EXPERIENCES OF CUSTOMIZATION AND INTRODUCTION OF A CM MODEL

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ABSTRACT. This document describes the experiences of the first stage of customizing and introducing Adele and Adele MMI Builder at a department of Ericsson Microwave Systems AB in Mölndal, Sweden. The document lists positive as well as negative experiences and also provides a short discussion of unsolved problems.

1 SUMMARY

Introduction of a CM tool in a development organization is time-consuming and can be difficult. The more confident the people are in their own established CM methods, the more difficult it is to get acceptance for new methods and tools. In a more chaotic environment, the benefits of a CM tool are more obvious. Thus, the introduction of a CM tool must be supported and coordinated from the top, with management decisions from all management levels.

During the customization of the CM tool it is important to have frequent co-operation with end-users to get confidence and a good usability as well as relevant functionality in the product. Representatives from different staff groups should form a reference group together with the customization team.

Adele works well as a highly customizable CM tool. However some functionality, which is essential for using the CM tool as a general tool for the entire organization, is missing.

2 INTRODUCTION

Ericsson is an international leader in telecommunications, recognized for its advanced systems and products for wired and mobile communication in public and private networks. Ericsson is also a leading supplier of electronic defence systems. Ericsson has 70,000 employees and activities in 100 countries.

Ericsson Microwave Systems is responsible for defence electronics and microwave communications within Ericsson. The product range includes ground-based, naval and airborne radar systems, defence communications, electro-optics and airborne EW systems. The company is active in civil telecommunications, being a world leader in the supply of radio links, and is also the Ericsson R&D centre for very high speed electronics.

Ericsson Microwave Systems make active use of the technical synergy between defence electronics and civil telecommunications

The company, with sites in Mölndal, Kista and Borås in Sweden, employs 3,000 people, and has a turnover of more than SEK 3,000 million.

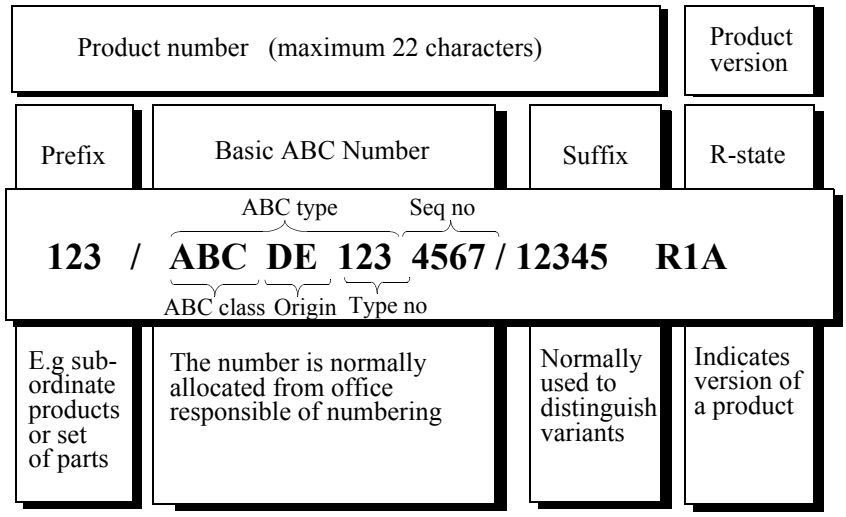
2.1 CM WITHIN ERICSSON

As one of the leading telecommunications manufacturers of the world, Ericsson has a long experience of the development of complex and technically advanced products. A prerequisite of the success is a long tradition of CM in the sense of item identification, version handling and change control.

Products and documents are central in the Ericsson CM nomenclature. A product may consist of subproducts and/or documents.

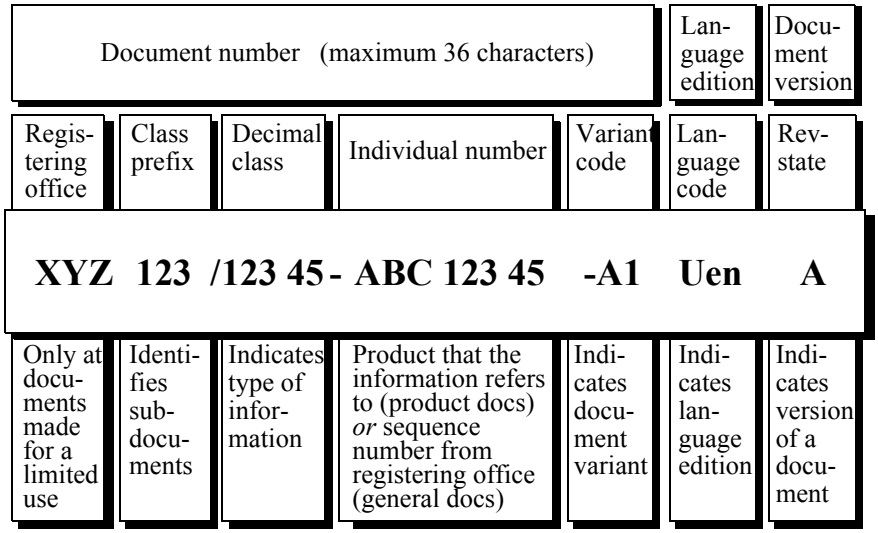
2.1.1 Product Identification

Products are classified in what is called the *ABC classification system*. Each version of a product is identified by means of a product number and an *R-state* (Release state). If the product is stored while in production, an indication of the processing stage is also included. How a product identity is built is shown in the figure below. The product version is defined by the set of documents that is related to it. The R-state is used to distinguish between sets of documents, and the mapping between R-states and document sets is found in the DSU (Document Survey) for the product. In general terms, the DSU is a kind of VDD (Version Description Document).



2.1.2 Document Identification

Each document is identified by its document number, its version called *Rev-state* (Revision state), and the language in which it is written. Usually language code is not included when a document is referred to, because editions in different language contain the same information. Document that require updating are registered with *registration notation* and can be product documents or general documents. Documents that do not require updating are registered (locally) with *reference notation* and can be office documents or personal documents. How the document identity is built for a document with registration notation is shown in the figure below.



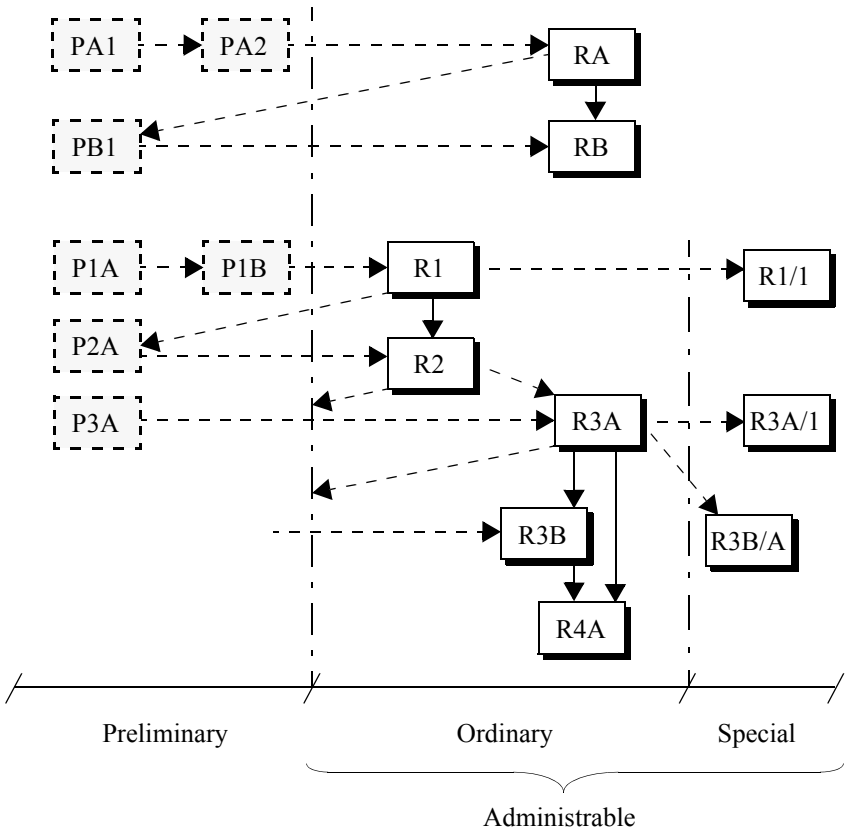
2.1.3 Product Change and Version Handling

Ericsson differentiate between *administrable* and *preliminary* product versions. Administrable versions, which are meant for delivery to customers, are subdivided into *ordinary* and *special* versions.

Ordinary versions have complete product documentation and are designated by ordinary R-states of the following types:

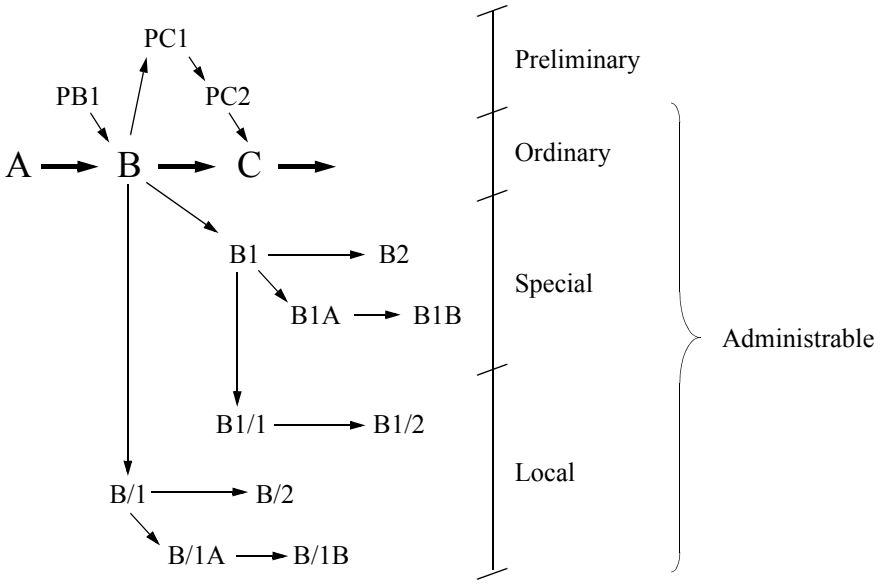
- R1 Interchangeability is stated in the documents, usually in the Product Revision Information, PRI.
  (limited interchangeability)
- R1A Interchangeability is indicated by the R-state.
  (regulated interchangeability)
- RA The latest version replaces all earlier ones.
  (simplified R-state)

Preliminary version is used during the development process to identify different versions of a product. Interchangeability does not exist between preliminary R-states. The type of version is identified in the R-state of the product, illustrated in next figure.



2.1.4 Document Change and Version Handling

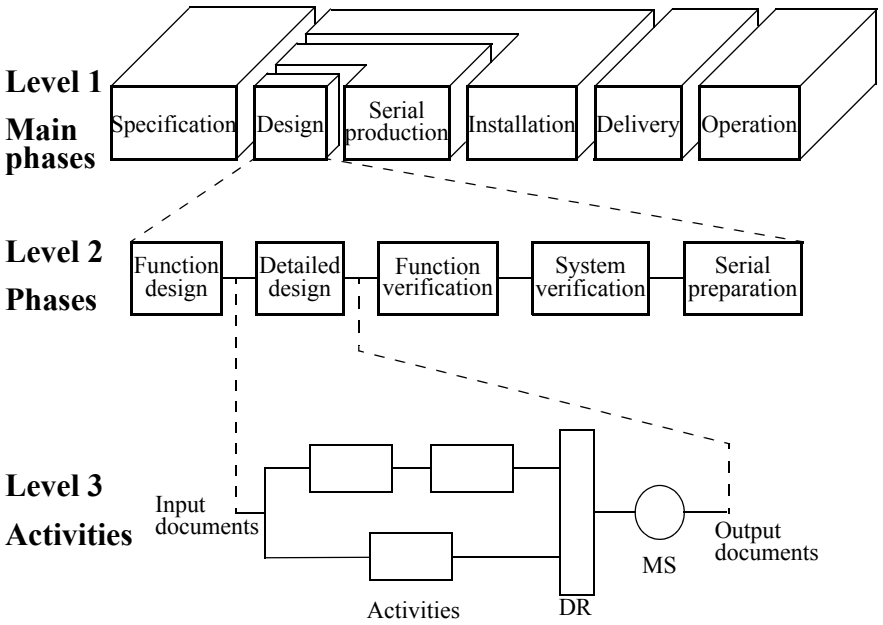
Ericsson differentiate between *administrable* and *preliminary* document versions by means of the Rev-state. Administrable versions are meant to be registered, filed, stored and distributed to subscribers. A document that is to be corrected even though a new version of it has been registered is called a *special version*. The *local version* is used when document versions are adapted to local Ericsson requirements. The type of version is identified in the Rev-state of the document according to following figure.



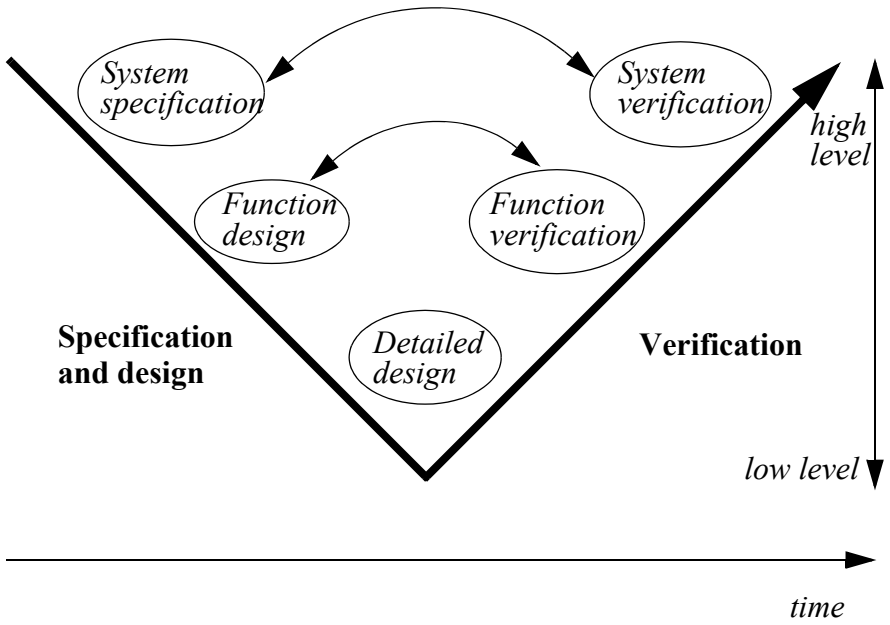
2.2 DEVELOPMENT PROCESSES

When the products developed by the company (today Ericsson Microwave Systems AB) grew more complex, there was a need for a well-structured development method. The strongest need was to find a way to see that the design followed the demands from the customers.The development of the design model has started around 1975.

The used design model is defined on company level. The current model is not a water-fall model although this is a common misunderstanding. The iterations and the concurrent engineering are not drawn in the picture because it would make the picture too messy.



An alternative, possibly better, way to illustrate the model is the V-shape shown in next figure.



The main phase Design is the one which is important for design of software and hardware. The phase is divided into five sub-phases, explained below.

2.2.1 Function Design

Function design is also known as top-down design, which means drawing block diagrams of the system, showing the functions of different parts, not how they are implemented.

2.2.2 Detailed Design

During detailed design the hardware and software processes are different. Software design includes design specifications, implementation and verification. The hardware design includes design specification and realization of hardware requirements.

2.2.3 Function Verification

During this phase the design is checked to match the function design.

2.2.4 System Verification

The system is verified before serial production to match the system specification.

2.2.5 Serial Preparation

The documents needed for serial production and the documents for operation and maintenance are produced.

3 INVESTIGATION AND CHOICE OF SCM TOOL

With the increasing use of software in the products, and the increasing complexity of this software, the Radar Design Department of the Ground Systems Division at Ericsson Microwave Systems AB decided to start an investigation to find an SCM tool.

In general the software part of a product contains 150 to 300 thousand lines of source code. The design team usually consists of 5 to 40 people. A general software part takes about 100 man years to design. One of the team's tasks is to re-use material on software, document or product level, or, when necessary, design a new function.

During the evaluation of SCM tools, the tools were more or less thoroughly investigated. For some tools only the documentation and descriptions were read. A few tools were evaluated during courses and other investigated during tests at the department. No tool fulfilled the product, document and version handling requirement.

When the investigation was complete, the choice of an SCM tool was Adele and Adele MMI Builder. The main reason for this choice was that the tool appeared to be easily customizable to fit the company-specific methodology, for easy and efficient use.

3.1 CONCLUSIONS

The main important thing before starting the investigation, is to have a SCM requirement specification with priority-ranked requirements. To get confidence during investigation, the requirements need to be approved from the whole organization.

During the investigation it is very important to have participants from the different parts of the organization to get a well established acceptance of the chosen SCM tool.

To have the very best acceptance of introducing a SCM tool in an organization with their own CM, take your time.

4 CUSTOMIZATION

4.1 INTENTION OF CUSTOMIZATION

A basic requirement was to use the SCM tool both as a product and project archive. This implies no need of double data storage.

One requirement from the end-users was to have an MMI (Man Machine Interface, GUI Graphical User Interface) and not just a command line interface.

Another requirement was to have a familiar data model with the company- specific notation, for example Ericsson version management and handling of products and documents, and also a familiar presentation in the MMI.

There was also a requirement of handling different roles and a status machine in the system. The status machine controls the life-cycle of a document.

During design there are different roles in a project, which the tool had to support. The roles design responsible, release responsible, document responsible, preparer and reader was required to be supported. The document responsible is the one who performs approving of documents.

4.2 END-USERS

For the first version of the customization, the main group of the end-users were software designers. Their tasks included writing design documents, designing code, testing and verification.

4.3 CUSTOMIZATION PROCESS

Before starting up the customization of the tool, there was a need of having a reference group with participants from the end-users, from the department office and the customization team. The participant from the end-users was a software designer with long experience of Ericsson CM handling and software design. The participant from the department office was the department expert of Ericsson CM methods.

The reference group had a three day brain-storming meeting to define the requirements on the customization. During this work the data model was designed and documented. The layout of the MMI views was designed and documented as well. A scenario description was written to document the work-flow in the CM tool. Before starting the design phase, all the documents were approved by the pilot project (the end-users).

The customization was estimated to take a team of two people a period of two months. To secure the time schedule, a consultant from the vendor was introduced in the task and was involved in the design for one week.

Every week a follow-up meeting with the managers and the reference group was held, to discuss customization status according to time schedule, planned work, finished work and remaining work and risks.

During the customization the team had highest priority on design comparing to other problems in the area. The team was placed together in the same room for highest efficiency.

4.4 POSITIVE EXPERIENCES

As we have expected, the data model can easily be tailored to fit company-specific work methodology and development processes as described in chapter 2.1 on page 3. Since the data model was documented in detail, the implementation phase was short and secure.

Creating customized commands is easy and gives good performance results compared to shell scripts.

The workspace support, configuration management, process engine and version management works very well for the company requirements.

The history manager works well for including new versions of objects in the database.

There is a powerful language for building customized views and dialogue boxes in the MMI. The language is easy to understand and use.

During the customization we got a quick and helpful support from the vendor. This is essential for a fast and successful customization result.

To have all requirements well-documented, together with the reference group, before starting the implementation shortens the implementation phase and provides better acceptance from the end-users.

4.5 NEGATIVE EXPERIENCES

The data model concept is complex and can be difficult, but often necessary, for end-users to understand.

Process modelling is time-consuming and difficult for end-users to implement. Only the system administrator has the capability to implement processes. The process modelling must have a more common easy-to-use availability.

4.6 CONCLUSIONS

Since the Ericsson internal CM is quite different from what most SCM tools offer, the need of an easy customizable tool is obvious. Before starting the customization of a tool, the following questions must be answered:

- How many requirements on the tool are an absolute "must"?
- How much do we want to invest in building new features?
- Is it a requirement to use the process modelling in the tool, or is it more efficient to buy a specific process tool and integrate the two systems?

To get confidence during customization a reference group is required. The participants must be selected carefully with different categories of people like internal CM expert, CM tool expert, participants from the pilot project, quality management and a project manager for the customization project being authorized to decide about money and resources. The participants need to be accepted in the organization as the right representatives. The group should still be quite small.

5 EXPERIENCES OF INTRODUCTION

5.1 POSITIVE EXPERIENCES

End-users involved in the requirement, design and implement phase provide a high acceptance. The pilot project provides a feed-back of usability.

A well-documented customization documentation shortens the time schedule.

5.2 NEGATIVE EXPERIENCES

It is difficult to know if the tool follows standards like ISO 9001, MIL-STD-973. This is a requirement from our customers.

CM is a complex technique which takes time to fully understand. This is one reason why there are problems for the organization to understand the positive effects on introducing SCM tool. It is even more troublesome to introduce a CM tool in a company with its own well-established CM procedures.

Estimating the pay-back of a SCM tool is very hard. There is no evidence of cut costs or improved revenues. The company managers and controllers have low understanding of this type of investment.

5.3 CONCLUSIONS

To get full acceptance for the SCM tool, confidence from top-management during introduction is essential.

SCM tool vendors have to document what standards their tool complies with, and according to what standards it was developed.

6 UNSOLVED PROBLEMS

There is no standardized interface for interaction with other tools. There are conflicts with other tools with closed databases and their own version handling.

The history manager handles only comments for creation of objects, not for removal. This is a requirement for having Adele as a product archive.

Handling of configuration items smaller than a file, like for IETMs. An IETM is built of a presentation equipment, an MMI and a database with information. The information is created only once, stored only once and is presented when necessary. This implies the manual to be built of many small information blocks. A normal project has a database containing thousands of information blocks which implies a need of configuration

management. An information block, configuration item, must be smaller than a file and contains for example a figure, a chapter in a document, a sentence. Every configuration item is SGML (Standard Generalized Markup Language) tagged. One configuration item can be reused in several customer projects.

There is no easy handling of directory structures produced by CASE, CAD and CAE tools. The directory contents normally need to be consistent.

Coupling between source files and change requests (CR, request for corrective action etc.) is necessary for a complete change control.

7 TERMINOLOGY

CR	Change Request
DR	Design Review
DSU	Document Survey A document connecting the R-state of an Ericsson product to the Rev-states of the belonging documents
EW	Electronic Warfare
GUI	Graphical User Interface
IETM	Interactive Electronic Technical Manuals
MMI	Man Machine Interface
MS	Mile Stone A point of time in the activity when a phase is completed (EMW development model); an event which denotes measurable progress
SGML	Standard Generalized Markup Language
VDD	Version Description Document A form identifying the version of a composite item by listing the versions of the components

8 ABOUT THE AUTHOR

Annita Persson received her B.Sc. in Mathematics from Göteborg Univesity in 1983. After graduation, she spent two years of teaching and postgraduate studies in Numerical Analysis at the Department of Computing Science, Göteborg University and Chalmers University of Technology.

In 1985, she joined Ericsson and worked for eight years as a software designer in several projects. Since November 1992 she has been CM coordinator and project leader of the customization and introduction of a CM tool at the Radar Design Department of the Ground Systems Division, Ericsson Microwave Systems AB.