to output list
    This method provides the opportunity to reduce the amount of messages by deleting certain types of messages.

  – CHANGE_FIELDCAT: Change field catalog of output list

  – USER_SELECTION: Determine follow-up action when selecting a field per double-click/hotspot

  – CHANGE_LINE_SIZE: Change number of lines for printing

  The BAdI "AD01_RRB_COLLECTIVE1" is called in the following transactions: DP95, DP96 and DP97.

4.3.2 BAdIs for Restricting the Change Options for Users

- **DIP_INFLUENCE_GUI**
  With this Business Add-In you can stipulate whether the GUI is displayed in display or change mode. The enhancement contains the following method:

  – SET_MODE_CONDITION_SCREEN: Set processing mode for the condition screen

- **DIP_SET_USERSETTINGS**
  This enhancement is used to make user settings and prevent users from changing these settings themselves. The enhancement contains the following methods:

  – SET_USER_SETTINGS: Set user settings

  – DEFINE_NON_ALTERABLE_SETTINGS: Define non-alterable settings

  (Please take notice of note 446477 for details on "Fixed setting of the user settings for DP80/DP90")

4.3.3 BAdI for Document Flow Reporting

- **AD01_RRB_REPORTING_1**
  This enhancement is used to fill other fields in document flow reporting (DP98) for billing requests. The enhancement contains the following methods:

  – FILL_ADDITIONAL_FIELDS: Change or add to output list

  – CHANGE_FIELDCAT_LAYOUT: Change field catalog/layout of output list

  – USER_SELECTION: Determine follow-up action when selecting a field per double-click/hotspot

4.3.4 BAdIs with Influence on Further Processing in SD:

- **BADI_SD_V46H0001**
  This enhancement is used for changing the header and item data and adds further partners for items. The enhancement contains the following enhancement components:

  – EXIT_SAPLV46H_001: Change the item fields

  – EXIT_SAPLV46H_002: Change partner

– EXIT_SAPLV46H_003: Change header fields

- **DIP_CREATE_FOLLOW_UP**
  This enhancement is used to determine whether a billing request is created in resource-related billing, or whether the expenditure should be added to an existing sales order or contract as a sub-item as it's done in standard for repair orders. The enhancement has the following enhancement components:

  – CREATE_FOLLOW_UP_SALES_DOC: Create follow-up document or enhance existing document

- **DIP_SET_SD_DIALOG**
  This enhancement is used to activate SD dialog boxes during sales document simulation and creation. The enhancement contains the following enhancement components:

  – SET_SD_DIALOG_POPUPS: Activate dialog boxes in SD sales document

The following table contains the old enhancements and the Business Add- Ins that replace them. The old enhancements are, however, still available.

Previous Enhancement	Business Add-In
AD010001	DIP_AD010001
AD010002	DIP_AD010002
	DIP_AD010002_SEL
AD010003	DIP_AD010003_DC
	DIP_AD010003_IC
AD010005	DIP_AD010005
AD010006	SMOD_AD010006
AD010007	DIP_AD010007
V46H0001	BADI_SD_V46H0001

4.4 Changing Selection Criteria or Selected Data

4.4.1 Change object list and hierarchy (EXIT_SAPLAD15_001)

The exit has two parameter tables which can be changed. Table ET_OBJECTS contains the object list being processed, table ET_RSTHIE the object hierarchy. The object list can be modified either by adding new objects or by removing objects from the list. In both cases the object hierarchy must be adjusted, especially if you delete objects which are not leaves in the hierarchy. The logical connection between these two tables is done with fields OBJNR (CO object number) in ET_OBJECTS and NAME in ET_RSTHIE. If you are inserting or deleting objects in the middle of the hierarchy, the fields TLEVEL (hierarchy level of object) and PARENT (reference to parent object ID) must be set correctly in table ET_HIERARCHY.

The exit is called with the object list for each input object. For example, if a sales document with three items is processed, the exit is called three times. Therefore, the exit has also the input objects as import parameters.

Examples:

1. **PROBLEM:** You are billing a service order network. Some of the orders should not be billed. This depends on the service order type.
   SOLUTION: Read the master data for each order in the object list and check the service order type. Remove from ET_OBJECTS and ET_RSTHIE all orders, which are not to be billed.

2. **PROBLEM:** You want to perform an authorization check on the processed objects.
   SOLUTION: Use either the input object for your own authority checks or remove objects from the object list if the user is not allowed to process them.

3. **PROBLEM:** You want to price your project, but the structure for pricing differs from the logistic structure of the project.
   SOLUTION: Change the hierarchy in ET_RSTHIE by adjusting fields ID, TLEVEL and PARENT. Remember that such a hierarchy change is permanent for the transaction. If you want to switch between the logistical structure of the project and your alternative structure for pricing, consider using additional characteristics.

4.4.2 Change Selection Criteria (EXIT_SAPLAD1C_002)

This exit is called for each source selection line of the DIP profile except for those selection lines with user-defined sources. The selection criteria are stored in parameter table ET_COSEL. The COSEL structure of the parameter consists of a field name (FIELD), a sign (SIGN), an option (OPTION) and low and high value of the selection (LOW, HIGH). The sign can be either 'I' for include or 'E' for exclude. The option can be one of ABAP's compare operands (EQ (equal), BT (between), CP (contains pattern, like),...). The low and high values must be filled for the option; for example, BT requires low and high values while EQ requires only a low value. The field name is the technical field name of a table field.

The ET_COSEL structure is already filled with all selection criteria of the selection line plus some additional criteria dependent on the source. For example, the source "'Actual costs - Line items" has a selection criteria for the value type to select only actual values from table COVP.

Although all criteria from the source selection line are filled in ET_COSEL, your changes have only an effect on selection if they are related to a field which is directly handled on the database side. I.e. for source 'Actual costs - Line items' you cannot add a selection criterion for activity types, but you can add one for cost elements - even if the cost element is not a relevant characteristic. Any added selection criterion for activity type is not evaluated later with other criteria even if the activity type is a relevant characteristic.

For which fields the selection criteria can be changed depends on the source and the tables read by the source. An overview is shown in Table 8.

Source	Table	Fields
Actual cost - Line items	COVP	LEDNR, OBJNR, GJAHR, PERIO, WRTTP, VERSN, KSTAR, HRKFT, VRGNG, VBUND, PARGB, BEKNZ, TWAER, MEINH, MEINB, WERKS, MATNR
'Actual costs - Totals records	COSSA	LEDNR, OBJNR, GJAHR, WRTTP, VERSN, KSTAR, HRKFT, VRGNG, PAROB, USPOB, BEKNZ, TWAER
	COSPA	LEDNR, OBJNR, GJAHR, WRTTP, VERSN, KSTAR, HRKFT, VRGNG, VBUND, PARGB, BEKNZ, TWAER
Stat. key fig. - Line items	COVPR	LEDNR, OBJNR, GJAHR, PERIO, WRTTP, VERSN, STAGR, VRGNG, MEINH
Stat. key fig. - Totals records	COSRA	LEDNR, OBJNR, GJAHR, WRTTP, VERSN, STAGR, VRGNG
Funds - Line items	V_COFP	OBJNR, GJAHR, PERIO, WRTTP, VERSN, VRGNG, TWAER
Funds - Totals records	FMSUA	LEDNR, OBJNR, GJAHR, WRTTP, GEBER, POSIT, VORGA, TWAER, BUKRS, GSBER
Planned costs - Totals records	COSSA	Equal to 'Actual costs - Totals records'
	COSPA	
Planned stat. key fig. - Totals records	COSRA	Equal to 'Stat. key fig. - Totals records
Easy Cost Planning	CKF_DIP_C USTOMER_ EXIT	None

Table 8: Available Selection Fields for EXIT_SAPLAD1C_002

Examples:

1. **PROBLEM:** You want to exclude all materials from the selection of source 'Actual costs - Line items' but you do not want to add the material as a relevant characteristic.
   SOLUTION: Add a line to ET_COSEL excluding table records with a material number:

```
DATA Z_COSEL LIKE LINE OF ET_COSEL.
IF I_DLISRC = '0001'
   Z_COSEL-FIELD  = 'MATNR'.
   Z_COSEL-SIGN   = 'E'.
   Z_COSEL-OPTION = 'BT'.
   Z_COSEL-LOW    = '000000000000000000'.
   Z_COSEL-HIGH   = 'ZZZZZZZZZZZZZZZZZZ'.
   APPEND Z_COSEL TO ET_COSEL.
ENDIF.
```

2. **PROBLEM:** You also want to select settled costs for billing.
   SOLUTION: Settled costs are excluded in the standard. Therefore the system always adds lines which exclude them from the selection. The exclusion is done by fields BEKNZ and VRGNG. Therefore, you have to remove all entries in ET_COSEL referring to the exclusion of settled costs. This can be done with the following code:

```
DELETE ET_COSEL
   WHERE FIELD = 'BEKNZ'
         OR ( FIELD = 'VRGNG'
              AND (    LOW = 'KOAO'
                    OR LOW = 'KOAL'
                    OR LOW = 'KOAP'
                    OR LOW = 'KOAM' ) ).
```

4.4.3 Filter or change the selected data (EXIT_SAPLAD15_010)

Table 8 also shows a list of the tables read by the different sources. The data of these tables read by the different sources can be filtered or modified in EXIT_SAPLAD15_010. For each source selection line, the exit is called with the data read by this source selection line. In the exit you can either filter on fields which you cannot access in EXIT_SAPLAD1C_002 or you can even modify the values of the selected data.

Examples:

1. **PROBLEM**: You want to exclude all postings with company code 'ABCD' in source 'Actual costs - Line items'
   SOLUTION: Just add the following lines of code in the exit, excluding the company code, which is not needed.

```
IF I_DLISRC = '0001'.
   DELETE T_COVP
         WHERE BUKRS = 'ABCD'.
ENDIF.
```

2. **PROBLEM:** Your confirmations are done in minutes and hours. The different unit of measures causes the system to create more dynamic items and more items in the debit memo request. You want to have always minutes in the dynamic items.
SOLUTION: Check the selected data for postings with hours. For these lines, convert the quantity to minutes.

```
IF I_DLISRC = '0001'.
  LOOP AT T_COVP
       WHERE MEINB = 'H'.
    T_COVP-MBGBTR = T_COVP-MBGBTR * 60.
    T_COVP-MEINB = 'MIN'.
    MODIFY T_COVP.
  ENDLOOP.
ENDIF.
```

4.5 Defining and Populating Characteristics

4.5.1 Overview

With the definition of own characteristics, you have a powerful tool to enhance the structuring of dynamic items, the creation of sales document items and the pricing. User-defined characteristics can be used with both standard sources and user-defined sources. This chapter describes how they can be used to enhance functions using standard sources.

The most important thing when creating characteristics is that you know if the characteristics are independent or dependent. The exact definition can be found in chapter 3.1.2. Independent characteristics are filled from the source data. Their value should not change when the same data is read again. This is not so much a problem with standard sources but this must be clear if you create your own sources.

Dependent characteristics should be really dependent on one or more independent characteristics. Two dynamic items with equal values for certain characteristics A and B must have also the same values in those characteristics C and D depending on A and B. The value of dependent characteristics should not be changed in the future!

Unlike dependent characteristics, independent characteristics are stored on the database in table AD01DLI, which holds the dynamic items characteristics vector. With this vector, the document flow for resource-related billing is stored. Therefore, it is clear, that independent characteristics should not change suddenly for the same source data. A consequence of this would be that the billed flow can no longer be related to the original source data.

4.5.2 Independent Characteristics (CI_ATTRI2, EXIT_SAPLAD12_003)

To add an independent characteristic, create structure CI_ATTRI2 with fieldname and type. When activating the structure, the system starts changing the database table AD01DLI which includes this structure. After this has happened, you can access the characteristic in the DIP profile although it is not filled yet. For each selected data record and each user defined characteristic, EXIT_SAPLAD12_003 is called. Here you can use the current processed source data record to fill the characteristic.

Example:

PROBLEM: You want to use the company code of your actual costs as a characteristic of the dynamic items.
SOLUTION:

- Create structure CI_ATTRI2 and add the field ZZBUKRS with type BUKRS to the structure. Save and activate the structure. Table AD01DLI will be changed on the database.
- Add the following code to exit EXIT_SAPLAD12_003, filling the characteristic ZZBUKRS:

```
FIELD-SYMBOLS <ZCOVP> LIKE COVP.
CASE I_TABNAME.
  WHEN 'COVP'.
    ASSIGN I_COST_VALUE TO <ZCOVP>.
    CASE I_FIELDNAME.
      WHEN 'ZZBUKRS'.
        E_ATTRI_VALUE = <ZCOVP>-BUKRS.
    ENDCASE.
ENDCASE.
```

4.5.3 Dependent Characteristics (CI_ATTRD, EXIT_SAPLAD12_004)

Creating dependent characteristics is quite similar to independent ones, except that a different exit must be used. To add a dependent characteristic, create structure CI_ATTRD with fieldname and type of your characteristic. This causes no changes on database tables. For filling the characteristic, EXIT_SAPLAD12_004 must be coded. For each source data record, the exit is called once to fill all user-defined dependent characteristics. The exit has as parameters a table with all available fields (IT_FIELDS), a structure with the values of the independent characteristics (I_AD01ATTRI) and an export structure with the dependent characteristics (C_AD01ATTRD).

Example:

PROBLEM: You are billing service orders containing suborders of different order types. You do not want to see a structuring after order number but a structuring after order type. Therefore you need the order type as a dynamic item characteristic.
SOLUTION:

- Create structure CI_ATTRD and add the field ZZAUFART with type AUFART to the structure. Save and activate the structure.
- Add the following code to exit EXIT_SAPLAD12_004, which is filling the characteristic ZZAUART:

```
DATA: BEGIN OF ZT_AUFK OCCURS 0,
        AUFNR LIKE AUFK-AUFNR,
        AUART LIKE AUFK-AUART,
        OBJNR LIKE AUFK-OBJNR,
      END OF ZT_AUFK.
DATA Z_AUFK LIKE LINE OF ZT_AUFK.
DATA Z_AUFNR LIKE AUFK-AUFNR.
FIELD-SYMBOLS <ZFIELD> LIKE LINE OF IT_FIELDS.
LOOP AT IT_FIELDS ASSIGNING <ZFIELD>
      WHERE NOT DER_FIELD IS INITIAL AND" Dependent char.
          NOT SEL_ATTR  IS INITIAL.   " Char. is relevant
  CASE <ZFIELD>-FIELDNAME.
    WHEN 'ZZAUFART'.
      READ TABLE ZT_AUFK
          INTO Z_AUFK
          WITH KEY OBJNR = I_AD01ATTRI-OBJNR.
      IF SY-SUBRC <> 0.
        Z_AUFNR = I_AD01ATTRI-OBJNR+2.
        CLEAR Z_AUFK.
        Z_AUFK-OBJNR = I_AD01ATTRI-OBJNR.
        SELECT SINGLE AUFNR AUART OBJNR
              FROM AUFK
              INTO CORRESPONDING FIELDS OF Z_AUFK
              WHERE AUFNR = Z_AUFNR.
        APPEND Z_AUFK TO ZT_AUFK.
      ENDIF.
      C_AD01ATTRD-ZZAUFART = Z_AUFK-AUART.
  ENDCASE.
ENDLOOP.
```

When selecting master data in such an exit, you MUST buffer the data as shown in this example. Imagine thousands of dynamic items going through this exit. If the master data for every item is selected from the database, you get major performance problems.

4.6 Create User-Defined Sources (EXIT_SAPLAD15_005)

4.6.1 Overview

Designing and coding user-defined sources is the best way to adapt the DIP to a specific business process, although such solution involves the most effort and manpower.

To implement a user-defined source, perform the following steps:

1. Create an entry for your source in table AD01SRC. Use transaction SE16 (Data Browser), enter AD01SRC as the table name and choose *Table -> Create entries*. Your source's name should start with one of the characters X, Y, Z, or 9. The text will appear in the source selection screen of the DIP profile maintenance.

2. Create entries for your source in table AD01SRCTAB. In this table, you can specify the tables to be read by the sources. It is also possible to enter views or DDIC structures as table names. The table is for documentation purposes only. The idea is that, in fact, a source consists of different sub-sources. A sub-source can be used in more than one main source with different selection criteria. Examples in standard are sources 0002 and 0021. Both have the structures COSPA and COSSA as sub-sources. Internally the program sets selection criteria for the value type depending on the source. If source 0002 is used, value type '04' is selected. If source 0021 is used, value type '01' is selected. With this technique, it is possible to create a new source based on old sources just by combining the sub-sources. The table entries of AD01SRCTAB are also a help for other exits like EXIT_SAPLAD12_003 because here you can see which DDIC structure is behind the parameter I_COST_VALUE.

3. The third step is the coding of EXIT_SAPLAD15_005. The exit has various import and export parameters. The original interface, introduced in Release 4.5A, is quite complex to implement. Therefore, a new interface was developed and published in note 216172 (since release 4.70, available in standard). The old interface is still supported and can be used as before. The new interface offers a very simple interface, reducing your implementation effort and speeding up the setup of your business process. The description of the old interface is no longer delivered with this documentation. If you need a description of the old interface, go on the hunt for an older version of this paper. *It's recommend to use the new interface. It is less effort to implement for you and it is less maintenance for me.* Nevertheless, be sure to fill only one interface. The old interface requires the export tables ET_DLIV1 and ET_DLIA to be filled. For the new interface, you have to fill only export table ET_DATA. If you provide values for both, the system will dump.

4.6.2 Implementation of EXIT_SAPLAD15_005

In the exit, you have to select the source, move the values and all available characteristics line by line to the interface table and leave it. It is not necessary to summarize the data or create the dynamic items in the exit. This is all done by the dynamic item processor.

As import parameters, you get the currently processed profile (I_PROFNR), the usage of the profile (I_USAGE), the currently processed source (I_DLISRC), the controlling area (I_KOKRS) and the currency of the controlling area (I_KWAER). The selection criteria of the currently processed source selection line can be found in parameter CT_COSEL. Exit EXIT_SAPLAD1C_002 is not called for user-defined sources. The selection criteria can be evaluated in the exit to speed up database accesses. If your source can evaluate all or part of the

selection criteria, you should delete them from CT_COSEL. All remaining selection criteria are evaluated after the exit. The objects for which the source data has to be read are in parameter table IT_OBJECTS. In this table you can find the CO object number and the object currency.

Your output must go to table ET_DATA. The structure of this table is a combination of all available independent characteristics and the value fields. Move your source data to this table and the rest is done by the dynamic item processor. You do not have to know which characteristics are relevant in the current profile, just fill the table with all characteristics, your source can provide. The DIP will clear all characteristics which are not relevant and summarize the data accordingly to the remaining characteristics. The dependent characteristics are defined afterwards. In the value fields of ET_DATA, you can transfer the amount and the quantity to the dynamic item processor. Field MEGBTR has to be filled with the quantity. The amount in transaction currency has to be moved to field WTGBTR, the amount in object currency has to be moved to field WOGBTR, and the controlling area currency has to be moved to field WKGBTR.

Be aware that, if you use the new interface, the system determines the dependent characteristics. Therefore exit EXIT_SAPLAD12_004 is called after creating dynamic items from the data provided by the exit.

Example:

PROBLEM: You want to read the material components of WBS elements. The quantity should be the required quantity. The amount should be taken from the total price of the component.

SOLUTION: Create a source that reads the components of your objects. The price is converted into object currency and controlling area currency. The quantity is taken from the requirements quantity of the component. The components are stored in database table RESB. Therefore we add an entry to table AD01SRC with source key ZCOM and source text "Components of WBS". In table AD01SRCTAB we add one record for source ZCOM with table name 'RESB'. Next, the following code has to be implemented in the exit module:

```
* Local data
DATA: BEGIN OF ZT_WBS OCCURS 0,      " Table with WBS elements
        PSPNR LIKE PRPS-PSPNR,       " internal WBS number
        OBJNR LIKE AD01OBJ-OBJNR,    " CO object number
        OWAER LIKE AD01OBJ-OWAER,    " object currency
      END OF ZT_WBS.
DATA Z_WBS LIKE LINE OF ZT_WBS.
DATA Z_OBJECT LIKE LINE OF IT_OBJECTS.
DATA ZT_RESB TYPE TABLE OF RESB.      " Components
DATA Z_DATA LIKE LINE OF ET_DATA.
FIELD-SYMBOLS <ZRESB> LIKE LINE OF ZT_RESB.
* Check if table is relevant for the current source
CALL FUNCTION 'AD1C_SOURCE_TABLE_CHECK'
    EXPORTING
        I_TABNAME           = 'RESB'
        I_DLISRC            = I_DLISRC
    EXCEPTIONS
        TABLE_NOT_RELEVANT = 1.
CHECK SY-SUBRC IS INITIAL.
* Collect the relevant objects
LOOP AT IT_OBJECTS INTO Z_OBJECT.
  CHECK Z_OBJECT(2) = 'PR'.        " Process only WBS elements
  Z_WBS-PSPNR = Z_OBJECT-OBJNR+2.
  Z_WBS-OBJNR = Z_OBJECT-OBJNR.
```

```
    Z_WBS-OWAER = Z_OBJECT-OWAER.
    APPEND Z_WBS TO ZT_WBS.
  ENDLOOP.
* Continue only if WBS elements exist
  CHECK NOT ZT_WBS[] IS INITIAL.
* Read components of objects
  SORT ZT_WBS BY PSPNR.
  SELECT *
         FROM RESB
         INTO TABLE ZT_RESB
         FOR ALL ENTRIES IN ZT_WBS
         WHERE PSPEL = ZT_WBS-PSPNR.
  SORT ZT_RESB BY PSPEL.
  LOOP AT ZT_RESB ASSIGNING <ZRESB>.
    CLEAR Z_DATA.
* Get object number for WBS element of component
    IF <ZRESB>-PSPEL <> ZT_WBS-PSPNR.
      READ TABLE ZT_WBS INTO Z_WBS
           WITH KEY PSPNR = <ZRESB>-PSPEL
           BINARY SEARCH.
    ENDIF.
* Fill characteristics
    Z_DATA-KSTAR = <ZRESB>-SAKNR.    " Cost element
    Z_DATA-MATNR = <ZRESB>-MATNR.    " Material number
    Z_DATA-MEINH = <ZRESB>-MEINS.    " Unit of measure
    Z_DATA-OBJNR = Z_WBS-OBJNR.      " Object number
    Z_DATA-TWAER = <ZRESB>-WAERS.    " Transaction currency
    Z_DATA-WERKS = <ZRESB>-WERKS.    " Plant
    Z_DATA-WRTTP = '01'.             " Value type 01 = Planned
* ...                               " Any other (ind.) char.
* Fill values
* Quantity
    IF NOT Z_DATA-MEINH IS INITIAL.
      Z_DATA-MEGBTR = <ZRESB>-BDMNG.
    ENDIF.
* Amount
* - Transaction currency
    IF NOT Z_DATA-TWAER IS INITIAL.
      Z_DATA-WTGBTR = <ZRESB>-GPREIS * <ZRESB>-BDMNG
                    / <ZRESBY-PEINH.
    ENDIF.
* - Object currency
    IF Z_DATA-WTGBTR <> 0.
      IF Z_DATA-TWAER <> Z_WBS-OWAER.
        CALL FUNCTION 'CONVERT_TO_LOCAL_CURRENCY'
             EXPORTING
                DATE             = <ZRESB>-BDTER
                FOREIGN_AMOUNT   = Z_DATA-WTGBTR
                FOREIGN_CURRENCY = Z_DATA-TWAER
                LOCAL_CURRENCY   = Z_WBS-OWAER
                TYPE_OF_RATE     = 'P'
             IMPORTING
                LOCAL_AMOUNT     = Z_DATA-WOGBTR
             EXCEPTIONS
```

```
                    NO_RATE_FOUND     = 1.
          IF SY-SUBRC <> 0.
            MESSAGE ID SY-MSGID TYPE SY-MSGTY NUMBER SY-MSGNO
                    WITH SY-MSGV1 SY-MSGV2 SY-MSGV3 SY-MSGV4.
          ENDIF.
        ELSE.
          Z_DATA-WOGBTR = Z_DATA-WTGBTR.
        ENDIF.
      ENDIF.
*  - Controlling area currency
    IF Z_DATA-WTGBTR <> 0.
      IF Z_DATA-TWAER <> I_KWAER.
        CALL FUNCTION 'CONVERT_TO_LOCAL_CURRENCY'
             EXPORTING
                  DATE              = <ZRESB>-BDTER
                  FOREIGN_AMOUNT    = Z_DATA-WTGBTR
                  FOREIGN_CURRENCY  = Z_DATA-TWAER
                  LOCAL_CURRENCY    = I_KWAER
                  TYPE_OF_RATE      = 'P'
             IMPORTING
                  LOCAL_AMOUNT      = Z_DATA-WKGBTR
             EXCEPTIONS
                  NO_RATE_FOUND     = 1.
        IF SY-SUBRC <> 0.
          MESSAGE ID SY-MSGID TYPE SY-MSGTY NUMBER SY-MSGNO
                  WITH SY-MSGV1 SY-MSGV2 SY-MSGV3 SY-MSGV4.
        ENDIF.
      ELSE.
        Z_DATA-WKGBTR = Z_DATA-WTGBTR.
      ENDIF.
    ENDIF.
*  Append values in export table
    APPEND Z_DATA TO ET_DATA.
  ENDLOOP.
```

The example should work as shown here, although it has some disadvantages. First, there is no buffering of the selected data. If you have more than one source selection line in your profile for this source, the exit is called more than once for the same objects. As there is also no evaluation of selection criteria, the same data would be read more than once. A good buffering logic would be very useful here, but is obviously much more work. The second problem of this coding is the selection of RESB without the primary key or an index. To improve the performance, an index on table RESB for field PSPEL could be created. Much better would be the using of table RSPSP. This is an index table for the components (and reservations) for WBS elements.

4.7 Change Processing information (EXIT_SAPLAD15_015)

Each dynamic item has its characteristic vector and values, called the processing information. The processing information holds data like the input object, the material from material determination or the default percentage from the source selection line. Parts of the processing information can be changed in EXIT_SAPLAD15_015. For example, it is possible to do your own material determination logic in the exit. An overview of the changeable and unchangeable characteristics is shown in Table 9.

	Parameter	Meaning
Changeable processing information	DEFPERCENT	Default percentage
	AUMOT	Apportionment reason
	INV_MAT	Material from material determination
	INV_SINGLE	Sign: Create sales document item for each dyn. Item
	INV_QUANT	Sign: Use quantity of dyn. Item in sales document item
	FLMEH	Sign: Convert to sales unit
Unchangeable processing information	DLINR	Dynamic item key
	DLISRC	Source of dynamic item
	VBELN	Input object: Sales document
	VBPOS	Input object: Sales document item
	AUFNR	Input object: Service order
	PSPNR	Input object: WBS element
	PRONR	Input object: Project definition
	PROFNR	Dynamic item processor profile
	FAKTF	Billing form
	OBJNR	Input object: CO object number
	OBJNR_PD	Input object: CO object number of project definition
	TIMESTMP	Timestamp of dynamic item

Table 9: Processing Information of Dynamic Items for EXIT_SAPLAD15_015

The processing information is in parameter C_DLIM. Some additional information is also provided by the exit to be used as a basis to change the processing information. Parameter I_USAGE gives the current usage of the DIP. I_DLIA contains the characteristics of the dynamic item. In parameter I_DLIV1, the source values are stored. In parameter I_DLIV2, the total flow of billed and rejected values can be found. The billed values are in fields IN_XXXBTR, the rejected values are in fields NO_XXXBTR. The other fields of this structure are not used.

Example:

PROBLEM: Generally, you want to summarize all dynamic items of small parts in one debit memo request item with material SMALL-PARTS and without any quantity. Therefore you set-up the material determination so that for all costs of small parts this material is found and the sign to use the quantity is switched off. But if the open costs exceed 10 euros in controlling area currency, you want to show a separate line in your debit memo request with the quantity and the original material number.

SOLUTION: First you have to make sure that the material is a relevant characteristic of your dynamic items, because you want to use the original material. Next the exit has to check if the open values exceeds the limit and sets the processing information accordingly. The code looks like this:

```
      DATA Z_OPEN LIKE I_DLIV1-WKGBTR.
      IF C_DLIM-INV_MAT = 'SMALL-PARTS'.
        Z_OPEN = I_DLIV1-WKGBTR          " TOTAL COSTS
                 - I_DLIV2-IN_WKGBTR     " SUBTRACT BILLED COSTS
                 - I_DLIV2-NO_WKGBTR.    " SUBTRACT REJECTED COSTS
        Z_OPEN = ABS( Z_OPEN ).
        IF Z_OPEN > 10.
          C_DLIM-INV_MAT = I_DLIA-MATNR.
          C_DLIM-INV_SINGLE = 'X'.
          C_DLIM-INV_QUANT = 'X'.
        ENDIF.
      ENDIF.
```

Note that a single sales document item is now created for all changed dynamic items , even if they have now equal values in C_DLIM-INV_MAT. If you also want to summarize using this new material number, you should not set C_DLIM-INV_SINGLE.

4.8 Change Texts of Dynamic Item Structuring (EXIT_SAPLAD13_001)

The texts displayed in the dynamic item overview screen are taken from different master data. Text of the structure nodes are taken from either sets or single values master data if known by the DIP. Texts of dynamic items are taken from the material which was determined for the dynamic item.

Especially when adding user-defined characteristics and using structuring after single values, the system does not know where to get the text for the single values. Therefore, the system places the value itself as text. EXIT_SAPLAD13_001 lets you change texts both of nodes and dynamic items. Changing the text of a dynamic item also causes the texts in the sales price view to change. When creating the structure for the sales price view, the system takes the text of the dynamic item, the sales document item is based on. In fact it takes the text of the first dynamic item belonging to the sales document item.

The following rules should be followed:

- When the texts of dynamic items are being changed, all dynamic items which are later summarized to the same sales document item should get the same new text. The summarization is mainly based on the determined material and the characteristics with sign 'No summarization'.

- Texts of objects cannot be modified. Often they have longer names than the structures provide by the exit. Texts of objects are read after the exit.

- The texts changed here are not copied to the later created sales document items. The texts are only used in overview screen.

In the exit, parameter C_RSTTXT can be changed to your texts. Only the fields TEXT20 and TEXT40 are displayed on screen and can be changed. Field SPRAS contains the language key. The ID and TEXT10 fields are only used internally. Parameter I_RSTHIE contains the node information. Here the TYPE field is important. It contains the type of the hierarchy node. A dynamic item has type 'DLI', a set has type 'SET' and single value nodes have different number depending on the field. Single value nodes of user defined fields have '0000' as type. A complete list of the node types can be found in Table 10. Node types for objects are not displayed as their names should not be changed. For all dynamic items, the exit provides the additional parameters

I_DLIA with the dynamic item characteristics and I_DLIM with the dynamic item processing information.

Example:

PROBLEM: You are billing working hours of employees. For each employee the hours are summarized in one sales document item. To achieve this, the 'No summarization' indicator is set for the personal number characteristic . As the employees change often, you bill the working hours by one material found by material determination. In the dynamic item structure view, you can use a structuring by the personnel number single values to get an overview of the working hours per employee. In the sales price view, the text of the material is displayed. You want to see here the personal number, too.

SOLUTION: Change the texts of dynamic items to the personal name and personal number. The code can look as follows:

```
DATA L_NAME LIKE BAS_CHECK_PERNR-NAME.
IF I_RSTHIE-TYPE = 'DLI'.
  IF NOT I_DLIA-PERNR IS INITIAL.
    WRITE I_DLIA-PERNR TO C_RSTTXT-TEXT20.
    CALL FUNCTION 'RP_CHECK_PERNR'
         EXPORTING
              BEG    = SY-DATLO
              PNR    = I_DLIA-PERNR
         IMPORTING
              NAME   = L_NAME
         EXCEPTIONS
              OTHERS = 1.
    IF SY-SUBRC <> 0.
      C_RSTTXT-TEXT40 = C_RSTTXT-TEXT20.
    ELSE.
      C_RSTTXT-TEXT40 = L_NAME.
    ENDIF.
  ENDIF.
ENDIF.
```

Type	Field	Description
0101	KOSTL	Cost center
0102	KSTAR	Cost element
0104	STAGR	Statistical key figure
0105	LSTAR	Activity type
0107	PRZNR	Business process
0109	PERNR	Personal number
0110	MEINH	Unit of measure
0112	TWAER	Transaction currency
0113	MATNR	Material number
0114	FIPOS	Commitment item
0115	WRTTP	Value type
0116	WERKS	Plant
0117	BEMOT	Accounting indicator
0118	ARBPL	Work center
0119	AWERK	Plant of work center
0120	ASNUM	Activity number
0121	OBART	Object type
0122	VERSN	CO version
0130	POPER	Posting period
DLI		Dynamic item
SET		Set

Table 10: Node Types of Structuring

4.9 Change Data in Sales Document Items

It is often necessary to change sales document item data before the item is created or to move additional data from dynamic items to sales document items - for example, if you want to move the personnel number to a partner role of the sales document item. Remember that characteristics are only copied to the sales document item where the "No summarization" indicator is set.

4.9.1 Change Item Data

With the first exit you can modify the sales document item data before the item is created. EXIT_SAPLV46H_001 offers two import parameters and 1 changing parameter. In I_VBAKKOM you can find the sales document header information. In parameter I_SDSM_DLI the information of the dynamic item is stored. This is not the information from the dynamic item, but the condensed information of all dynamic items summarized to this sales document item. Here you can also find the value of the dynamic item characteristics if they could be copied to the sales document item. Finally, in parameter C_VBAPKOM the communication data for the creation of sales document items is stored. All possible data from I_SDSM_DLI is already moved to C_VBAPKOM if the fieldnames are equal. If you want to modify existing fields or move additional fields (such as user-defined characteristics) to C_VBAPKOM, you can do it here.

Example:

1. **PROBLEM:** You want to have use your own characteristic ZZAUFART in structure C_VBAPKOM.

SOLUTION: Add the field ZZAUFART to structure VBAPKOZ. Additionally add the following coding in EXIT_SAPLV46H_001:

```
C_VBAPKOM-ZZAUFART = I_SDSM_DLI-ZZAUFART.
```

1. **PROBLEM:** You have entered a manual discount condition ZDIS in the sales order item. The discount should be used for all items in debit memo requests created by resource related billing. In standard, the system does not copy the conditions from the predecessor document to the debit memo request.
   SOLUTION: Parameter C_VBAPKOM has fields KSCHLX, KBETRX, KWAERX, KPEINX, KMEINX (where X goes from 1 to 4) for adding conditions to the sales document items. To solve the problem, the conditions from the predecessor have to be read and added to parameter C_VBAPKOM. Add the following coding in EXIT_SAPLV46H_001:

```
CONSTANTS LC_KSCHL LIKE KONV-KSCHL
          VALUE 'ZDIS'.
STATICS L_VBAK LIKE VBAK.
STATICS L_KONV LIKE KONV.
IF L_VBAK-VBELN <> C_VBAPKOM-VGBEL.
  CLEAR L_VBAK.
* Read the predecessor header
  SELECT SINGLE VBELN KNUMV
         FROM VBAK
         INTO CORRESPONDING FIELDS OF L_VBAK
         WHERE VBELN = C_VBAPKOM-VGBEL.
ENDIF.
IF L_KONV-KNUMV <> L_VBAK-KNUMV
   OR L_KONV-KPOSN <> C_VBAPKOM-VGPOS.
  CLEAR L_KONV.
* Read condition LC_KSCHL from predecessor
  SELECT SINGLE KNUMV KPOSN KSCHL KBETR KWAER KPEIN KMEIN
         FROM KONV
         INTO CORRESPONDING FIELDS OF L_KONV
         WHERE     KNUMV = L_VBAK-KNUMV
               AND KSCHL = LC_KSCHL
               AND KPOSN = C_VBAPKOM-VGPOS.
ENDIF.
IF NOT L_KONV-KSCHL IS INITIAL.
* Fill condition
  C_VBAPKOM-KSCHL4 = L_KONV-KSCHL.
  C_VBAPKOM-KBETR4 = L_KONV-KBETR.
  C_VBAPKOM-KWAER4 = L_KONV-WAERS.
ENDIF.
```

This solution has some limitations. First of all, you can copy only up to three conditions from the predecessor. C_VBAPKOM-KSCHL1 is reserved for the cost condition. In Release 4.5, the other three conditions are used by the manual conditions of the DIP. So if you have defined three manual conditions and the cost condition, you have nothing left to add the conditions of the predecessor.

The above solution is working fine for percentage discounts or surcharges. It's not so easy to use it for other conditions because RRB creates new items with probably different unit of measures coming from the dynamic item sources. So you need to think more deeply about the solution.

4.9.2 Add Partners

For a modification of the partner roles of a sales document item, you can use EXIT_SAPLV46H_002. Here you can add, delete, or change the partners. Here, you have once again the parameters I_VBAKKOM and I_SDSM_DLI with the same meaning as in EXIT_SAPLV46H_001. Additionally the import parameter I_VBAPKOM is provided with the information after the creation of the sales document item. The partner roles can be found in parameter XVBPAKOM.

Example:

PROBLEM: You bill labor hours and you want to have the personal number of the employee who has done this labor in the partner roles of sales document item.

SOLUTION: Create a partner role ZP for the employee and implement the following coding:

```
IF NOT I_SDSM_DLI-PERNR IS INITIAL.
  CLEAR XVBPAKOM.
  XVBPAKOM-POSNR = I_VBAPKOM-POSNR.
  XVBPAKOM-PARVW = 'ZP'.
  XVBPAKOM-PERNR = I_SDSM_DLI-PERNR.
  APPEND XVBPAKOM.
ENDIF.
```

4.9.3 Change Pricing Data

If it is not enough to have your characteristic in the sales document item, you can also forward it to the pricing if you have maintained conditions based on dynamic items characteristics. You can move fields from the sales document to the pricing communication structure in USEREXIT_PRICING_PREPARE_TKOMP and USEREXIT_PRICING_PREPARE_TKOMK which can both be found in Include MV45AFZZ. Pricing structure KOMK contains the header fields, structure KOMP contains the item fields.

Example:

PROBLEM: You want to use the personal number in pricing.

SOLUTION: The field PERNR exists already in structure KOMP. Therefore, you have only to define access sequences and condition tables containing PERNR. Add the following code to USEREXIT_PRICING_PREPARE_TKOMP:

```
READ TABLE XVBPA
          WITH KEY POSNR = VBAP-POSNR
                   PARVW = 'ZP'.
IF SY-SUBRC = 0.
  TKOMP-PERNR = XVBPA-PERNR.
ENDIF.
```

4.10 Other Exits in SD

There are a lot of other exits in SD. To explain them all exceeds the scope of this paper. One problem which often occurs is to save your additional characteristics with the sales document. For the personnel number, it is quite easy, because it can be stored with the partner roles. If you have other characteristics which cannot be moved to SAP standard fields, you have to save them in your own tables. This can be done in the exits for reading, saving and deleting of sales documents.

Example:

PROBLEM: You want to store the value of field ZZAUFART together with the sales document item.

SOLUTION: First you have to create a table containing at least the fields MANDT, VBELN, POSNR and ZZAURT. The first three fields must be similar to table VBAP and are the key of your table ZZVBAPADD. Create also two function modules for loading and saving this table. The last one has to be an update function module. In USEREXIT_READ_DOCUMENT, you have to call your read module to get the additional data. In USEREXIT_SAVE_DOCUMENT the data has to be saved using your update module. Finally USEREXIT_DELETE_DOCUMENT must be used to remove your additional data if the sales document is deleted.

4.11 Menu Exit (EXIT_SAPLAD14_006, EXIT_SAPLAD14_008)

There is often the need to perform special operations on the data currently being processed or to start additional tasks out of the dialog. For example, you want to set all items to bill later if the open amount is smaller than 10 euros.

Such functions can be performed by the menu exit which is called from the dynamic item structure overview screen. The exit can be accessed by the user under menu 'Edit'. To activate the exit, you have to set first a name for the menu item by EXIT_SAPLAD14_008. This is easily done by giving a text string to export parameter I_MENU_TEXT.

If the user selects the menu item, EXIT_SAPLAD14_006 is called. The exit provides several information. Parameter I_MODE offers some general information about the current input state on screen (see Table 11). From parameter table IT_MARK only the fields ID (node number) and MARK are used, indicating that the user has marked a node or item on screen. The node or item has to be marked in the table control and not in the hierarchy tree. Parameter IT_RSTHIE contains the hierarchy structure with ID, TYPE and NAME. The ID is the same as in EXIT_SAPLAD13_001. The name is the name displayed on the screen and depends, therefore, on the actual user settings.

Field	Meaning	Values
SHODLI	Not used	Always X
HANDLE	Type of displayed data	A: Amount Q: Quantity P: Percentages
FAKTUR	Current entry columns	1: Billing 2: Postpone 3: Reject
CURR	Current displayed currency	T: Transaction currency O: Object currency K: Controlling area currency

Table 11: Parameter I_MODE of EXIT_SAPLAD14_006

Field	Meaning	Changeable ?
ID	Node number	
DYNP2-WAERS	Currency of amount values	
DYNP2-MEINH	Unit of measure of quantities	
DYNP2-RV_WAERS	Currency of revenues	
DYNP2-BEMOT	Accounting indicator	YES
DYNP2-AUMOT	Apportionment reason	
DYNP2-PRODO	Not used	
DYNP3-WXGSRC	Amount from source	
DYNP3-WXGINV	Amount invoiced	
DYNP3-WXGNYI	Amount open	
DYNP3-WXGNOW	Amount to bill	YES
DYNP3-WXGLAT	Amount to postpone	YES
DYNP3-WXGNOT	Amount to reject	YES
DYNP4-MEGSRC	Quantity from source	
DYNP4-MEGINV	Quantity invoiced	
DYNP4-MEGNYI	Quantity open	
DYNP4-MEGNOT	Quantity to bill	YES
DYNP4-MEGNOW	Quantity to postpone	YES
DYNP4-MEGLAT	Quantity to reject	YES
DYNP5-RATNOW	Percentage to bill	YES
DYNP5-RATNOT	Percentage to postpone	YES
DYNP5-RATLAT	Percentage to reject	YES
DYNP6-WXGRV1	Revenue of node	
DYNP6-WXGRV2 DYNP6-WXGRV3 DYNP6-WXGRV4 DYNP6-WXGRM1 DYNP6-WXGRM2 DYNP6-WXGRM3	Not used	
DYNP6-RATNOW_C	Percentage to bill	
DYNP6-RATNOT_C	Percentage to postpone	
DYNP6-RATLAT_C	Percentage to reject	
DYNP6-WXGBAS	Amount basis for percentages	
DYNP6-MEGBAS	Quantity basis for percentages	
FLGDLI	Sign: Node is dynamic item	

Table 12 :Parameter ET_VALUES of EXIT_SAPLAD14_006

Parameter ET_VALUES contains the nodes' values. An overview of the fields' meaning is shown in Table 12, where you can also find the changeable fields of this table. Although you can change 'bill', 'reject' and 'postpone' value of the amount, quantity and percentages, the following rules have to be observed:

- The system checks the changes in the following order: percentages, controlling area currency, quantity, transaction currency, object currency. The first changed value overwrites the others.

- The sum of 'bill', 'postpone' and 'reject' is always equal to the open value. So if the sum is not equal, the reject column gets the difference between the open value and the sum of the bill and postpone value.

- The accounting indicator can be changed together with the values.

Example:

PROBLEM: You want to give the user the possibility to postpone all dynamic items with an open amount less than 10 euros.

SOLUTION: Set the open value of the dynamic items to the postpone column.

```
FIELD-SYMBOLS <VALUE> LIKE LINE OF ET_VALUES.
LOOP AT ET_VALUES
        ASSIGNING <VALUE>
        WHERE DYNP3-WXGNYI < 10.
   <VALUE>-DYNP3-WXGNOW = 0.
   <VALUE>-DYNP3-WXGLAT = <VALUE>-DYNP3-WXGNYI.
   <VALUE>-DYNP3-WXGNOT = 0.
   <VALUE>-DYNP4-MEGNOW = 0.
   <VALUE>-DYNP4-MEGLAT = <VALUE>-DYNP4-MEGNYI.
   <VALUE>-DYNP4-MEGNOT = 0.
   <VALUE>-DYNP5-RATNOW = 0.
   <VALUE>-DYNP5-RATLAT = 100.
   <VALUE>-DYNP5-RATNOT = 0.
ENDLOOP.
```

4.12 Exits for Results Analysis

For documentation of the exits in results analysis, see OSS notes 191546 and 189716.

4.13 Delete Messages in Collective Processing List (BAdI AD01_RRB_COLLECTIVE1)

There is often the need to reduce the number of messages shown in the message list and result list in collective processing (DP95, DP96, DP97). E.g. messages with ID VPK1 310, AD01 261 and AD01 263 as well as AD01 243 shouldn't be shown in both lists. The BAdI-implementation could be look as follows:

```
METHOD fill_additional_fields.

  DATA: l_error_list LIKE LINE OF ct_error_list,
        l_collective_result LIKE LINE OF ct_collective_result,
        l_tabix LIKE sy-tabix.

  LOOP AT ct_error_list INTO l_error_list.

    IF ( l_error_list-arbgb = 'AD01' AND
    ( l_error_list-txtnr = '261' OR l_error_list-txtnr = '263' ) )
    OR l_error_list-arbgb = 'VPK1' AND l_error_list-txtnr = '310'
    OR l_error_list-arbgb = 'AD01' AND l_error_list-txtnr = '243'.
      DELETE ct_error_list.
      l_tabix = sy-tabix - 1.
      DELETE ct_error_list INDEX l_tabix.
    ENDIF.

  ENDLOOP.

  LOOP AT ct_collective_result INTO l_collective_result.
    IF l_collective_result-st_text = 'Item Could Not Be Processed'
    OR l_collective_result-st_text = 'Items Cannot Be Processed'
    OR l_collective_result-st_text = 'No relevant items exist'
    OR l_collective_result-st_text = 'No expenditure items found'.
```

```
            DELETE ct_collective_result.
        ENDIF.
    ENDLOOP.

ENDMETHOD.
```

4.14 Creating "Solutions" with Customer Exits

A collection of customer enhancements were provided to adjust the DIP to your needs. The exits itself should help to solve a lot of problems. But sometimes it's necessary to combine the exits for a certain business process. In this chapter, solutions are described for the most common problems, which are not covered by our standard delivery. Most of them are based on questions customers and consultants send to SAP via OSS or mail. We want to say thank you for giving us a closer look to the problems out in the world.

4.14.1 Use of service operation and short text in the debit memo request

Resource related billing is a quite usual process to bill service orders. These orders are structured by service operations and material components. For the last, it's quite easy to have them listed in the billing, because the material number is updated to the actual costs source and it's also a standard characteristic of the DIP. The bigger problem in billing service orders is the display of the service operations in the invoice. The order confirmation is done on operations' level, but it's not obviously visible in the costs source. You can find there a lot of CO and FI stuff, but the confirmation is encrypted in some of those strange fields. In this chapter, we implement a solution to bring the service operations' text into the short text of the debit memo request item.

First of all, we have to know about the link from the CO line item to the service operation. If a confirmation is posted, the confirmation number and counter can be found in COVP-REFBN and COVP-AWORG. With this information we can read the confirmation from table AFRU and find there the routing number (AFRU-AUFPL) and the general order counter (AFRU-APLZL). This leads us straight to the service operations in table AFVC where the operation number (AFVC-VORNR) and short text (AFVC-LTXA1) is stored. Now, you may have the intention to implement the operation number and the short text as independent characteristics. But this can lead into trouble, if these values are changed in the service order after they are billed. The system would create different dynamic items and the previously billed values have no connection to the source costs any longer.

Therefore, we use a different approach with a solution based on both independent and dependent characteristics.

1. First, we define two independent characteristics ZZAUFPL (type CO_AUFPL) and ZZAPLZL (type CO_APLZL) and fill them in EXIT_SAPLAD12_003.

```
STATICS Z_AFRU TYPE AFRU.
FIELD-SYMBOLS <ZCOVP> TYPE COVP.
CASE I_TABNAME.
  WHEN 'COVP'.
    ASSIGN I_COST_VALUE TO <ZCOVP>.
    CASE I_FIELDNAME.
```

```
          WHEN 'ZZAUFPL' OR 'ZZAPLZL'.
             IF Z_AFRU-RUECK <> <ZCOVP>-REFBN
               OR Z_AFRU-RMZHL <> <ZCOVP>-AWORG.
               CLEAR Z_AFRU.
               SELECT RUECK RMZHL AUFPL APLZL
                 FROM AFRU
                 INTO CORRESPONDING FIELDS OF Z_AFRU
                 WHERE RUECK = <ZCOVP>-REFBN
                   AND RMZHL = <ZCOVP>-AWORG.
                ENDSELECT.
             ENDIF.
             CASE I_FIELDNAME.
               WHEN 'ZZAUFPL'.
                  E_ATTRI_VALUE = Z_AFRU-AUFPL.
               WHEN 'ZZAPLZL'.
                  E_ATTRI_VALUE = Z_AFRU-APLZL.
             ENDCASE.
          ENDCASE.
    ENDCASE.
```

2. Second, we define two dependent characteristics ZZVORNR (type VORNR) and ZZVORTX (type LTXA1) and fill them in EXIT_SAPLAD12_004. These two CHARACTERISTICS DEPEND ON ZZAUFPL AND ZZAPLZL.

```
    STATICS Z_AFVC TYPE AFVC.
    FIELD-SYMBOLS <ZFIELD> TYPE AD01FIELDS.
    LOOP AT IT_FIELDS ASSIGNING <ZFIELD>
        WHERE NOT DER_FIELD IS INITIAL AND" DEPENDENT CHAR.
            NOT CHAR_REL  IS INITIAL.  " CHAR. IS RELEVANT
      CASE <ZFIELD>-FIELDNAME.
        WHEN 'ZZVORNR' OR 'ZZVORTX'.
           CHECK    NOT I_AD01ATTRI-ZZAUFPL IS INITIAL
                AND NOT I_AD01ATTRI-ZZAPLZL IS INITIAL.
           IF   Z_AFVC-AUFPL <> I_AD01ATTRI-ZZAUFPL
             OR Z_AFVC-APLZL <> I_AD01ATTRI-ZZAPLZL.
              SELECT AUFPL APLZL VORNR LTXA1
                FROM AFVC
                INTO CORRESPONDING FIELDS OF Z_AFVC
                WHERE AUFPL = I_AD01ATTRI-ZZAUFPL
                  AND APLZL = I_AD01ATTRI-ZZAPLZL.
               ENDSELECT.
           ENDIF.
           CASE <ZFIELD>-FIELDNAME.
             WHEN 'ZZVORNR'.
               C_AD01ATTRD-ZZVORNR = Z_AFVC-VORNR.
             WHEN 'ZZVORTX'.
               C_AD01ATTRD-ZZVORTX = Z_AFVC-LTXA1.
           ENDCASE.
      ENDCASE.
    ENDLOOP.
```

3. Third, we have to bring the operation number and text into the short text of the debit memo request item. For this, sign No summarization' must be set in the DIP profile for characteristics ZZVORNR and ZZVORTX and the following code must be added to EXIT_SAPLV46H_001:

```
IF    NOT C_VBAPKOM-ZZVORNR IS INITIAL
   OR NOT C_VBAPKOM-ZZVORTX IS INITIAL.
   CONCATENATE C_VBAPKOM-ZZVORNR C_VBAPKOM-ZZVORTX
               INTO C_VBAPKOM-ARKTX
               SEPARATED BY SPACE.
ENDIF.
```

4. Fourth, we want to see the operation number and text also in the sales price view and in each dynamic item instead of the material master short text. This can be achieved by coding EXIT_SAPLAD13_001:

```
IF    NOT I_DLIA-ZZVORNR IS INITIAL
   OR NOT I_DLIA-ZZVORTX IS INITIAL.
   CONCATENATE I_DLIA-ZZVORNR I_DLIA-ZZVORTX
               INTO C_RSTTXT-TEXT40
               SEPARATED BY SPACE.
ENDIF.
```

You may have noticed that in this example, some data read from database tables is buffered in static variables to reduce database and network load while running the transaction. This buffering is sufficient for smaller service orders with few operations and confirmations. If you have bigger service orders with lots of operations and confirmations, you should think about implementing internal buffer tables for the AFVC and AFRU entries. These global buffer tables should be defined in separate function groups, so they can be accessed by the different exits by calling function modules. This allows also an implementation without using dependent characteristics for the operation number and text. The texts in EXIT_SAPLAD13_001 and EXIT_SAPLV46H_001 are then filled directly by the buffered operation data and not by the characteristics ZZVORNR and ZZVORTX.

5 Differences between Releases

The dynamic item processor was first shipped in R/3 with Release 4.5. Of course, there have been further developments after release 4.5B. This paper describes the state of the DIP in Release 4.6C. In the following, you can find an overview of the changes since R/3 Release 4.5.

5.1 New Functions in 4.7

- Document Flow Evaluations for Order
  As of SAP R/3 Enterprise Core 4.70 (SAP_APPL 470) you can evaluate the document flow of billed resources/expenses for a customer order, service order, contract, or project using a new program. The program displays the billed, rejected, and open resources/expenses in a structure overview similar to the expenditure view in resource-related billing. You can change the structure interactively. The billing requests are listed in detail for each resource item. You can navigate to the billing request directly from the result overview. Many other functions, such as filtering, enable you to make a flexible evaluation. You evaluate the document flow using the transactions DP99A, DP99B and DP99C. These transactions differ only in their selection options.

- Document Flow Evaluation for Billing Request
  As of SAP R/3 Enterprise Core 4.70 (SAP_APPL 470) you can display expenditures billed using the document flow from a debit memo request or a credit memo request. When you use the transaction DP98, you receive a corresponding list with all billed resource items for the billing request. You have to enter the debit memo request and credit memo request number respectively, in the selection screen.

- Performance Improvement Results Analysis Using Dynamic Items
  As of SAP R/3 Enterprise Core 4.70 (SAP_APPL 470) additional data is updated in the document flow of resource-related billing, which are evaluated in the results analysis methods 14 and 15 (results analysis methods based on dynamic items). The additional database fields significantly improve the performance of these results analysis methods, because results analysis must no longer evaluate the document flow of sales and distribution documents (SD documents) to determine the posting date of the revenues assigned to billed expenditures.
  The enhanced function is active for newly created billing documents only. For existing document flow entries, you can adjust the old document flow entries for the new logic with the program RDPRAFKDAT, thereby improving performance in period-end closing. You do not need to make any other settings to activate this function.

- New Business Add – Ins (BAdIs)
  Further details see chapter 4.3

- Improved Control Options for Transferring Quantity and Costs
  Further details see chapter 3.1.4

- Increase of Material Determination Lines per DIP Profile
  Further details see chapter 3.1.4

- New Analysis Program for DIP Profile
  Further details see chapter 3.1.7

- Creating Quotation from the Project Builder
  Further details see chapter 2.1.4.2

- Archiving CO Line Items
  Further details see chapter 2.5

- Enhancement Collective Processing for Resource-Related Billing
  Further details see chapter 6

- Resource-Related Down Payments and Billing Plan
  Further details see chapter 2.1.5

- Initial Screen of RRB
  Further details see chapter 2.3

5.2 New Functions in 4.6C

- New and enhanced business processes

  - Pricing for Projects is now integrated in Project Builder, based on new source 'Easy Cost Planning'. Now it is possible to create pricings without an operative project.

  - Pricing for Projects based on an inquiry can be based on 'Easy Cost Planning'.

  - Existing pricings or saved data of resource-related billing can be refreshed from sources keeping all manual changes.

- New functions in the user interface

  - In sales price view, you have now the same possibility to change the values postponed, rejected, or to be billed . You can see here the dynamic items the sales document items (pricing items) are based on.

  - The hierarchy change in sales price basis is now possible for all relevant characteristics of the dynamic item profile. Therefore you can add or remove characteristics from structuring.

- New functions in customizing
  - With sign 'DI w/ Material' (DIP profile, view 'Usage'). it is now possible to have the system remove all dynamic items where material determination failed.

  - There are several new characteristics delivered: Personal Number, Activity Number, Business Process, Work Center, Plant of Work Center,

  - With sign 'Conversion quantity' (DIP profile, view 'Material determination'), It is now possible to convert automatically in the sales document item the quantity of the dynamic item into sales unit or the base unit of the determined material.

  - You can now enter single values in the material determination criteria.

  - Where ever you can enter a set in customizing, you are now able to jump directly to the set maintenance tool for creating, changing or viewing a set.

  - Source 'Easy Cost Planning for WBS elements was added.

  The navigation in DIP profile was enhanced. You see now all the time which profile or line you are viewing or changing.

- New customer enhancements

  - Enhancement AD010007 was added with exit EXIT_SAPLAD15_015. It can be used to change the DI processing information (i.e. the material determination).

  - Exit EXIT_SAPLAD13_001 was added to enhancement AD010001. It can be used to change the texts of dynamic item structuring.

5.3 New Functions in 4.6A/B

- New and enhanced business processes

    – The pricings of projects or service orders are now stored in their own database tables. Therefore, it's now possible to create more than one pricing per object.

    – The pricing is now better integrated. Prices are updated immediately if the user changes any on screen.

    – Pricing for Projects allows you to create or update billing plans of your project by using the calculated sales price from pricing.

    – It is now possible to perform Pricing for Projects with simulations.

    – In pricing or resource-related billing, you can now enter a price date.

    – The logic of the 'From period' in resource-related billing was changed letting you define a real interval.

    – Costs rejected earlier are no longer displayed if you are rerunning resource-related billing. The rejected costs can be reopened online.

- New functions in user interface

    – The user interface was completely redesigned. There are now two different views on your pricing.

    – The sales price basis view (similar to the overview screen in Release 4.5) displays the structure of your resources. The input mode (i.e. amount quantity or percentage) is now directly accessible on screen. There is now a navigation tree for the structure.

    – The sales price view displays the structure of the later created sales documents. In this view you access the pricing procedure and adjust the conditions.

    – To achieve better handling, transactions DP80 and DP90 were split into DP80, DP81, DP90, and DP91:

    – DP80: Create quotation for service order.

    – DP81: Pricing for Projects

    – DP90: Resource-related billing for service order and sales documents

    – DP91: Resource-related billing for sales documents

    – The new entry screens are enhanced for better navigation. You can now create a sales document immediately without entering the overview screen. Most of the settings are accessible on the entry screen.

    – In DP81, the user can now enter a project definition or a WBS element. The retrieval of the sales documents is done by the system.

- New functions in customizing

    – As there is no possibility (and need) to enter manual conditions on dynamic item level. The customizing in ODP4 was reduced to the definition of the condition for the costs.

    – It's possible to switch off the 'No summarization' indicator for the unit of measure and the transaction quantity. This allows much more condensed items in the sales document when billing amounts only.

6 Collective Run of Resource-Related Billing (DP95, DP96, DP97)

Using transaction DP95, you can start the report for collective run for resource-related billing. With the collective run, you can:

– Create directly debit/credit memo requests from the source data.

– Create a saved extract which can be later processed either in DP90/DP91 or once again in DP95. This saved extract represents a kind of 'snapshot'.

– Refresh a saved extract from source by keeping manual changes.

– Create a sales document on basis of a saved extract. The extract can be created either in DP90/DP91 or by performing DP95.

There are some additional settings to be specified like price date or the date range of selection. The report can be run in the foreground or as a batch job.

The report returns three lists. An overview list shows the settings and the number of processed input objects. In a detail list, you can see a list of all processed objects with the generated sales documents. If an error occurs, there is an additional error list displaying an overview where the error has happened

If you do not run the report in batch, you can navigate to the source order and to the created debit/credit memo requests by double clicking the column of the list.

As of SAP R/3 Enterprise Core 4.70 (SAP_APPL 470) you have additional selection options for sales orders or service orders when collectively processing resource-related billing. You can find this improved collective processing in the following programs:

• The transaction DP96 offers an improved selection of sales orders.

• The transaction DP97 extends the selection options for service orders.

7 Conversion from Old to New Resource-Related Billing (DP70)

With the Dynamic Item Processor introduced with R/3 Release 4.5, there was also introduced a new business process for resource-related billing, described in this paper. The new resource-related billing replaces the old one also knows under transaction code VA90. The old resource-related billing will be shipped up to and including Release 4.6C. Later releases starting with Release 4.70 will no longer include VA90.

If you are upgrading from a release before 4.5, you can still use old VA90 in Release 4.5 and 4.6. It is possible to run both processes in parallel. This allows you to upgrade your system and delay the conversion of your resource-related billing process. If your new system is otherwise running well, you can do a smooth shift to the new DP90/DP91 without any pressure.

In fact, SAP recommends that you finish billing old orders with VA90 and bill only new orders with DP90. This way of upgrade makes the flow conversion unnecessary and preventing also from rounding differences in the converted flow because the new flow is stored differently in DP90.

Nevertheless, you want to or you have to migrate to the new resource-related billing, because you are billing projects. As projects are objects with long lives, migration is recommended to prevent the existence of two different business process running side by side for a long time.

Please take notice of note 442170 for details on "Quick conversion from VA90 to DP90".

7.1 Conversion of Billing Flow and Customizing

To convert your order from VA90 to DP90, you can use the flow conversion report accessible using transaction DP70. Although its reports allow an automatic conversion of the document flow, you have to do some manual tasks in the conversion process because, for example, the customizing settings are not converted.

For a complete conversion, carry out the following steps:

1. Set up your customizing for new resource-related billing. This includes the DIP profile (ODP1), the specification of cost conditions (ODP4) and the definition of a new results analysis key if you are using resource-related results analysis.

2. Run transaction DP70 to convert the flow of billed costs. DP70 also sets the DIP profile in the sales order item or the service order.

3. Change the results analysis key in your sales order item, service order or project.

Note that projects billed on a resource-related basis are also converted by running DP70 with the sales order used for billing the project. Most manual work in the conversion process has to be done by setting up the material determination (if you want to use the already existing material determination see note 442170). The biggest difference between VA90 and DP90 is the lack of any time dependency for the material determination. If you need one, you now have to use enhancement AD010007.

The conversion report can transfer the flow of actual costs and statistical key figures. For the first one, you must have a source selection line for 'Actual Costs - Line Items' in your profile, for the

second one the source 'Actual Statistical Key Figures - Line Items' is necessary. There is no conversion of billed items added by using the VA90 enhancement KSDIEX01, but you can use report RDPFLOW00 as a template for your conversion.

Each line item is converted into dynamic items by deriving the relevant characteristics of the DIP profile. Therefore it is now possible that for different debit memo request items to be billed by the same dynamic item although they had a different expenditure ID in VA90. Owing to the summarization logic of the DIP, different expenditure items are now probably mapped to the same dynamic item. Costs from purchase order are already summarized by VA90. This summarization can no longer be kept in DP90. The conversion report distributes the sum of billed costs of an purchase order item to the line items, the summarized value is based. The oldest line items are filled first. The distribution is also done with respect to the account assignment if you are using purchase orders with multiple account assignments.

VA90 always selects all costs. Therefore, your new profile should not narrow the selection, except you narrowed the selection in VA90 by using KSDIEX01. Otherwise when first accessing DP90, you would get not all the costs you selected, but only the source costs billed, with the opposite sign.

7.2 Conversion of Customer Enhancements

The new dynamic item processor does not support the exits of VA90. For the most common business processes implemented in enhancement KSDIEX01 and in the form routines of program RV45HFZZ the following replacement strategies are recommended:

- Material determination different from SAP standard logic: You can use now enhancement AD010007 (see also note 442170).

- Creating additional attributes for the items selected in standard: Instead of adding fields to structure EBINFO, you can now create independent and dependent characteristics in enhancement AD010003. Note that the 'No summarization' indicator must be set for your characteristics if you want to use them in SD.

- New filter criteria: For this issue, you have now a wide variety of possibilities. First you can add selection criteria in the source selection part of the DIP profile. Next you can add database selection criteria or filter the data after database selection in enhancement AD010002. It is also possible to remove objects from the selection in enhancement AD010001. Finally, you can use enhancement AD010007 in combination with the sign 'DI w/ Material' in the usage part of the profile to remove all dynamic items without a material determined.

- Reading your own items for billing: Use enhancement AD010005 to add your own sources. In the DIP, it is no longer necessary to define your own logic for a key of an expenditure item (EXPID). Additionally you do not have to care about the flow update.

- Summarizing the item information to be transferred: With the included summarization possibilities, it is no longer necessary to add your own summarization logic. You can easily switching characteristics on and off which you want to summarize over or not. If you still want to do some additional summarization before the creation of dynamic items, you can use exit EXIT_SAPLAD15_010 of enhancement AD010002.

- Create a debit memo request with main item and sub-items: This can be replaced by the business process with the service product.

- Form routine USEREXIT_IN_REQ_ITEM is replaced by exit EXIT_SAPLV46H_001 of enhancement V46H0001.

- Form routine USEREXIT_IN_REQ_ITEM_PARTNER is replaced by exit EXIT_SAPLV46H_002 of enhancement V46H0001.

Of course, you can also use the BAdIs described in chapter 4.3 instead of the corresponding enhancement/exit.

7.3 Changes to the User Interface

The biggest change in the user interface is that there is now the additional screen, where the user can define the resources to be billed, rejected, or postponed. This offers a lot of scope for improved processing of resource-related billing. For example, you do not have to create a debit memo request for costs never to be billed. You can reject the costs in the new overview screen. Nevertheless, it is possible to create a debit memo request directly from the entry screen with the button 'Save Billing Request' accessible by the same key (F5) as in VA90. To go directly to the debit memo request in change mode, you have to set also in the user settings the sign 'Show billing request after saving'. The only difference: The debit memo request is now saved on database before It is opened again in change mode.

The 'Posting date from' on the input screen is replaced by 'Period from'. The option 'Statistical key figure' has now to be handled by an additional source selection line in the DIP profile. The possibility of an object selection list is not included in DP90. If you need this function, you must use enhancement AD010001 or AD010002.

8 Figures

9 Tables

10 Changes to this document

10.1 Version 1.1

- Chapter 2.2.1 revised.

- Added chapter "2.1.4.4 Additional Programs for Pricing for Projects"

- Added some hints for characteristics "Accounting indicator" and "Billing form" to chapter "3.1.2.1 Use of Characteristics".

- Added some hints to chapter "3.1.3 Source Selection".

- "Figure 22: Calling Sequence of Customer Enhancements" revised.

- Description of new interface of exit EXIT_SAPLAD15_005 added to chapter 4.6.

- Added another example to chapter "4.9.1 Change Item Data".

10.2 Version 2.0

- Chapter "2.1.3.2 Quoting and Billing of Service Products" revised.

- Chapter "2.1.1 Resource-Related Billing of Sales Documents, Service Orders and Projects" updated

- Chapter "2.1.3.2 Quoting and Billing of Service Products" updated.

- Chapter 2.1.4.2 Addition: Report "Struct_Quotation_For_Pricing"

- New chapter "2.1.5 Resource-Related Down Payments" added.

- New chapter "2.4 Archiving CO Line Items" added.

- Chapter "3.1.4 Material Determination" revised

- Chapter "3.1.7 Profile Check (ODP2)" updated.

- New Chapter "4.1 BAdIs"

- Added new chapters 4.1.1 – 4.1.4 (several BAdIs)

- Removed the description of the old interface of EXIT_SAPLAD15_005 from chapter 4.6.

- Chapter "5.1 New Function in 4.7" added

- Chapter "6. Collective Run of Resource-Related Billing (DP95, DP96, DP97) revised

- Chapter "7. Conversion from Old to New Resource-Related Billing"