A grayscale background image of a modern, multi-story building with a complex, angular design. The building has several windows and a prominent vertical structure on the right side. In the foreground, there are some trees and a grassy area.

Integrated Business Processes with SAP ERP

Script 3: Life-cycle Data Management in SAP ERP

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1 Life-cycle Data Management in SAP ERP

This teaching unit aims at giving you an understanding of Life-cycle Data Management in the SAP ERP system. The different tools that support master data management are described. Product structure browser, engineering workbench, classification, document management system, variant configuration, and engineering change management are the topics covered in this unit.

At the end of this unit, you will be able to:

- Explain how Life-cycle Data Management integrates with the business processes within the SAP ERP solution
- Gain a basic understanding of the Document Management System
- Describe the functions of the Classification system
- Explain Variant Configuration
- Explain the purpose of Product Structure Browser and Engineering Workbench
- Explain the Engineering Change Management Process

Scenario for the Case Study

In the practical application section of this unit, you will lodge a document in the system and link it with the material master record of your product (Speedstar). Moreover, you will classify the two products (Speedstar and Speedstarlett) and describe them by using characteristics. Finally, you will get to know the product structure browser.

The following figure shows the entire process that you will carry out independently in SAP ERP. The colored coding is grey-scaled this time. This suggests that the functions of cross application (CA) are not specific to any functional area but they are cross-application components of the SAP ERP system.

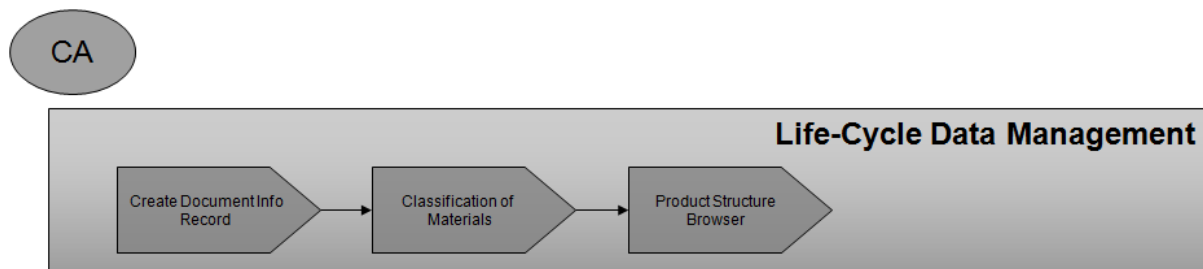


Figure 1: Process Overview: Life-cycle Data Management

2 Life-cycle Data Management

In this section you will get an overview of SAP ERP's Life-cycle Data Management. The various Life-cycle Data Management tools of SAP ERP are used to enable collaborative engineering and product development.

2.1 Theory: Life-cycle Data Management



Product development is vital for the development and continuance of a company. Product-specific data and processes in product development require new product lines as well as a professional management regarding changes to the product life-cycles. The functions of SAP Product Life-cycle Management (PLM) enhance administration and controlling of all product-related issues.

Thereby, this support is not only available for development processes within a company, but also features inter-company cooperation concerning collaborations with partners such as engineering services, customers, and vendors.

2.1.1 Components of Life-cycle Data Management

In an engineering environment, i.e. within the scope of product development, products are usually created using a CAD system (computer-aided design). The **PLM interface** of the SAP ERP system can be used to transfer data from those CAD systems to the SAP ERP system. These **product data** are then managed by using document management. **Document management** allows storing originals (the original product development data) in **SAP secure storage areas** or linking the data to other objects.

For central access to product-specific data and to facilitate navigation through product-specific data, SAP features the **product structure browser**. All product-relevant information, such as material master, BOM, routings or documents, can be displayed and modified if necessary, using the product structure browser.

Engineering change management enables users to make changes dependent on the data, the serial number or individually defined effectivities (validity). Product data can be recorded in **configuration management** and transferred to other systems by **replication**. Thus, a separate system can be run for the engineering process, in addition to the production system.

The following list shows an overview of some important components of the SAP Life-cycle Data Management and their functionalities:

- **Integration**
 - integration of most CAx solutions using the PLM interface
- **Document management**
 - secure storage areas, versioning, status management and engineering change management
 - object links to other SAP ERP objects
- **Product structure management**

- management of materials, documents, BOMs, routings, classes, etc
- management using the product structure browser, the engineering workbench, and the replication workbench
- **Engineering change and configuration management**
 - changes to SAP ERP objects with different effectivities (validity)
 - documentation of configuration and distribution to other systems using replication

2.1.2 Integration via PLM Interface

The **PLM interface** allows connecting different third-party systems with the SAP ERP system. Thus, data transfer between external systems and the SAP system is enabled.

Most commonly, systems connected to SAP ERP via the PLM interface are CAD systems, classification systems, GIS systems (geographical information systems) or Microsoft office applications.

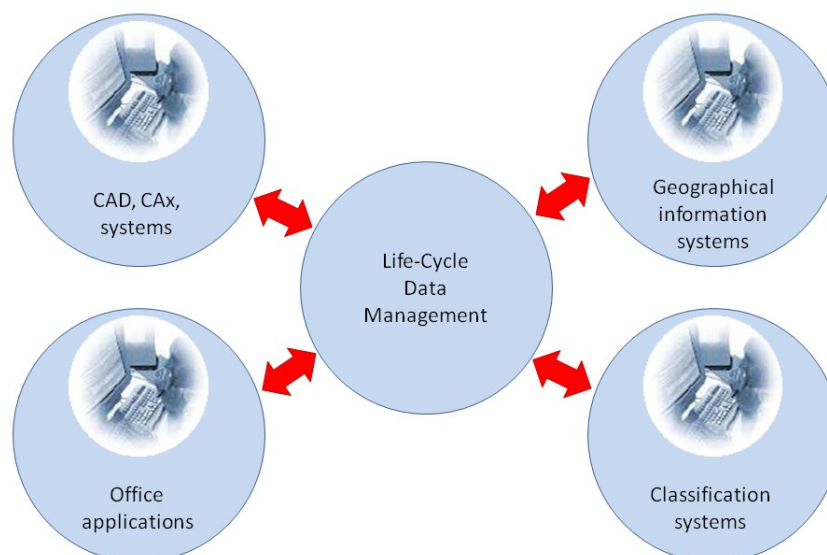


Figure 2: PLM Interface: Possible Applications

2.1.3 Document Management

The **document management system** allows the integration of **external files (Originals)** into the SAP ERP system. Thereby, the format of the external files is not important. A **document info record** is required to control the process steps for the original documents. The document info record can be linked to other objects to provide other objects with the original information. Originals can be stored in different **secure storage areas** and can directly be displayed and processed from the document info record. Access is controlled using the authorization concept of SAP ERP.

A document is an information carrier with specific information on it that is determined for either the person responsible or for the exchange of information between systems (DIN defi-

dition). A document consists of a document info record and the corresponding original. The original can be in paper format, folders, or electronic files.

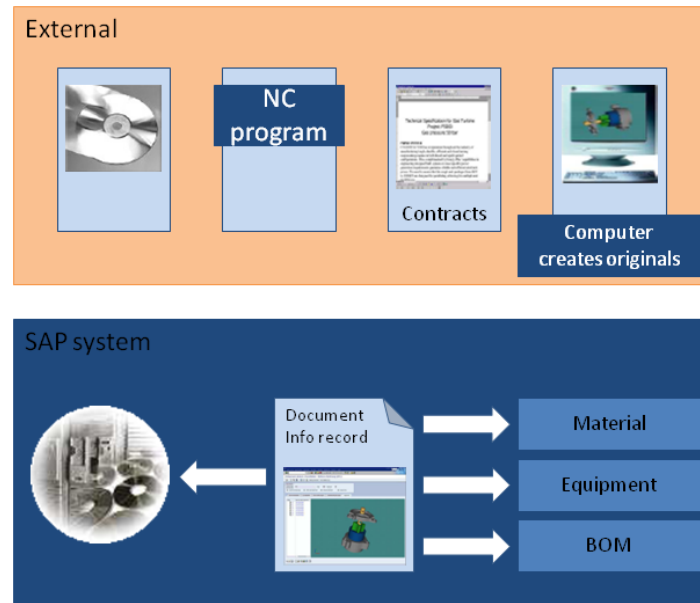


Figure 3: Document Management

2.1.2.1 Document Info Record

Document Info Records in SAP ERP's document management system allow for the integration of documents into master and process data. Document Info Records therefore have the following features:

- **Functions**
 - o version management
 - o status management
 - o classification
 - o secure storage areas
- **Integration with ECC** (enterprise core component = SAP ERP)
 - o object linkages
- **Interfaces to external systems**
 - o PLM and ArchiveLink interfaces
- **Display and processing of originals**
 - o ECL viewer and MS Office integration
- **Easy DMS interface**

Using the **document info record**, you can manage **original application files**. Moreover, they enable controlling of the **process flow** of the original files. Document Info Records can be integrated and linked to other objects (e.g., material, equipment). The document info record also supports **versioning** and **classification**.

When creating a document info record you must specify the following fields first:

Each document info record has a special key. This special key consists of a **document number** and a **document type**. The documents number can only ever be used in combination with a document type. The document type is the central element of the document key.

Furthermore, a **document part** can be used to divide up original information. A document part is a section of a document which is maintained as an independent document. For instance, design departments can use document parts to divide up large documents such as design drawings into pages.

Finally, the **version** enables a user to make different status changes visible in the course of processing, by using different versions in the document.

The actual information in a document info record is contained in the assigned original documents. Originals can be stored in a **security storage area** if required and can be displayed or modified directly from the document info record. Therefore, you can use either the **ECL-viewer** (Engineering Client) or the Microsoft **Office Integration**.

The **PLM interface** is used to integrate external **CAD systems** into the ERP system, and **external archiving systems** can be connected with the ERP system using the **ArchiveLink interface**.

Document management can be facilitated for the end user with the **Easy DMS interface**. The Easy DMS interface is a tool for creating and modifying documents without a SAP GUI and without special knowledge.

The following figure displays a document info record created for a material master in SAP ERP. It is possible to link documents to a large number of SAP objects (for example, materials, customers) in order to document the objects in more detail for various business processes (procurement, production, sales etc.).

The document info record features simple and clear navigation since the most important functions can be executed using push-buttons or are available on tab pages. You can include multiple application files in the document info record and then display or change them by using the push-buttons which are shown at the bottom of the following screenshot. You can display originals by integrating them in the document info record or you can run them in a separate application.

The Status management in a document info record enables controlling the business processes for releasing a document. Multiple employees can be included in this process.

- Clear overview on the basic data screen
- Status management for business release
- Any number of originals can be integrated, displayed, and are easy to manage

Figure 4: Basic Data Screen of the Document Info Record

2.1.2.2 Object Links of a Document

If information in form of originals is made available to objects in SAP ERP, object **links** are created between document info records and these objects. Thus, originals such as specifications, documentations, or image information can be linked to a document info record and can be made available via an object link to the material master.

Originals can also be displayed on the page linked to the object directly, without displaying the corresponding document info record. Object links can be set both from object side and document side.



Note

If you link documents with other objects, the status plays an important role. For example, you can set in the system that only the currently valid documents are displayed in a material master. If you now have documents with different versions and validities, the material master user can only see one version.

You can assign special authorizations, for example, allowing only released documents to be linked with other SAP objects.

Furthermore, when creating a new document version, you can use the old version as the copy template so that the object links are also copied. The processor of such an object can always make the complete history visible or display only the currently valid version.

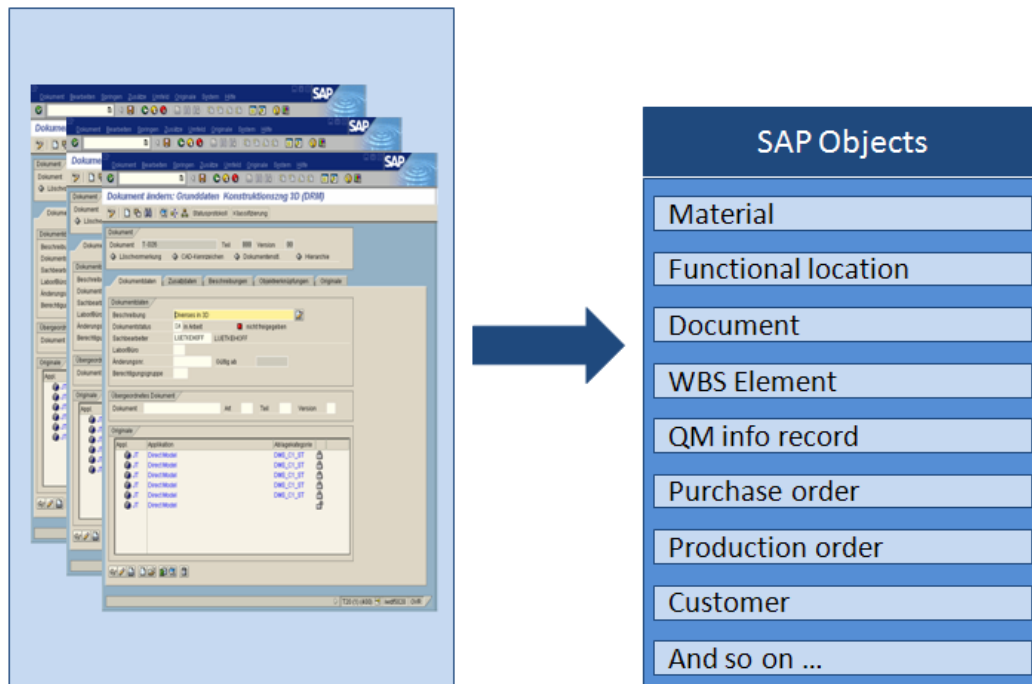


Figure 5: Object Links of a Document

2.1.4 Product Structure Management

Product Structure Management allows the management of structures, describing the product and the management of product data needed for manufacturing.

2.1.5.1 Classification

The classification system allows classifying objects, so that you can find them more easily later. Thereby, you use characteristics to describe all types of objects and to group similar objects in classes. These classes are then used finding objects more easily by utilizing the characteristics defined in them as search criteria. This ensures that you can find objects with similar or identical characteristics as quickly as possible.

The concept of classification can be explained by comparing it to a filing cabinet. The user cannot find his or her data because it is not stored in an orderly fashion in the drawers of the filing cabinet. You could have the same problem in ERP if information is not properly structured. Classes can be compared to drawers.

Classification facilitates the search for objects for the end user. Using the classification, you do not need to know an exact object number (e.g. Speedstar-xxyy), but you can search for materials using **object attributes** and **specifications**. Regarding a bicycle, you can, for example, search for the bicycle type or the frame type. All objects will be found which are matching exactly the search criteria or being in between defined search limits.



Figure 6: Classification

Example: Search for materials

1. You need a material master as a new component for your BOM. Since the materials were classified in the company, you look for relevant classes in which the materials were classified at first.
2. You select the relevant class and display the characteristics of the class. Then, the characteristics are assigned and the search begins.
3. You receive a list of materials featuring exactly the characteristics values that you provided as selection criteria.
4. Finally, the material is assigned to the BOM.

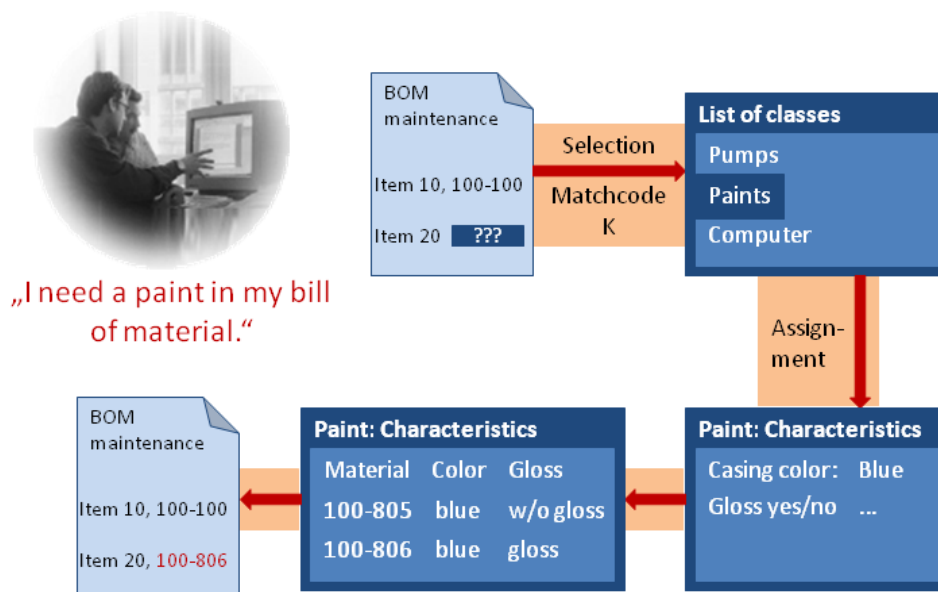


Figure 7: Example: Finding a Material

Classification system: Functions

The classification functionality is only available if you have completed the required preparation. The person in charge firstly decides which attributes (characteristics) describe the product properly. Then, he creates these attributes with the specific characteristic values.

The characteristics are not assigned to an object directly (e.g., to a material), but to a class instead. The SAP system is organized by using different classes with different class types. Then the relevant objects are assigned to these classes. A document could be included in a different class as a material master.

The following steps are carried out in the classification process:

1. Define characteristics and allowed characteristic values
2. Maintain class and assign relevant characteristics to classes
3. Create object (e.g., material) and assign the class to it
4. Now you can search (and find) the object by using the classification

Simplified memory hook (!): **Classification = Assignment + Assigned values**

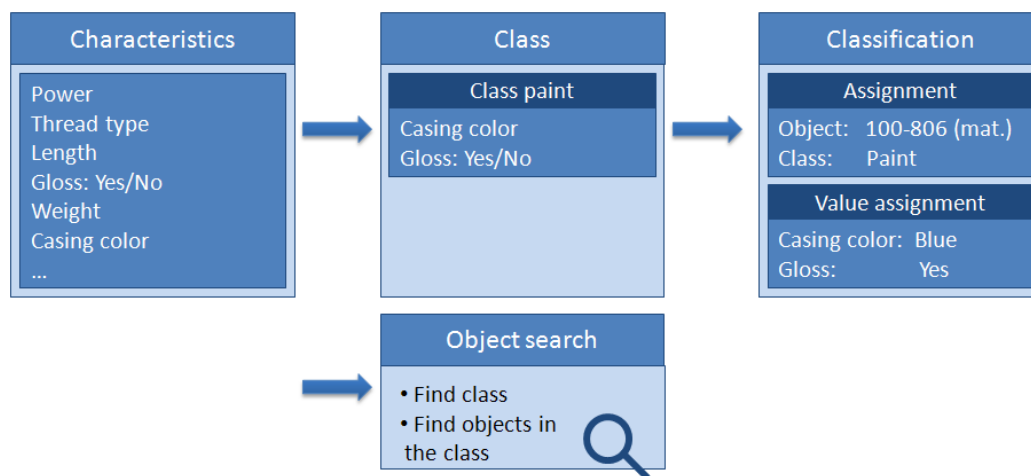


Figure 8: Classification System: Functions

Assignment and Value Assignment

Classification means to assign an object (e.g., material) to a class, and the assignment of the characteristics included in the class.

Classification can be carried out either directly in the object or in the relevant classification transactions.

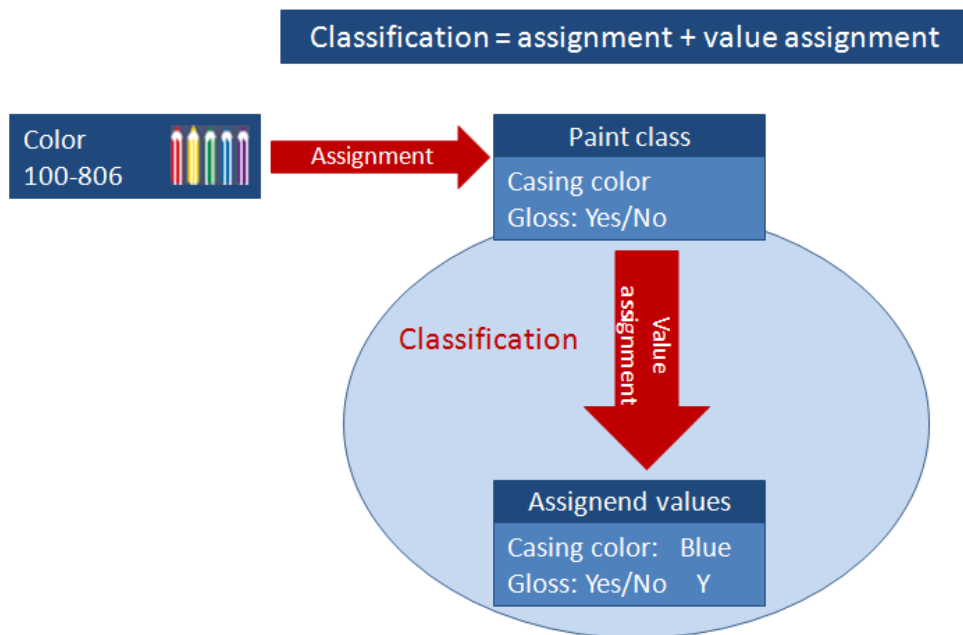


Figure 9: Assignment and Value Assignment

Class Hierarchy

You can define hierarchical structures for classes in the SAP ERP system. Characteristics can be inherited within a hierarchy. The idea is that certain characteristics are required for multiple classes under one hierarchy node in a hierarchy. You assign these characteristics to this node (class) only, in class maintenance. The characteristics are then inherited by all classes that are below this class node in the hierarchy.

If lower-level classes inherit a characteristic, you can also systematically restrict the value range for this characteristic. In the subordinate classes, you only see the restricted set of allowed values, and you can only select values from the restricted set for further assignment.

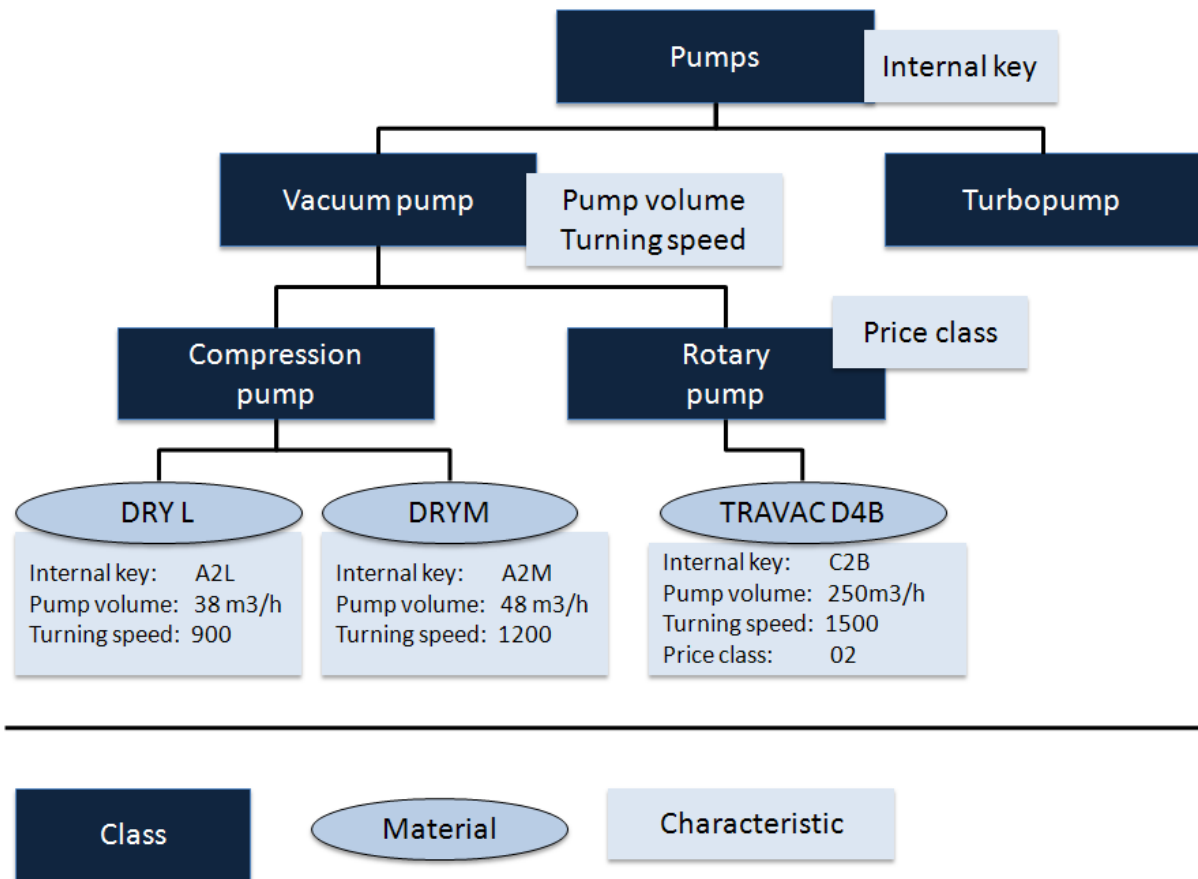


Figure 10: Class Hierarchy

2.1.5.2 Variant Configuration

Companies often produce complex products. These complex products are reflected in complex configuration tasks in sales and production. However, configuration tasks in a company selling products with variants must be carried out quickly and properly. Variant configuration allows manufacturers to offer multiple or new variants of its products. Often, new variants are created by modifying existing product designs as orders are processed. The important thing is to react quickly to customers' requirements. A customer buying a car, for example, can choose the features of the car and combine these features as required.

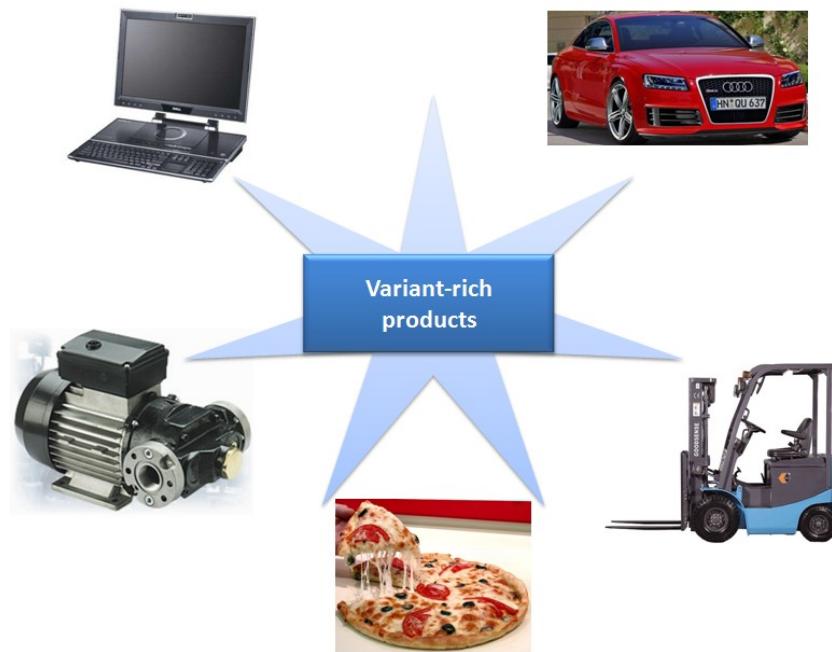


Figure 11: Overview of Variant Configuration

A product that is produced in several variants is referred to as **configurable material**. A configurable material covers all possible features of the product and does not refer to a particular finished product. The features of configurable materials are modeled in SAP ERP by using **characteristics**.

The following figure displays a pump as configurable product. Here you can choose between multiple characteristics (e.g. Manual, Electric) in the particular components (e.g. Drive Type), when producing a specific configuration or variant of this pump.

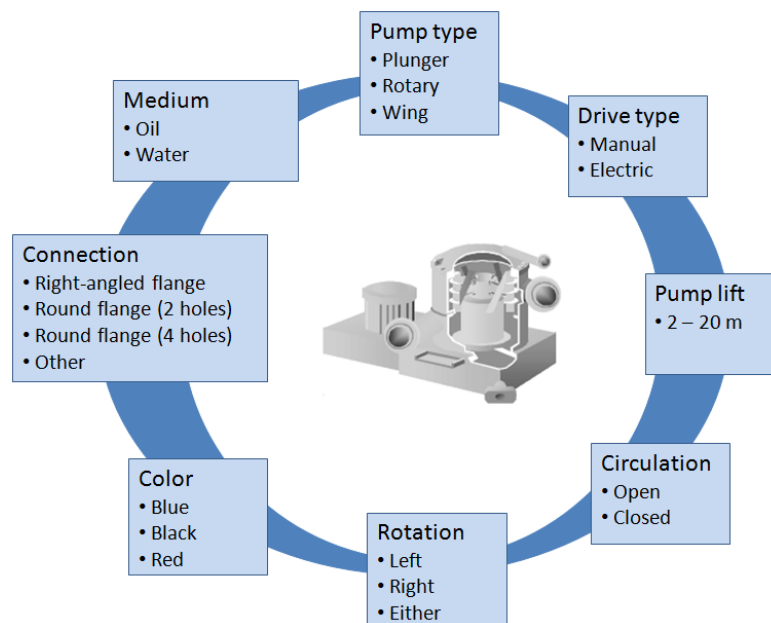


Figure 12: Variant Configuration

Configurable Master Data

The **BOM** of a **configurable material** contains all parts required for all possible variants of the material. The BOM is configured using **dependencies**. That is, parts required for a partic-

ular variant are selected in the manufacturing or planning process upon the defined dependencies. The BOM is exploded in accordance to the **characteristic values** assigned.

You can also change the BOM manually for a sales order in case the configuration profile contains the appropriate settings. Thus, you can for example add or delete parts for a specific sales order. In that case, you have to save the BOM as an *Order BOM* for the sales order.

The task list or **routing** of a configurable material consists of all operations required for the manufacturing of all possible variants of a material. Dependencies are used to select the operations of the routing that are required for a particular variant of the configurable material. The routing's task list can be exploded according to the assigned characteristic values.

Thus, with variant configurations there is no need to create a separate material for each variant of a product in the company. The configurable material is used to cover all variants possible. You create a super BOM and a super routing for this material, containing all the components and operations for producing all variants of the product. Dependencies let you describe the interdependencies between characteristics and characteristic values, control which components are selected from a bill of material (BOM) and which operations are selected from a task list, and change the values of fields in BOM items and operations during configuration.

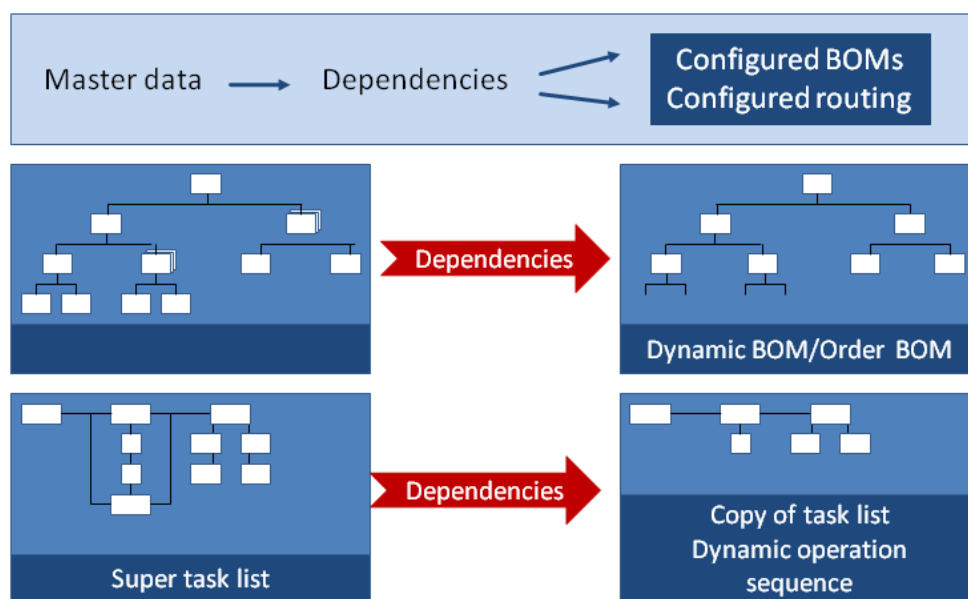


Figure 13: Configurable Master Data

Example: Configurable Bicycle

Generally, you could have created the two products Speedstar and Speedstarlett as configurable materials (set flag in the Basic Data 2 view). The advantage would be that, for example, the BOM of the basis module would not have to be created twice and would be included both in the Speedstar and in the Speedstarlett.

In that case, the basis module would contain both the aluminum frame as well as the carbon frame in its BOM (kind of super BOM containing all components of both variants). The two frame types would be considered in accordance to the **dependencies** and their **classification**, respectively, when exploding the BOM of the basis module. For example, you could define a characteristic for the frame type with the values aluminum and carbon.

The following figure displays a hypothetical BOM for a configurable material bicycle, which contains all materials required to produce both variants (Speedstar and Speedstarlett). The attribute frametype characterizes the Dependency in the BOM variants.

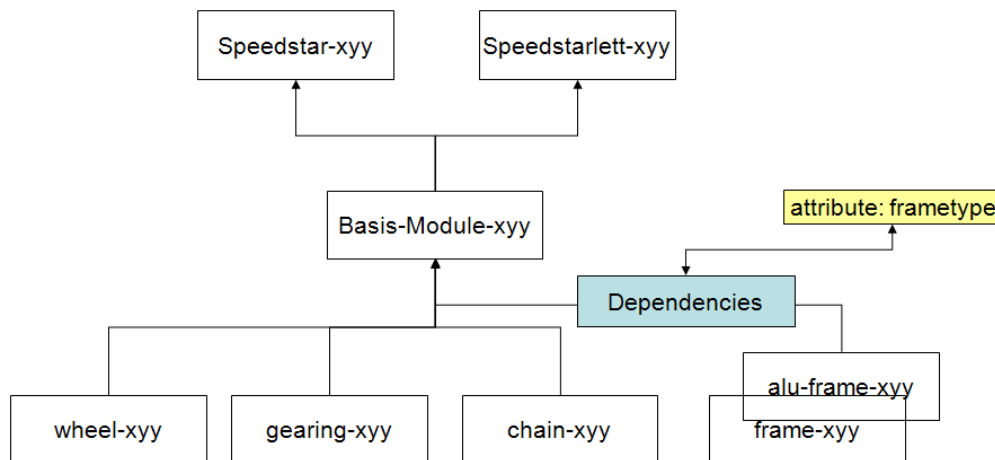


Figure 14: Example: Configurable Bicycle

2.1.5.3 Product Structure Browser

The product structure browser is used to display information about product data. The information displayed is particularly important for engineering and design as well as production. You can obtain a quick overview of product-defined data displayed structurally with this graphical browser. Navigation within the product structure and access to all data that is relevant for the product is provided.

In the previous teaching units, you have created various master data in the system. From a logistical perspective the material master is the central object within your process chain. Almost all the other master data, e.g. the BOMs, the routings, are created with reference to the material master. You can access these data individually or use a tool that displays the relationship in a compact way that is easy to understand. Therefore, the product structure browser can be used.

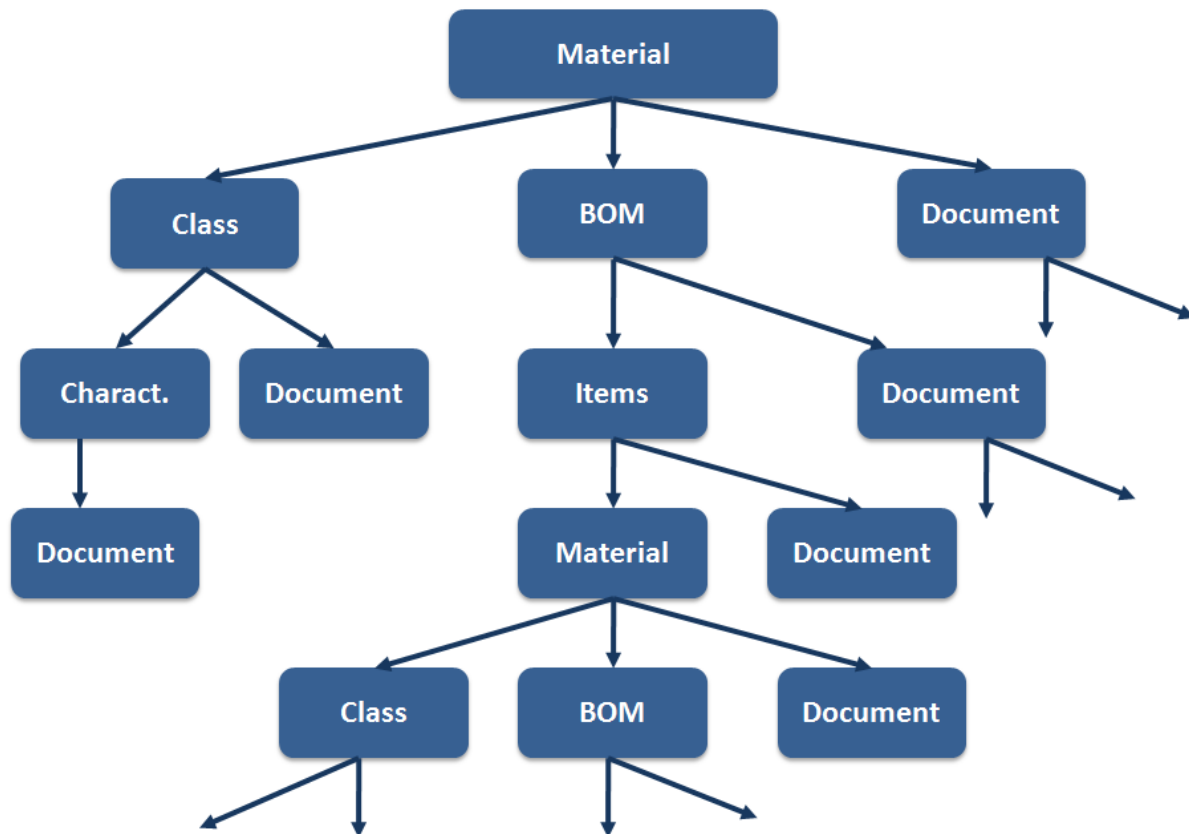


Figure 15: Overview of the Product Structure

In life-cycle management, the product structure browser is the central navigation and information tool. It is a graphical tool for visualizing all functionally related objects, e.g., material, BOM, document, classes, characteristics or routings. This information is displayed in a tree structure.

You can call up objects from the browser and modify them. After reloading the browser, all changes are visible immediately. You can restrict the display of detailed data in accordance to the processing situation by using filters.

Originals can be displayed directly in the integrated viewer (ECL-Viewer), as you can see from the following figure with the BOM of the Speedstar.

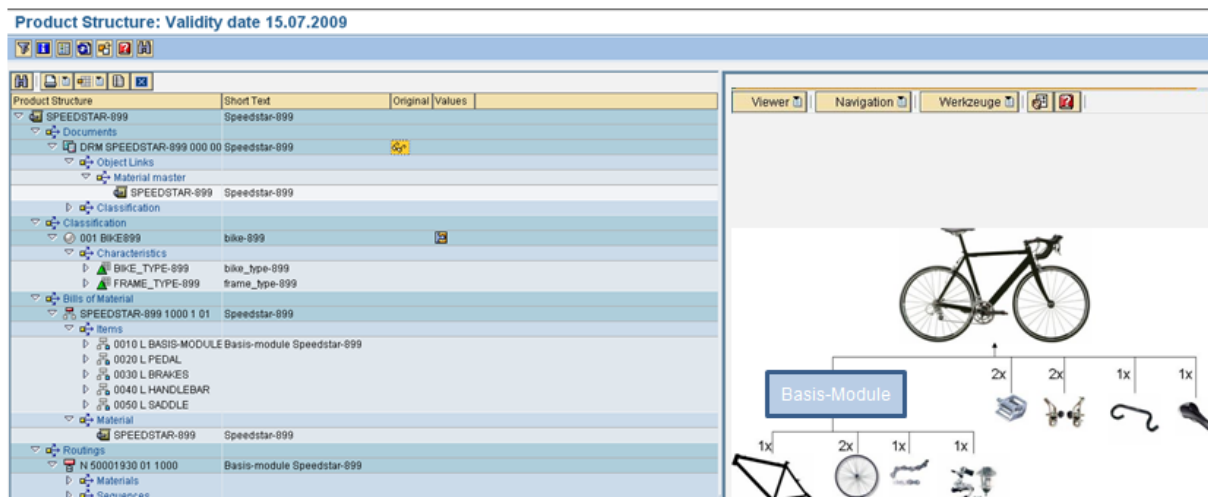


Figure 16: Product Structure Browser: SAP-System-Screenshot

2.1.5 Engineering Change and Configuration Management

Engineering Change Management can be used to change various aspects of production master data (for example, BOMs, task lists, materials, documents, etc.) with history or depending on specific conditions. Changes take effect under precisely defined conditions.

Configuration Management enables you to identify the objects that describe a product in a particular life-cycle phase and collect them in a configuration folder. With different configuration folders in various life-cycle phases, you manage the configuration of products and projects across different life-cycle phases.

2.1.5.1 Engineering Workbench

The Engineering Workbench (EWB) serves as maintenance environment for product structures and operations. The central objects that are maintained in the EWB are BOM items and operations. But the EWB features more than the creation of BOMs and routings only. The following summarizes the advantages of the EWB:

- You can display views of these objects that present the conventional structures of bills of material and routings. Additionally, the EWB provides new views combining all of the maintenance functions, such as Create, Change and Delete on all of these views.
- Routings and BOMs no longer need to be maintained separately from each other. You can simply select those object types with which you want to work, for instance Material, Production resource/tool Operation, etc. in the Engineering Workbench and summarize this selection in a **working area**. For instance the design and production departments both have special requirements and therefore each has its own special working area.
- Thereby, you can define a worklist for the EWB containing previously selected objects which are supposed to be processed in the EWB. After selection, these objects are copied from the database into the worklist. Only when you save the worklist, after having processed the objects, new objects will be created in the database, or existing ones will be changed or deleted.
- The EWB allows for simultaneous maintenance of routings and BOMs.

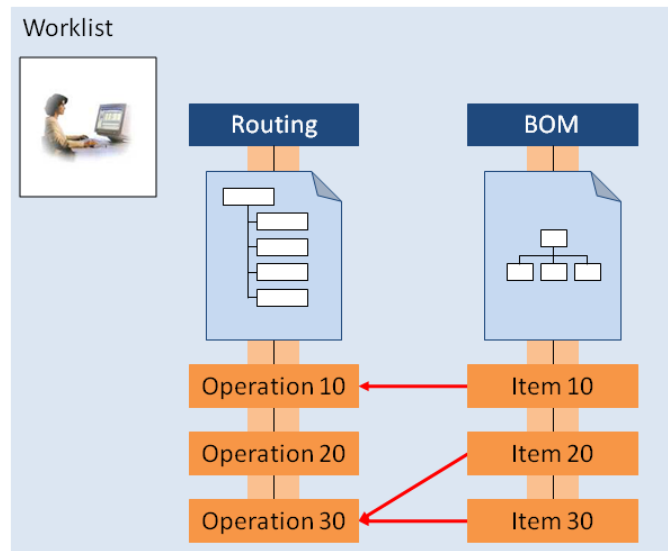


Figure 17: Engineering Workbench

Simultaneous Processing

Another benefit of the engineering workbench is the **lock logic** on individual data. Thus, if an object is maintained in the EWB, not the entire task list of a routing or the entire BOM need to be locked for processing. Different positions of a BOM or operations of a routing can be processed *simultaneously* by different users.

In case you want to modify a **position** that is already in use by another user, the system refuses the processing and, simultaneously, provides you with contact information of the other user. Thus, consultations between users of a data object are facilitated. The user can release the position or operation for you without stopping processing other objects.

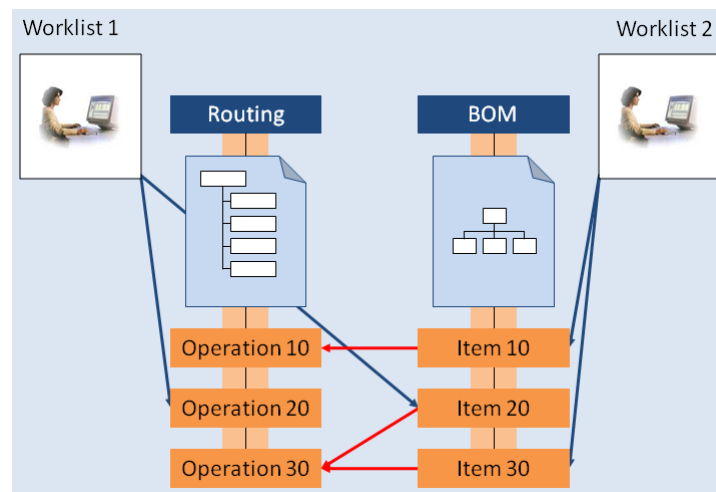


Figure 18: Simultaneous Processing

2.1.5.2 Engineering Change Management

Engineering Change Management is a central logistics function that can be used to change various aspects of production basic data (for example, BOMs, task lists, materials, and documents) with history (with date effectivity) or depending on specific conditions (with parameter effectivity).

The following figure displays the possible effects of changes to a part in a material. Different areas of Life-cycle Data Management are affected by the change.

As you can see, a material change can have a range of consequences within a company: A material change does not only affect the material master record, but can also affect bills of material, routings, or documents. These objects are grouped together using engineering change management.

To account for all changes in the master data and associated objects, the product changes can be carried out with either a change master record or an engineering change request (ECR) and engineering change order (ECO).

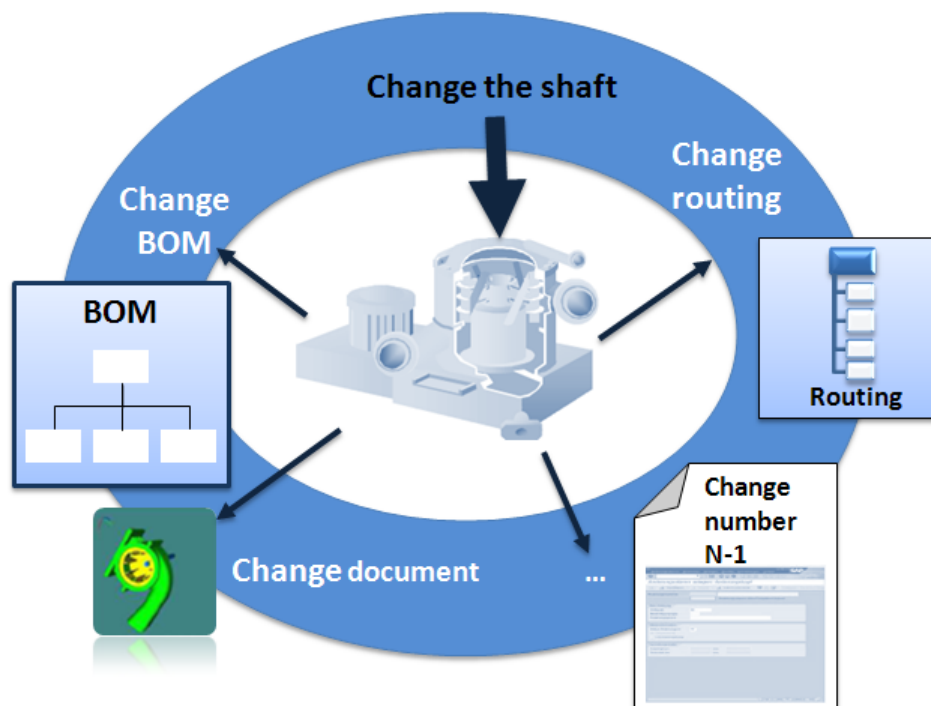


Figure 19: A Material Change and its Consequences

Using **engineering change management (ECM)**, you can group changes for different objects that are affected by one change. ECM is a central logistical function for **changing master data**, which also monitors changes and documents them completely, in accordance to produce supporting documentations.

Additionally, you can use ECM to historically store objects like BOMs, routings, etc. That is, you can store objects more than one time thereby saving a history of all relevant change states as they occur. A change with history has the following distinctive characteristics:

- It takes effect under precisely defined conditions (precise date or specific effectivity parameter value).
- The changed object is saved twice: in its state before and after the changes.
- A change master record or ECR/ECO (Engineering Change Request/ Engineering Change Order) controls and documents the changes.

By defining the **effectivity (validity)** in the change master record in the ECO (Engineering Change Order), changes are made effective at a pre-defined point of time (when this effectivity is made active).

By setting a corresponding release key, changes automatically take effect at the predefined effectivity in the areas of the logistics process chain (e.g., sales order, MRP, production control etc.).

You can use Engineering Change Management to make changes to many SAP Life-cycle Data Management objects. You can create a change definition that is valid for all bills of material and task lists, or you can create it for specific BOM categories and task list types. For example, you can decide that any bill of material can be changed with a change number, or that only material BOMs can be changed with a change number, but not document structures.

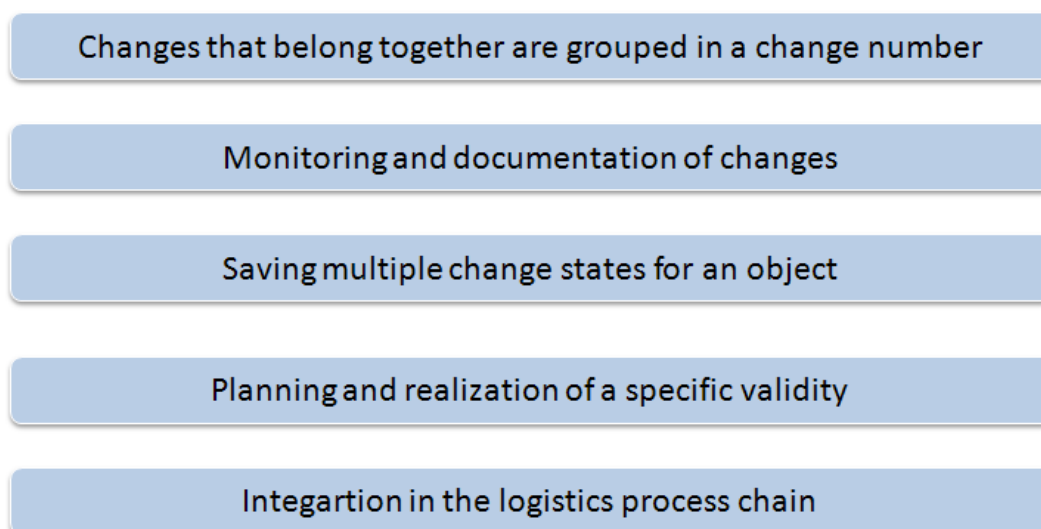


Figure 20: Why Make Changes with Engineering Change Management?

2.1.5.3 Comparison of Change Master Record and ECR/ECO

In the header of a **change master record**, the person in charge firstly enters general information, e.g., reasons for the change or validity. Then, the person in charge gathers and enters the objects that have to be changed or lets the system generate them. After that, the user changes them.

In the header of an **ECR (Engineering Change Record)**, the person in charge firstly enters general information, e.g., reasons for the change or validity. Then, the person in charge gathers the objects that have to be changed, depending on their status. Only after a status-dependent conversion into an engineering change order (ECO), the person can change the objects. This conversion depends on the status. In contrast to the change master record, the ECR/ECO features a **status network** allowing for the request, check and release of change processes.

The differences between using a change master record and ECR/ECO is that once a change master record is created, the user can make changes to the objects. Contractedly, with an ECR, the user cannot change objects until the ECR has been converted to an ECO. This con-

version is dependent on status.

A workflow management system can coordinate the flow of information of any kind using different activities. A workflow gets the right work in the right order at the right time to the right person.

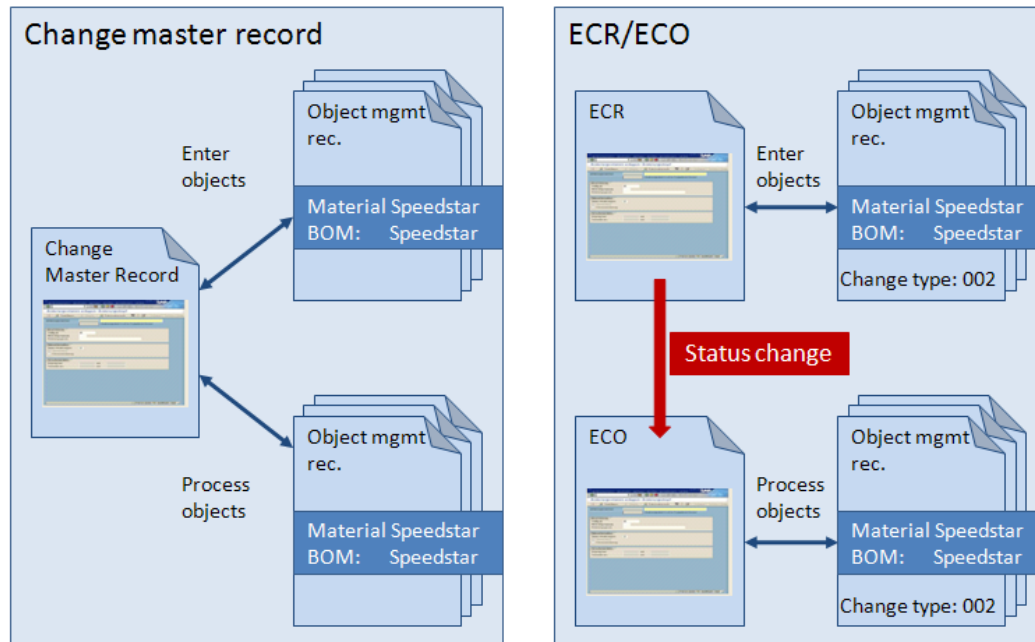


Figure 21: Comparison of Change Master Record and ECR/ECO

2.2 Practice: Document Management and Classification



You want to conduct a material search using the characteristics of the material (Speedstar, Speedstarlett). Product characteristics are stored as characteristics with characteristic values. Characteristics are assigned to a class, which is in turn assigned to material master records. In addition, you want to centrally manage the original files. Therefore, you use the document management. Then, you will get a conclusive overview of your product using the product structure browser.

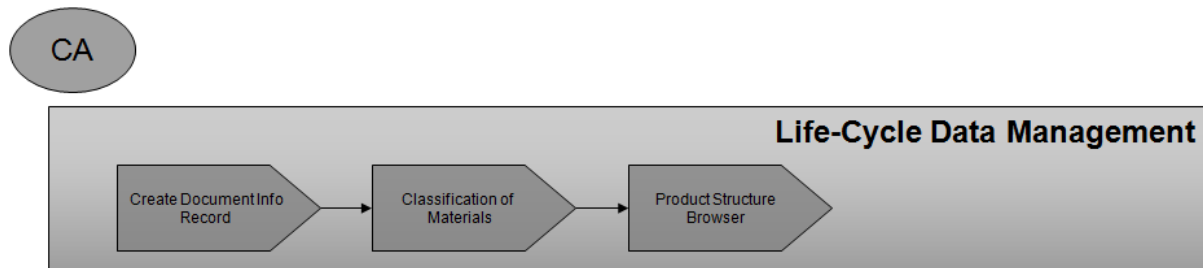


Figure 22: Process Overview: Life-cycle Data Management

2.2.1 Create Document Info Record

At first you create a document info record to be able to link production-related information of your finished product (Speedstar) with the production materials. Thereby, you want to store the BOM of the Speedstar as original in the document management system. Please note that in business reality document info records are much more complex as the following example. In our example we use a BOM as original. Real products, however, feature numerous information, such as technical specifications, etc. which are stored in a document info record.

Choose

Logistics → Central Functions → Document Management System → Document → Create (CV01N)

1. On the **create document initial screen**, enter the following data:
 - Document **Speedstar-xxyy**
 - Document type **DRM**
 - Document part **000**
 - Document version **00**
 - Confirm with **Enter**.
2. In the **Document data** tab, enter the following data:
 - Description **Speedstar-BOM-xxyy**
 - Lab./Office **KB1**
 - In the lower part of the screen, choose the **create** button (📎) in the **originals** window to create an original info record for this document.
3. Enter **document attachment** in the **log field** and confirm with **Enter**.

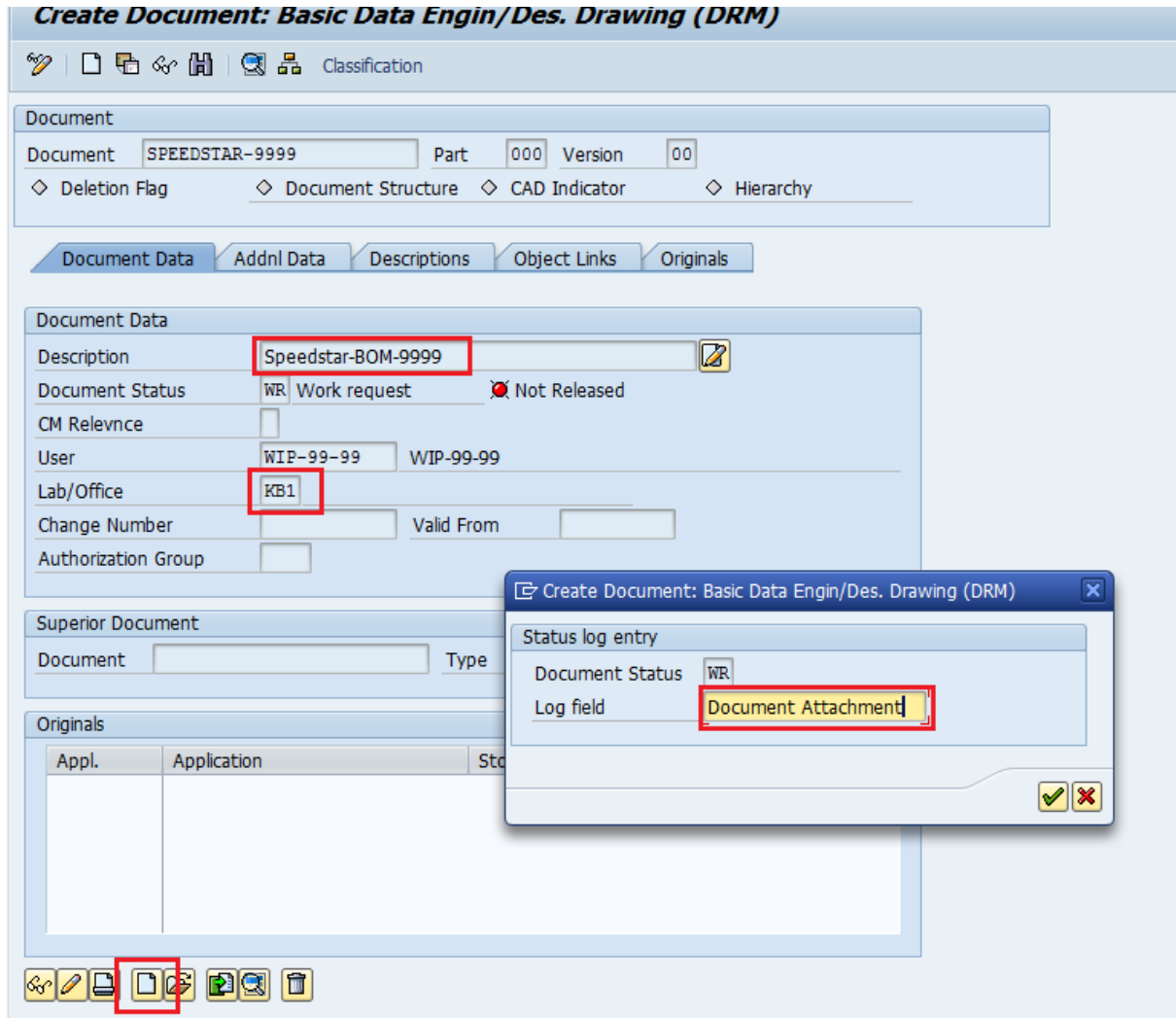


Figure 23: Create Originals: SAP-System-Screenshot

4. In the following screen, enter:

- WS-Appl. **JPG**
- Description **BOM**
- Data carrier **INTERNET**
- Original

Enter a picture (in jpg format) of your choice (preferably, the Speedstar BOM from the script), which you have to choose from your hard disk (use the F4 help for this field).

- Confirm with *Enter*.

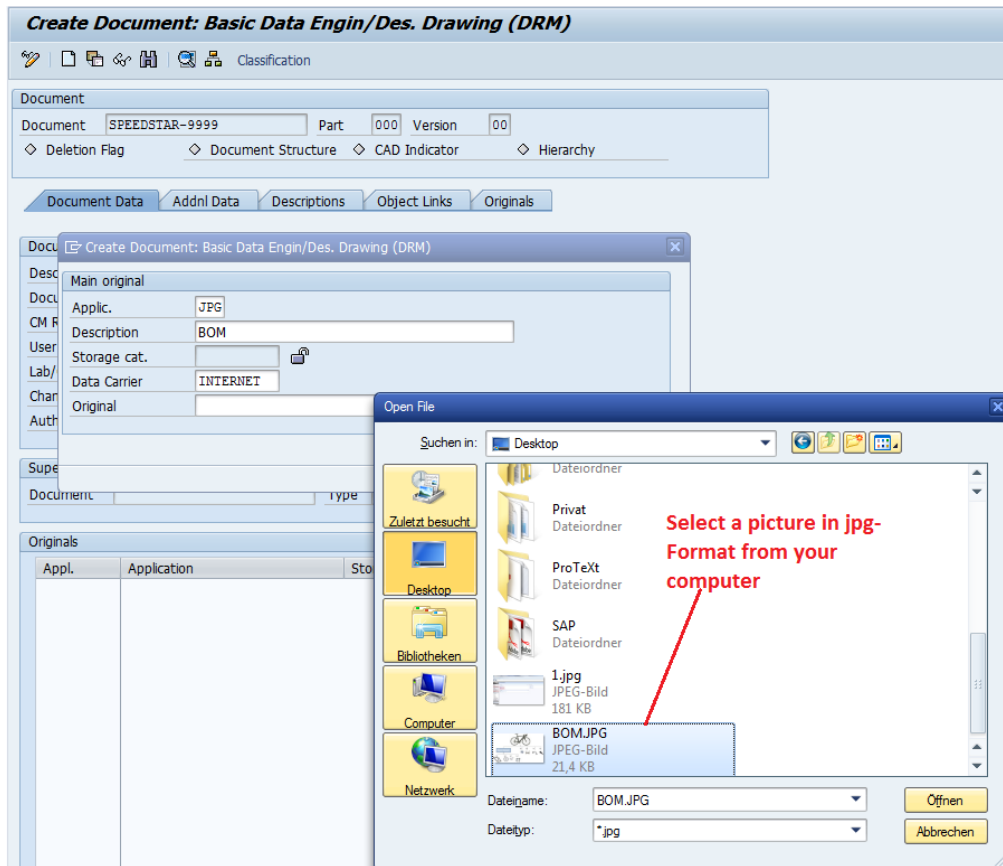


Figure 24: Select Originals: SAP-System-Screenshot

- You should now see the link of the document info record with the original info record in the **Original** window. Now press *Save*.

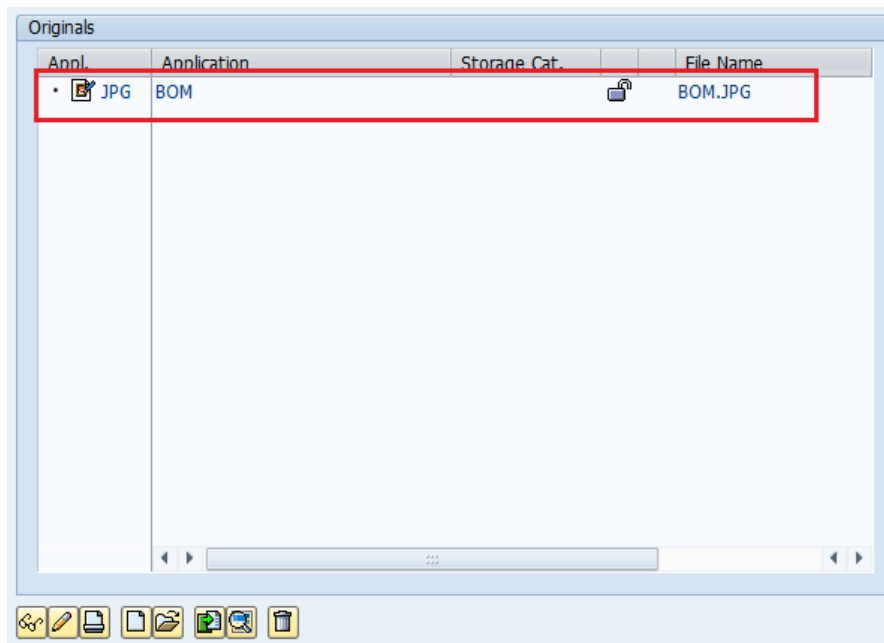


Figure 25: Originals Linked with Document Info Record: SAP-System-Screenshot

Next, you want to link the document info record with your material Speedstar-xyyy. Therefore, choose

Logistics → Central Functions → Document Management System → Document → Change (CV02N)

1. In the **change document: initial screen** enter once again the following data:
 - Document **Speedstar-xyyy**
 - Document type **DRM**
 - Document part **000**
 - Document version **00**
 - Press **Enter**.
2. Choose the **Object Links** tab and go to the material master tab.
3. Enter your material **Speedstar-xyyy** and choose **Save**.

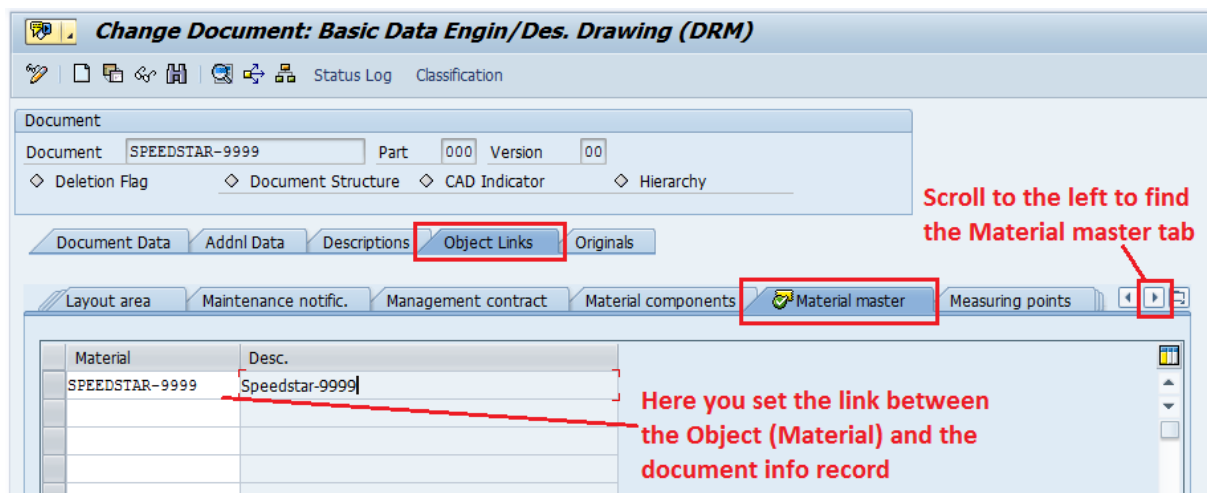


Figure 26: Object links Document Info Record: SAP-System-Screenshot

To make sure the object link was set successfully, take a look at the material master of the Speedstar. Therefore, choose:

Logistics → Materials Management → Material Master → Material → Display → Display Current (MM03)

1. Enter material **Speedstar-xyyy** and confirm with **Enter**.
2. Choose the **basic data** view and confirm with **Enter**.
3. Select the **Additional Data** button to display additional information regarding the material master.
4. In the **Document Data** tab, select your *document info record* and choose the **glasses symbol** to display the document.

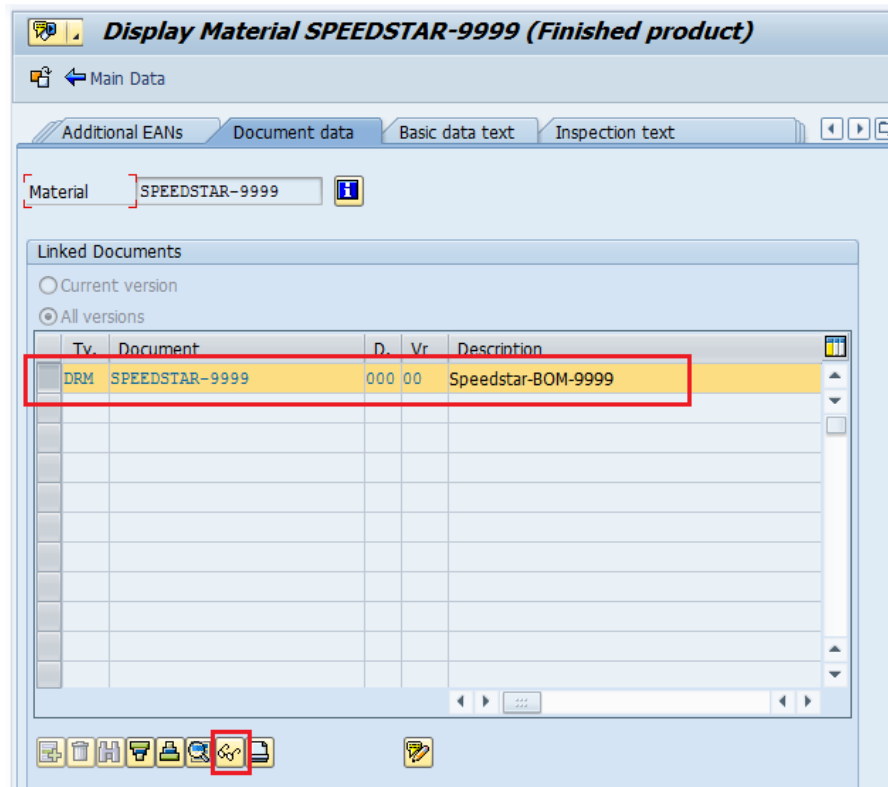


Figure 27: Object Link to Material Master Record (1): SAP-System-Screenshot

- Now, you should see the picture you uploaded earlier.

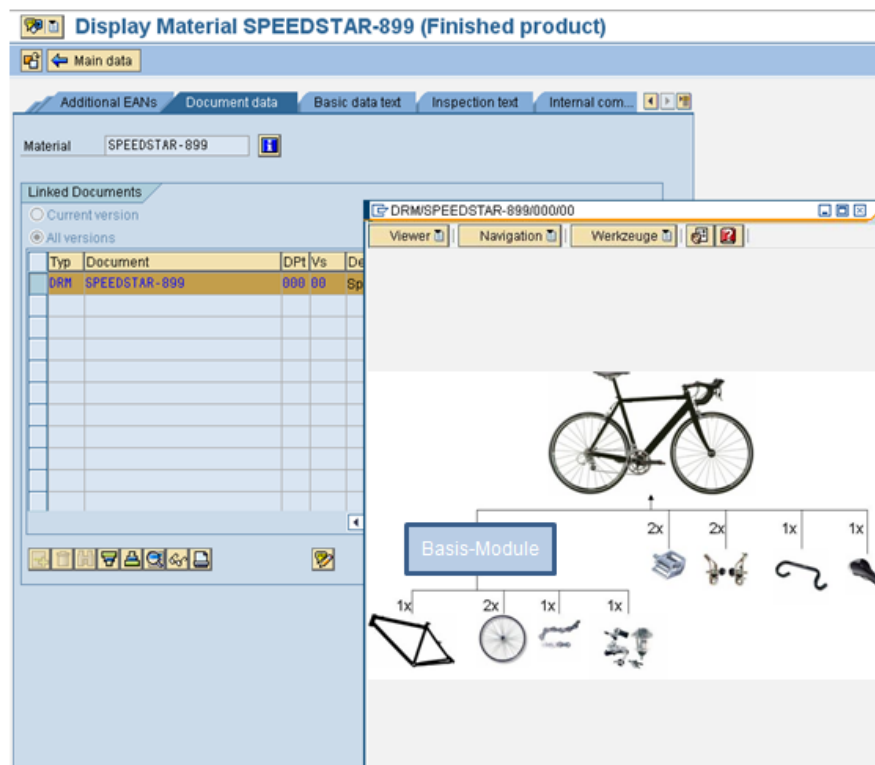


Figure 28: Object Link to Material Master Record (2): SAP-System-Screenshot



Depending on the settings of the system and possible false configurations of your operating system, the ECL Viewer might not be displayed. In that case just go on with the next step.

6. Return to the SAP Easy Access Menu.


2.2.2 Classification of Materials

Next, you want to further describe the Speedstar-xyyy, by using characteristics. The characteristics you will use for your racing bicycle are *bike-type* and *frame-type*.

2.2.2.1 Create Characteristics

First, you will create these characteristics. Therefore, call up the following transaction:

Cross-Application Components → Classification System → Master Data → Characteristics (CT04)

1. In the characteristics field, enter *bike-type-xyyy* and choose the  button.
2. Enter the following data:
 - Description *bike-type-xyyy*
 - Data type *character format*
 - Number of characters *20*
3. Go to the **values** tab and enter the following data:
 - Characteristic value *Men* with the description *Bicycle for Men-xyyy*
 - Characteristic value *Women* with the description *Bicycle for Women-xyyy*
4. *Save* the characteristic.

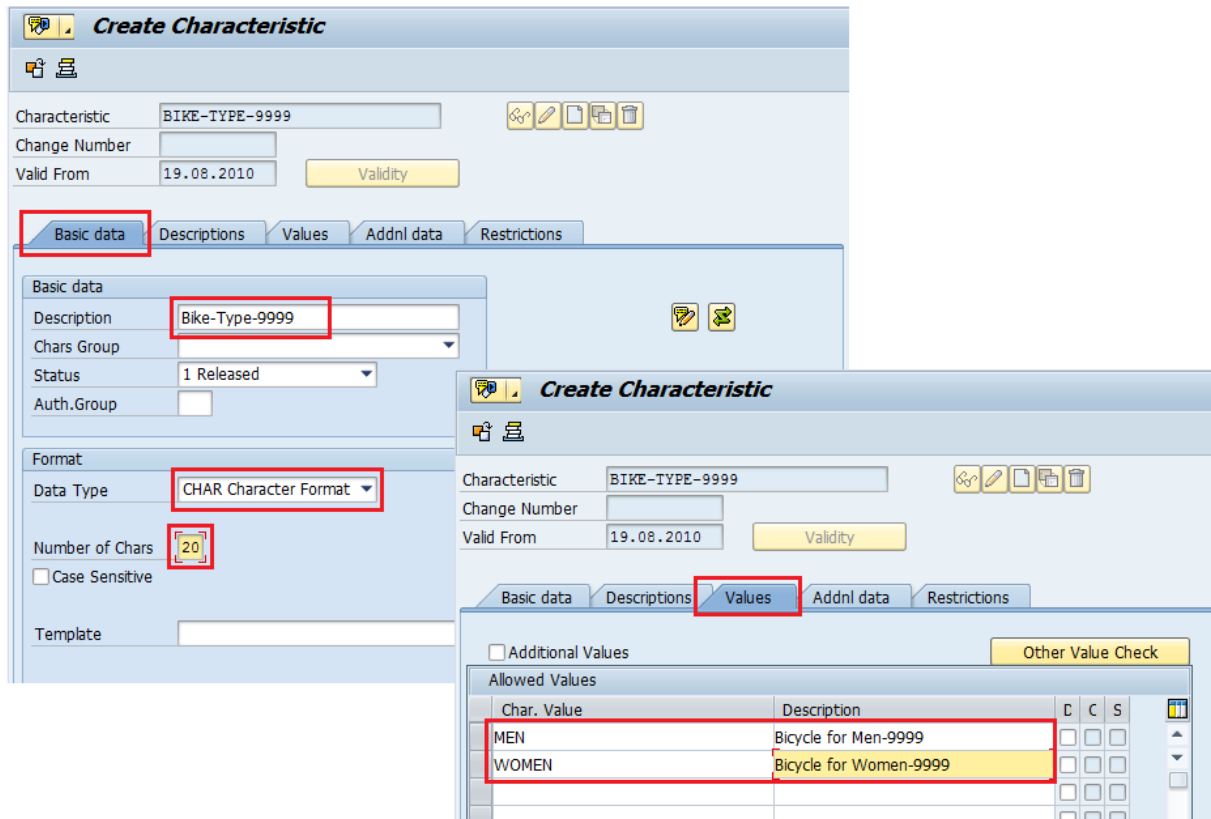



Figure 29: Create Attributes and Values: SAP-System-Screenshot


Next, create the characteristic **frame-type-xyyy**:

1. In the characteristics field, enter **frame-type-xyyy** and choose the  button.
2. Enter the following data:
 - Description **frame-type-xyyy**
 - Data type **character format**
 - Number of characters **20**
3. Go to the **values** tab and enter the following data:
 - Characteristic value **Carbon** with the description **carbon frame-xyyy**
 - Characteristic value **Aluminum** with the description **aluminum frame-xyyy**
4. *Save* the characteristic.

2.2.2.2 Create Class

Create a new class that is used to determine the bicycle type. Call up the following transaction:

Cross-Application Components → Classification System → Master Data → Classes (CL02)

1. In the **class screen**, enter the subsequent data:
 - Class **bikexxyy** (without hyphen!)
 - Class type **001** (material class)
 - Choose the  button.

2. In the **create class screen**, enter the subsequent data:
 - Name **bike-xyy**
 - Status **released**
3. In the **char.** tab, enter the following description for the class
 - 1st characteristic **bike-type-xyy**
 - 2nd characteristic **frame-type-xyy**
 - Confirm with *Enter*.

Create Class:

Change Language

Class: BIKE9999
Class type: 001 Material class
Change Number:
Valid from: 19.08.2010

Note that you create a class and assign the Attributes (Characteristics) only. You do not need to assign the Values (e. g. MEN, WOMEN) to the Attributes!

Char.	Description	Da...	N.	D.	Unit	R	Org. Areas	St...	C	I	Origin	P	S
BIKE-TYPE-9999	Bike-Type-9999	CHAR	20	0									
FRAME-TYPE-9999	me-Type-9999	CHAR	20	0									

The Attribute Values are already assigned to the Attributes in the Attribute definitions (Transaction CT04).

Figure 30: Create Class and Assign Characteristics: SAP-System-Screenshot

4. *Save* the class.

The last step of classification is to link the two materials with the newly created class.

2.2.2.3 Classification of Materials

To assign your materials to the new class, you need to create the classification view for your material. Therefore, call up the following transaction:

Logistics → Materials Management → Material Master → Material → Create (Special) → Finished Product (MMF1)

1. Enter your **Speedstar-xyy** as material and press *Enter*.
2. Select the **classification view** and confirm with *Enter*.
3. Generally, the **material class 001** should be selected already. However, if the system prompts you, select **material class 001**.
4. In the class field, enter your new class **bikexyy** and confirm with *Enter*. A new screen appears, prompting you to choose values for the two characteristics of the class.
5. Enter bike type **Men** and frame type **Carbon**. Confirm and save your entries.

Classification

Note that its not until this point,before you assign concrete values to the characteristics to describe a concrete product

Object

Material: SPEEDSTAR-9999 Speedstar-9999

Class Type: 001 Material class

Assignments

Class	Description	S...	S	I..	Itm
BIKE9999	Bike-9999	<input type="checkbox"/>	1	<input checked="" type="checkbox"/>	10

Entry: 1 / 1

Values for Class BIKE9999 - Object SPEEDSTAR-9999

General

Characteristic Descript...	Value
Bike-Type-9999	MEN
Frame-Type-9999	CARBON

Figure 31: Assign Materials to Class (1): SAP-System-Screenshot

6. Repeat steps 1-5 for the material *Speedstarlett-xyxy* with the values *Women* and *Alu-minum*.

Classification

Again, note that you assign the concrete values at this point. If you use the F4 Help in the Value fields you see that all possible values (here: MEN and WOMEN) are selctavble at this point. That is, the class allows to caractereize the material with all combination of Attribute and its Values

Object

Material: SPEEDSTARLETT-9999 Speedstarlett-9999

Class Type: 001 Material class

Assignments

Class	Description	S...	S	I..	Itm
BIKE9999	Bike-9999	<input type="checkbox"/>	1	<input checked="" type="checkbox"/>	10

Entry: 1 / 1

Values for Class BIKE9999 - Object SPEEDSTARLETT-9999

General

Characteristic Descript...	Value
Bike-Type-9999	WOMEN
Frame-Type-9999	ALUMINIUM

Bike-Type-9999

Characteristic Value	Description
<input type="radio"/> No Entry	No Entry
<input type="radio"/> MEN	Bicycle for Men-9999
<input checked="" type="radio"/> WOMEN	Bicycle for Women-9999


Figure 32: Assign Materials to Class (2): SAP-System-Screenshot

2.2.2.4 Find Material using Classes

Imagine you search for all materials in your company that are of "type" bicycle. In that case, one might try to search the material class "bike".

Now you will run a material search using the classification system. Look for your material using the selected characteristics. Therefore, call up:

Cross-Application Components → Classification System → Find → Objects in Class (CL30N)

1. In the **find objects in class** screen, enter:
 - class **bikexxyy**
 - class type **001**
 - Press *Enter*.
2. Select the following characteristics:
 - bike type **MEN**
 - frame type **Aluminum**
3. Start the search using the **find in initial class** button ( Find in initial class).

Which object is displayed? List the answer and the reason for the result.

Displayed objects:_____

2.2.3 Product Structure Browser

Check the documents and characteristics assigned to your material **Speedstar-xyyy** using the product structure browser. To call up the product structure browser, choose:

Cross-Application Components → Engineering Change Management → Environment → Product Structure (CC04)

1. In the initial screen of the product structure browser, enter your material **Speedstar-xyyy** and choose *Enter*.
2. Expand the **documents, classification, BOM, and routing nodes**.
3. You can see that the product structure browser provides you with ALL information linked to a material. At this point, you can conduct changes to BOM or routings directly.
4. In the **Originals** column, click the **glasses symbol** behind the DRM Speedstar row. The system displays the original info record in the **Viewer**.



Depending on the settings of the system and possible false configurations of your operating system, the ECL Viewer might not be displayed. In that case, just go on with the next step.

- Choose the *jigsaw* symbol behind the *001 racing bicycle* row under *classification* to get the assigned values of the respective characteristics

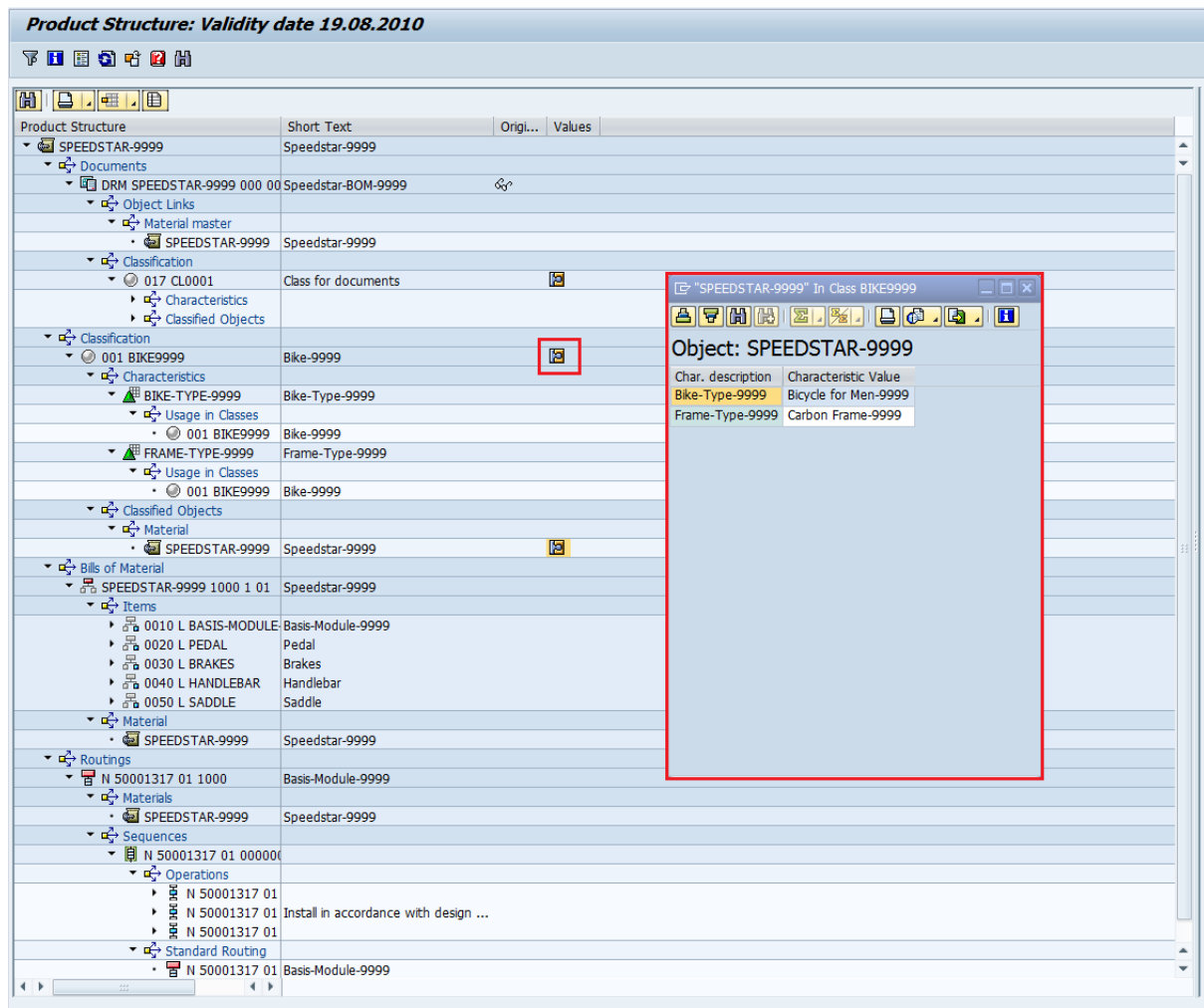


Figure 33: Product Structure Browser: SAP-System-Screenshot

- Choose the *BOM* (or as well the routing) and click the *right mouse button* to change the BOM (or routing) directly.

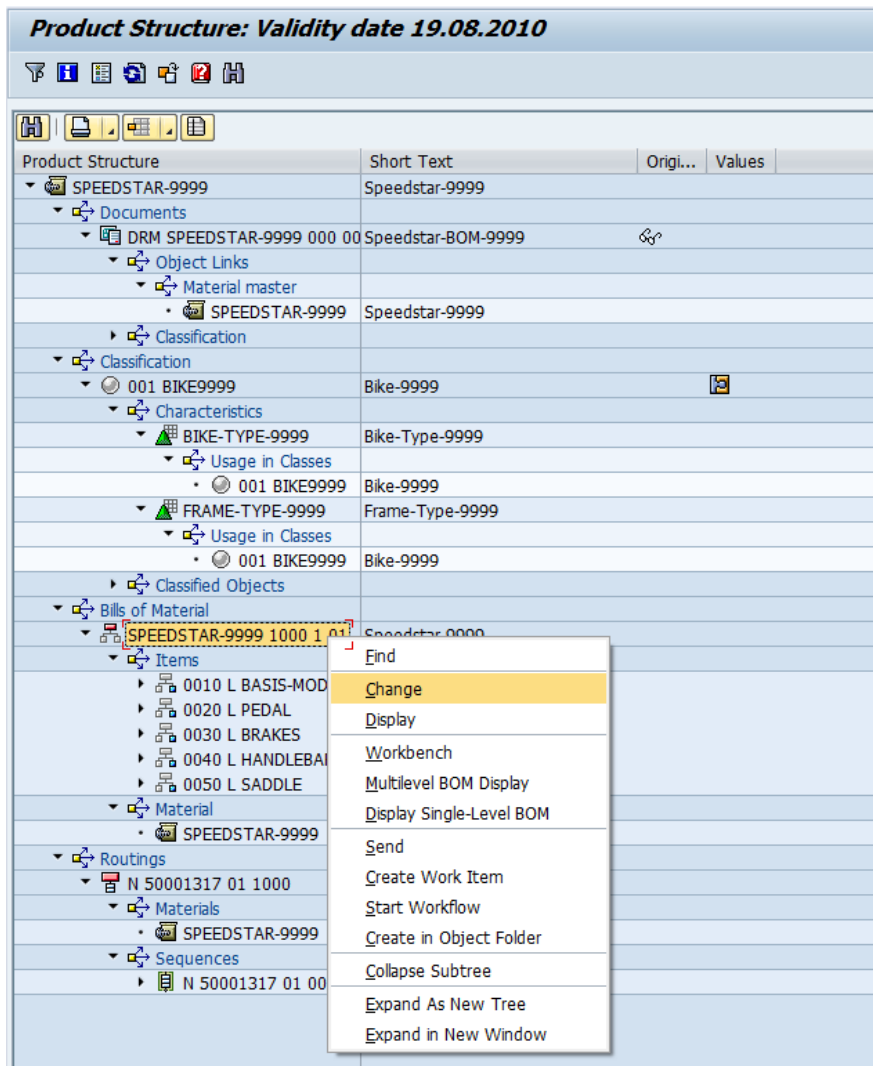


Figure 34: Change BOM: SAP-System-Screenshot

You can see that the product structure browser is used as the central component to process materials.

Finally, create a *screenshot* of your *product structure browser* and copy the image to your data sheet.

2.3 Elucidation



What have we learned so far?

You got acquainted with the components of the Life-cycle Data Management in SAP ERP. Its components are Integration using PLM-interface, Document Management, Product Structure Management, and Engineering Change and Configuration Management.

2.3.1 Life-cycle Data Management

Every product in a company has a life-cycle. The ideal evolution process (simplified illustration) of a product is following:

- Product generates costs in the product development phase
- Product is introduced to the market
- Product (hopefully) generates profits
- Profits rise as costs (production, distribution, promotion, market penetration) are reduced and possible positive effects on sales and production (network effects, publicity, scaling) take place
- At some point in time profits start to decline, since the product is not anymore up-to-date or the market penetration reached its limit (everybody has the product already)
- Now the company has two options:
 - o milk the cow as long as possible and then phase out
 - o introduce updates or variants to the product and, thus, extend the life span by boosting sales figures and then phase out at a later point in time

The Life-cycle Data Management of SAP ERP is meant to accompany a product through its whole life-time (life-cycle). The functions provided by SAP ERP facilitate:

- Integration of data and processes from development systems (CAx - Computer Aided x - stands for Design, Engineering etc.) with SAP ERP
- Documentation of product-specific data (BOM, routings, technical data etc.)
- Administration and controlling of all product-related data
- Change management of the products
- Collaboration with external (partners such as engineering services, customers, vendors) and internal (own employees can work on products simultaneously) systems during all phases of the life-cycle

2.3.2 Components of Life-cycle Data Management

In the context of this course (relevant for the SAP exam) the following components of the SAP Life-cycle Data Management and their functionalities are relevant:

- **Integration**
 - o Engineers work with software solutions like CAD (Computer Aided Design) or CAE (Computer Aided Engineering) to create technical designs and drawings of what is supposed to be a product someday.

- CAD capabilities are not included in SAP ERP, which means that the development efforts of the engineers somehow need to be transferred to the SAP ERP System.
- Therefore, the SAP ERP System has the PLM-interface, which provides integration of most CAx solutions. That is, you can transfer those technical data from the CAx-system to the ERP system.
- **Document management**
 - The data transferred to the SAP ERP System can then be stored as documents using the document management of SAP ERP. Data like these technical drawings are referred to as "Originals". A document in SAP ERP consists of a document info record and the original.
 - Document Info Records can be linked to other SAP ERP objects like BOMs, materials, routings, equipments etc. That is, you can attach a document info record with the original technical drawings to a BOM of a product, and, thus make the technical information available in the BOM. Another example is attaching a product documentation to a material master record with product information for marketing purposes.
 - Document management provides or enables
 - *secure storage areas*: you can store originals in a secure "folder" where only authorized personnel has access to
 - *versioning*: you can create multiple versions of a document, accounting for different validity periods etc.
 - *status management*: you can set multiple statuses for documents, like final, active, inactive etc. the status can be time dependent
 - *engineering change management*: you can use document info records in the engineering change management
- **Product structure management**
 - allows the management of materials, documents, BOMs, routings, classes, etc.
 - Using the product structure browser, the engineering workbench, and the replication workbench enable access to all data available for an object from a single point of entry.
 - For instance you access the material Speedstar using the product structure browser. All product-relevant information, such as material master, BOM, routings or documents can be displayed and modified out of the product structure browser.
- **Engineering change and configuration management**
 - Engineering change management enables users to make changes to SAP ERP objects (materials, BOMs, routings etc.) dependent on the data type, the serial number, or individually defined effectivities (validity).
 - Product data can be recorded in configuration management and transferred to other systems by replication. Thus, a separate system can be run for the engineering process, in addition to the production system.

2.3.3 Integration via PLM Interface

- PLM interface is used to connect third-party systems like development systems for CAX with the SAP ERP system.
- Most commonly systems connected to SAP ERP using PLM interface:
 - o CAD systems
 - o classification systems
 - o GIS systems (geographical information systems)
 - o Microsoft Office Applications.

2.3.4 Document Management

- **Document management system** allows for the integration of **external files** (documents) into the SAP ERP system.
- In SAP ERP documents consist of a document info record and the corresponding original. The original can be in paper format, folders or electronic files.
- The format of the external files is not important, since many formats are supported.

Document info record

- A **document info record** can be described as an SAP internal object that is used to control the process steps for the original documents. Document Info Records are used for integration of documents into master (e.g. material master) and process data (e.g. production order). That is, the document info record is a "representative" of the original in the system. The actual information is contained in the assigned original documents. Using the document info record, you can manage **original files** and control the **process flow** of the original files. The document info record also supports **versioning** and **classification**. That is you can create multiple versions of a document and also use documents in the classification system.
- Document info record has a special key consisting of document number and document type. The following entries must be done when creating a document info record:
 - o Document number
 - o Document type
 - o Document part
 - o Document version
- The document info record can be **linked to other objects**. If information in form of originals is made available to objects in SAP ERP, **object links** are created between document info records and these objects. Thus, originals can be linked to a document info record and can be made available via an object link to e.g. a material master. Originals can be displayed on the page linked to the object directly, without displaying the corresponding document info record. Object links can be set both from object side and document side.

Example: A product can be provided with a technical drawing of the product by attaching the document info record to its material master. In that way you can **access** the document info record and, thus, the information from the original document, directly from the material master.

- You can also **modify** the originals directly from the document info record. Therefore, you can use either the **ECL-viewer** or the **Microsoft Office Integration**
- Originals can be stored in different **secure storage areas**. A secure storage area can be described as a storage location with special authorization settings. Thus, only persons with the appropriate authorization (which is "attached" to their user) have access to the originals.
- **PLM interface** is used to integrate external CAD systems into the ERP system.
- **External archiving systems** can be connected with the ERP system using the ArchiveLink interface.
- The **Easy DMS (Document Management System) interface** is used to facilitate access to documents in SAP ERP and to easily create and modify documents and folders without a SAP GUI and without special knowledge of the document management.
Example: When you start SAP Easy DMS in Microsoft Windows Explorer, a connection is set up to the SAP system across the SAP Easy DMS interface. The layout of the Microsoft Windows Explorer toolbar changes whenever you call SAP Easy DMS in Microsoft Windows Explorer. The icons for SAP Easy DMS are inserted in the toolbar. Then you can create public and private folders (which are documents in document management, in hierarchically structured) and then save your files there. The documents are then transferred to the SAP ERP system.

2.3.5 Product Structure Management

Product Structure Management allows the management of structures, describing the product and the management of product data needed for manufacturing. Among others (Product Designer, Document Structure Management etc.) the following functions (that are relevant in our context) are featured:

Classification: Allows you to use characteristics (for example color or size) to describe all types of objects (for example, materials, documents, or equipment) and to group similar objects in classes. Using the characteristics as search criteria ensures that you can find objects with similar or identical characteristics as quickly as possible.

- **Classifying objects:** For classifying materials you use **object attributes** and **specifications (or values)**:
 - o Attributes describe material characteristics, e.g. **bike-type**
 - o Specifications describe the specific values of an attribute, e.g. **men, women**
 - o You create a class in SAP ERP, e.g. **bike**
 - o You assign attribute **bike-type** to the class **bike**
 - o You create a material "Speedstar" and assign it to the class **bike** AND assign the value **men** to the attribute **bike-type** regarding the Speedstar.
- **Note:**
 - o You assign attributes to classes
 - o You assign the total value range of characteristic values to the attribute
 - o You do NOT assign attributes to the material!

- You assign the material to the class. After that you get a proposal of the system regarding which ATTRIBUTES you can use in this class to describe your material, and what VALUES are allowed
- You assign a concrete ATTRIBUTE-VALUE combination in the class to your material

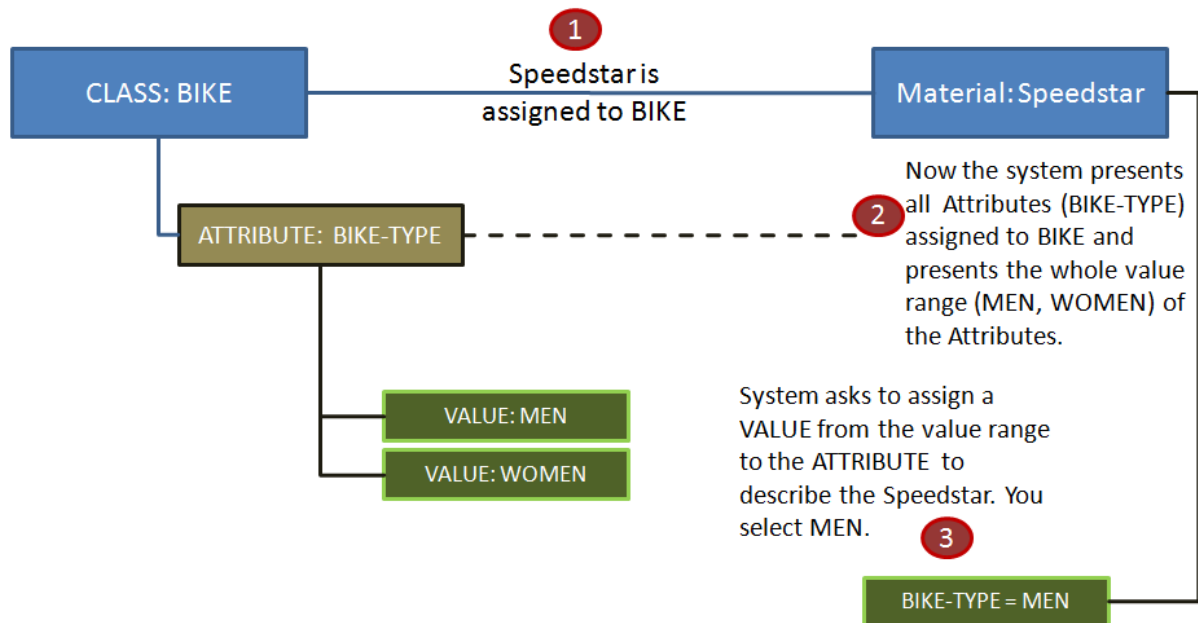


Figure 35: Classification

- **Search for materials:**

- When searching for materials that are classified, you can search for the class and use the class' attributes and values to limit the search. As a result you receive all materials with the specified attribute-value-combination.
- Example:
 - You search in the class BIKE. The system presents you the attribute BIKE-TYPE, since it is the only one assigned to that class.
 - You can choose if you want all materials to be displayed that are assigned to class BIKE, in that case you do not enter any value for BIKE-TYPE
 - Otherwise, you can choose BIKE-TYPE = MEN; the system displays all materials with that specification. In our case only the Speedstar.

- **Class hierarchy:**

- Hierarchical structures for classes can be defined in the SAP ERP system.
- Characteristics can be inherited within a hierarchy to lower-level classes
- If lower-level classes inherit a characteristic, you can also systematically restrict the value range for this characteristic.

Variant Configuration: With the variant configurator, you can describe and easily manage all the possible variants of a product. In the ordering process, the customer is able to configure a product that exactly matches his or her requirements.

- A product can have many variants.

- A product that is produced in several variants is referred to as **configurable material**.
- A configurable material covers all possible variants of the product and does not refer to ONE particular finished product.
- Variants of a configurable material are modeled in SAP ERP by using **characteristics**.
- **Configurable Master Data:**
 - o **BOM of a configurable material** contains all parts required for ALL possible variants of the material.
 - o The BOM is configured using **dependencies**.
 - o **Example:** The following figure explains the variant configuration for BOMs using Dependencies. The BOM is exploded in accordance to the **characteristic values** assigned.

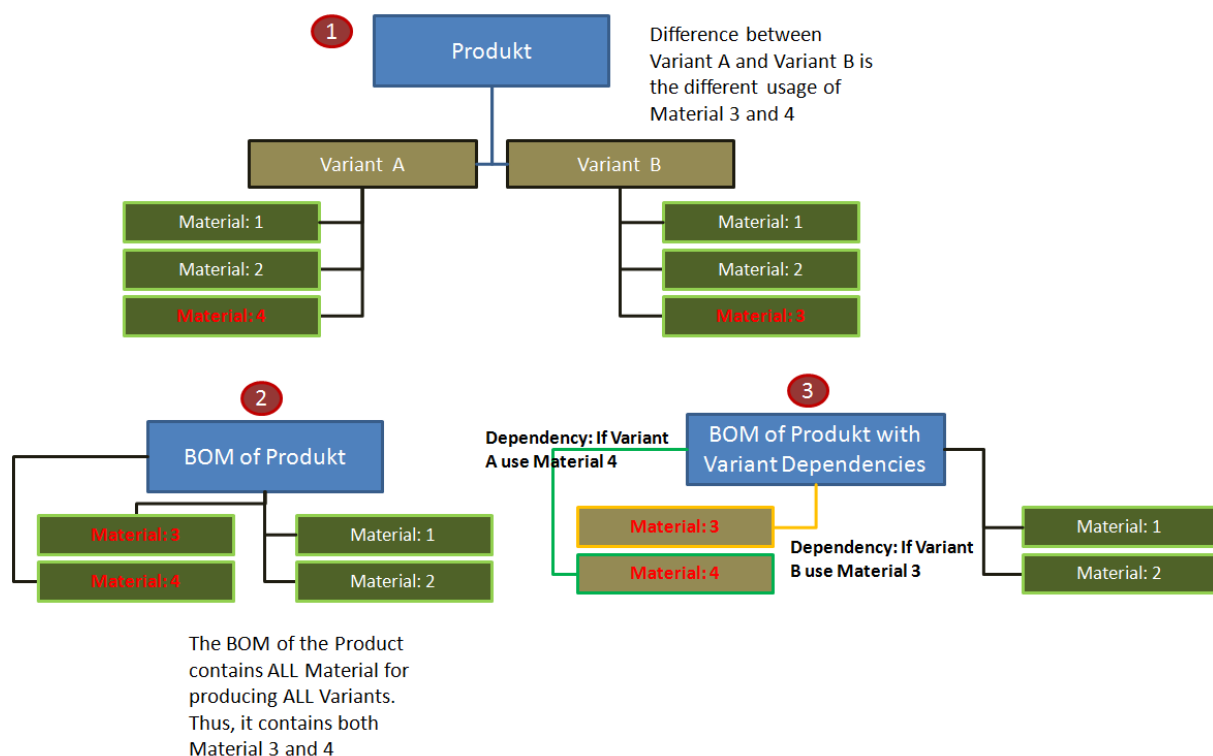


Figure 36: Variant Configuration for BOM

- o BOM can be changed manually for a sales order in case the configuration profile contains the appropriate settings. Then, you have to save the BOM as an *Order BOM* for the sales order.
- o **Routings** can be used accordingly for variant configuration:
 - The routing of a configurable material consists of ALL operations required for the manufacturing of all possible variants of a material.
 - Dependencies are used to select the operations of the routing that are required for a particular variant of the configurable material.
 - The routing's task list can be exploded according to the assigned characteristic values.

Product Structure Browser

- Central navigation and information tool for visualizing all functionally related objects, e.g., material, BOM, document, classes, characteristics or routings.
- Information is displayed in a tree structure.
- You can call up objects from the browser and modify them.
- After reloading the browser, all changes are visible immediately.
- You can restrict the display of detailed data in accordance to the processing situation by using filters.
- Originals can be displayed directly in the integrated viewer (ECL-Viewer)

2.3.6 Engineering Change and Configuration Management

Engineering Change Management can be used to change various aspects of production master data (for example, BOMs, task lists, materials, documents, etc.) with history or depending on specific conditions. Changes are taking effect under precisely defined conditions.

Configuration Management enables you to identify the objects that describe a product in a particular life-cycle phase and collect them in a configuration folder. With different configuration folders in various life-cycle phases, you manage the configuration of products and projects across different life-cycle phases.

Engineering Workbench

- EWB serves as maintenance environment for product structures (mainly BOM and routing)
- EWB provides different views on the objects to be maintained (BOM, routing etc.) In these views all maintenance functions, such as Create, Change and Delete are available.
- Allows for the simultaneous (at the same time) maintenance of routings and BOMs by several users
 - o **Lock logic** allows locking individual positions of a BOM or individual activities of a routing. Thus, not the entire task list of a routing or the entire BOM needs to be locked for processing. The routing can be processed *simultaneously* by different users.
 - o In case you want to modify a **position** that is already in use by another user, the system refuses the processing and, simultaneously, provides you with contact information of the other user. The user can release the position or operation for you without stopping processing other objects.
- You can maintain multiple objects in the EWB at the same time by adding them to your work list. After processing the objects in the work list, e.g., by creating new objects in the database or changing or deleting present objects, the worklist can be saved.

Engineering Change Management

- **ECM** allows to group changes for different objects that are affected by an overall change.

- ECM is a central logistical function for **changing master data**, which also monitors changes and documents them completely, in accordance to produce supporting documentations.
- ECM can be used to store objects like BOMs, routings, etc. with different (time-dependent) versions. Historical changes to those objects are stored in that way in different versions.
- The **effectivity (validity)** in the change master record in the ECO (Engineering Change Order) allows setting a particular time for the changes to get effective.
- By setting a corresponding release key, changes automatically take effect at the predefined effectivity in the areas of the logistics process chain (e.g., sales order, MRP, production control etc.).

Comparison of Change Master Record and ECR/ECO

Change master record:

- In header of a **change master record** first general information (reason for the change or validity etc.) is entered
- Then, objects that have to be changed are entered (or the system generate them)
- Then the user changes them.

ECR/ECO:

- In the header of an **ECR (Engineering Change Record)**, first, general information (reason for the change or validity etc.) is entered.
- Then, objects that have to be changed are entered (or the system generate them) **depending on their status**. That is, the difference to change master record is that a status-dependent conversion of the ECR into an ECO (engineering change order) must take place before the person can change the objects. This conversion is depending on the status of the ECR.
- In contrast to the change master record, the ECR/ECO features a **status network** allowing for the request, check and release of change processes.
- A workflow management system can coordinate the flow of information of any kind using different activities. That is, the ECR/ECO process can be automated using workflow logic. A workflow is a predefined concrete process that already have fixed time schedule, responsible person and order for activities to be executed.

3 Data Sheet

In the case study Life-cycle Data Management in SAP ERP, you learned about the functional area **Life-cycle Data Management**.

Finally, please **submit the carefully completed data sheet** to your tutor (use support email address) for the case study **Life-cycle Data Management**.

Please comply with the naming rules. Non-compliant data sheets will not be accepted; i.e. rename the document that you downloaded from this course's download area as follows:

03-life-cycle-xyyy-zzz-surname.doc

Thereby, you need to replace **xyyy** with your user number without the “**WIP**“ and without the hyphen (WIP-xx-yy) and replace **zzz** with the number of the client you are working on.

Example:

Your name is **Max Mustermann**, you are working on **client 901**, and your **user number** is **WIP-99-99**. Then, name the document as follows:

03-life-cycle-9999-901-Mustermann.doc

4 Reflexion



In this section you are confronted with some questions regarding the theoretical chapters of this teaching unit. Try to answer the questions on your own before taking a look at the standard solutions.

4.1 Questions

True or false?

1. You can integrate external files in the system using document management.

2. The entire routing or BOM is locked to modifications in the engineering workbench.

Comprehension Question

3. Name the tool that shows you a tree diagram?
4. *Complete the following sentences with a word or phrase*
Characteristics are assigned to a _____, which is in turn assigned to a _____.
5. Name some advantages of engineering change management.

6. What is the tool that displays in tree-structure-form all objects that belong to each other functionally, such as materials, BOMs, documents, classes, characteristics, or routings.

Multiple Choice Questions

7. Which statements about Document Management System are correct?
(3 correct answers)
 - a. The Document Management System allows for the integration of external files into mySAP ERP
 - b. A Document is made up of a document info record and the original that belongs to it.
 - c. Documents can only be assigned to a material master record
 - d. The original documents are stored in secure storage areas and can be displayed directly from the document info record.

8. Which of the following are functions of a classification?
(2 correct answers)
- a. Create Characteristics and allowed values
 - b. Assign Characteristics to an Object
 - c. Search for Object based on Class
 - d. Assign values to Class for an Object
9. Components of Life-cycle Data Management include?
(4 correct answers)
- a. Integration
 - b. Document Management
 - c. Engineering Change
 - d. Master Data Management
 - e. Product Structure Management
10. Which of the following statements about the Document Management System are correct?
(3 correct answers)
- a. Documents are stored in secured area and cannot be displayed directly
 - b. The document is made up of a document information record and the original
 - c. Integrated with external data
 - d. External CAD systems can be integrated
 - e. Documents can only be linked to MM

4.2 Standard Solution

True or false?

1. You can integrate external files in the system using document management.

True! Document management allows for the integration of external files.

2. The entire routing or BOM is locked to modifications in the engineering workbench.

False! Engineering Workbench allows the user to lock individual items, such as an operation, within a task list.

Comprehension Question

3. Name the tool that shows you a tree diagram?

Answer: Product Structure Browser

4. Complete the following sentences with a word or phrase

Characteristics are assigned to a **class**, which is in turn assigned to an **object**.

5. Name some advantages of engineering change management.

- **You can centralize changes at several different objects affected by a global change.**
- **You can carry out changes according to the data, the serial number, or individually defined values.**
- **You can save particular objects (e. g., BOM, routing) more than one time after each change.**
- **Change management is a central logistical function for changes to master data.**

6. What is the tool that displays in tree-structure-form all objects that belong to each other functionally, such as materials, BOMs, documents, classes, characteristics, or routings.

The tool displaying all linked objects in a tree-structure is the product structure browser.

Multiple Choice Questions

7. Which statements about Document Management System are correct?

(3 correct answers)

- a. The Document Management System allows for the integration of external files into mySAP ERP

- b. A Document is made up of a document info record and the original that belongs to it.
- c. Documents can only be assigned to a material master record
- d. The original documents are stored in secure storage areas and can be displayed directly from the document info record.

Answers a, b, d

8. Which of the following are functions of a classification?

(2 correct answers)

- a. Create Characteristics and allowed values
- b. Assign Characteristics to an Object
- c. Search for Object based on Class
- d. Assign values to Class for an Object

Answers a, c

9. Components of Life-cycle Data Management include?

(4 correct answers)

- a. Integration
- b. Document Management
- c. Engineering Change
- d. Master Data Management
- e. Product Structure Management

Answers: a, b, c, e

10. Which of the following statements about the Document Management System are correct?

(3 correct answers)

- a. Documents are stored in secured area and cannot be displayed directly
- b. The document is made up of a document information record and the original
- c. Integrated with external data
- d. External CAD systems can be integrated
- e. Documents can only be linked to MM

Answers: b, c, d