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Progress Report of the Engineering Data Management System Task Force

J.-L. Chevalley, G. Faber, W. Flegel, A. Hervé, C. Hauviller (Chairman), W. Klempt, J- Kuipers,
R. Loos, B. Nicquevert (Secretary), A. Onnela, M. Price, G. Rollinger, W. Witzeling/PPE,
A.-P. Hameri, M. Mottier, J. Nikkola, T. Pettersson, J. Schinzel, M. Tarrant, J. Vuoskoski/EST
P. Farthouat, P. Palazzi, B. Rousseau/ECP
M. Ferran, N. Høimyr/CN
J. De Jonghe/AS
P. Strubin/LHC
S. Oliger/ST

An Engineering Data Management System (EDMS) is a collection of tools and rules, which enables, as a minimum, a body of vetted information to be built up in a safe place and be easily accessible to the users. The Task Force worked through 1995 - to elucidate CERN's needs for an EDMS in the construction and lifetime of LHC and its experiments, - to discover the state of the art of EDMS and find a product on the market which fulfilled CERN's needs. A Call for Tenders was issued in December 1995 and the replies are being evaluated.

The name CEDAR has been chosen for the activity of implenting an EDMS at CERN (CERN EDMS for Detectors and Accelerators) see http://cadd.cern.chcedar/

Administrative Secretariat
LHC Division
CERN
CH - 1211 Geneva 23

Geneva Switzerland
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The EDMS Task Force

During 1994, meetings and memoranda in the LHC Experiments and in some CERN Divisions sought to promote the idea of adopting an EDMS. The present Task Force started in February '95, based in PPE Division's Mechanical Engineering groups, with representatives of the LHC experiments, the CAEC and ECP's electronic engineering support. They were to determine the **data management needs of engineers.** In April computer people (CN/ECP) were invited to attend and in October they were joined by colleagues from other Divisions (AS, AT, MT, ST) who had been studying their own engineering data management needs for some time. In December, the evolving Task Force produced procurement documents constituting a Call for Tender for EDMS Pilot Projects.

This Progress Report.

This is a **simple history** of the work of the first year of the Task Force (2/95-1/96) to introduce the subject and explain why and how it is being pursued. It describes the aspects considered, the needs, resources and availability of tools. It intends to animate and inform the discussion of EDMS, aims to sift and clarify the arguments in favour and those against, since awareness, belief and support at all levels is necessary to the acceptance of a somewhat invasive presence.

By being **explicit** we hope our errors will be obvious and may quickly be perceived and corrected. So the first fruit of this text should be criticism. Through discussion we hope to acquire, and impart, helpful insights into the whole question of an EDMS for CERN.

{Explicitness should tie down any vague impressions which might still exist - even in the minds of the Task Force. This is not to doubt the quality or seriousness of the TF, but members have many other things to do and to think about. In the first 10 meetings there were 87 presences recorded of the 17 members, an attendance rate of 1/2. At the last meeting covered in this report, 25/1/96, when the TF had accumulated 28 'members', the 16 present included 6 engineers and 10 physics and informatics specialists; of the 12 who could not come, 9 were engineers. This text hopes to inform those who have often found it difficult to devote two hours of prime working time to a multi-body, kaleidoscopic discussion, and allow them to voice their criticism. It might even bring insights to those who were present.)

M Ferran (editor).

Contents

Part 1.
Managing a Full Description of LHC and its Experiments over 20 years.

The **total data** describing LHC and its experiments will be large, complex, multidisciplined, widespread - in time and place - and longlived. **The size, complexity, speed and ease** of access and the need for **permanence** all dictate a computer-based system, an EDMS, (an Engineering Data Management System).

Technical drawings, Bills of Material, Finite Element Method calculations, maintenance contracts etc etc all need to be managed. Already there exist information collections on the World Wide Web, WWW, Euclid databases, AutoCAD files, Oracle databases, paper drawings and private information for LHC. A list is too simple a structure to express all the cross-relations involved, a more powerful, sophisticated mechanism is needed. Quickly evolving data is shared informally between close colleagues until it is vetted and approved - and they need mechanisms to help in this. Approved data which no longer changes much, and on which everyone depends, must be easily accessible. In all cases the data used will be rigorously identified, and unique.

People involved in design, production, installation, integration, maintenance, physics and improvement all need access to the heterogeneous technical data which constitutes the total description. Information used by participating tools, processes, and professions is expressed and related in many ways. Each professional will have his own view. For instance, for a steel girder it should be possible to see its extent and the load it can bear **(the layman's view)** and to call up the tools and measurements used to calculate loads and deformations (the expert's view) and then examine the mass, the cost, the chemical composition of the girder, its ferro-magnetic characteristics and so on. This "total engineering data" must always be available. An EDMS must help the users store and access such data in a way that suits them.

The **abundance** of information must **not** be allowed to **overwhelm** users. Expert or other views, like electronic board layouts or the overload characteristics of a chip, should not be allowed to needlessly obstruct the view of those who are not interested in it. On the other hand it should be **nearly impossible to overlook the** existence of information relating to an object or assembly in which we are interested. A user's 'Profile' will filter available information so that only, say, cabling, or financial, or magnetic considerations are presented to him - until he asks for more (and is allowed to see it). Explanatory movies, synthetic walkthroughs, assembly animations, talkies, (and much, much more) will become accessible. Data and relations need to carry a **guarantee** that they are **correct** and up to date.

The **future** of CERN now stretches almost as far ahead as its **history** goes back into the past and the length of time in each case corresponds roughly to a full professional career. So the same people cannot cover all of the past and all of the future. Further, the 1960's expansionist policy of hiring bright young men has been retroactively undermined by a later, enduring, moratorium on bringing in new blood. This leaves many engineers approaching retirement without being able to hand on their experience to the next generation. So the **engineering tradition** which produced, and grew wise in producing, the PS, SPS and LEP and the other accelerators and boosters - and the experiments which exploited them - must be saved, rapidly, for many of those who possess it will soon be gone. This precious tradition must be handed over to the **new professionals** and it should be conveyed in a **modern idiom** which is proof - where possible - against the modern ills of budget cuts, career moves and so on. It seems clear that an EDMS is just that idiom, but also that it will require energy and faith (and money) to make a successful transition. There is no time to lose.

Part 2.
What is an EDMS?

1. Basically.

The EDMS keeps a database containing the names, addresses and relationships of all interesting LHC data and helpful explanations. In principle it is useful, reliable and user friendly and will archive all important data so that it will be impossible to lose it by mistake. It is up to the user of the future to provide names, relationships and explanations to the system rather than simply keep it all in his head.

To the **user** the EDMS offers an easy means of finding and acquiring data, or making available new data for information or approval. Visible on his screen, an EDMS window allows him to click and browse through the logical structure of his machinery or view its assembled components. He may then see the status, properties and relations of any component and may examine any representation he likes, according to his station in life. In the working day there will be processes through which the data must be passed, such as **transfers, translations, simulations and integrations** and these processes will be invoked in a clear, "fill-in-the-form", "drag-and-drop" or other desktop manner. The EDMS will take part in this scenario as a helpful source or sink of data files (or services) with easy access across the WWW. The EDMS may be closely integrated with CAD tools, FEM tools etc. For instance it might be possible to look from a CAD session to a representation of an element in a remote database via the Web. The **computer** will at all times know the user's position and interest from his declared user-profile and help him find his way as he searches through the **multi-dimensioned world** of LHC information. "The current state" which the user sees - and may wish to remember - is subject to the independent actions of many people and must be kept in order by a central Version Control mechanism using time-stamps, change-logging and whatever else is needed.

To the **manager** the EDMS provides a mechanism for making sure changes are authorized, users are fully informed and nothing is lost. User-comfort features are often available such as highlighting new data, signalling changed data etc, and the framework of an EDMS is always flexible enough to support local modifications. Once a user has found what facilities suit him and his colleagues, the EDMS can be tailored to automate his favourite functions, while retaining complete user control. Gadgets are secondary but can make life easier; they are important.

Table 1. The EDMS gives the user a window into the world of Engineering Data

User Types	***User Functions***	***The EDMS***	***AllEngineering Data***
Even a Simple User has a role and interests and a power profile. Manager Users can accumulate more authority.	<--inform <--consult	**Metadata:** holds relationships (Product Breakdown Structure), addresses of files, functions and people, access rights etc	CAD data in different formats, controlled by EDMS. Texts, illustrations, data from tests, data from simulations, manufacturers etc.
	submit --> approve -->	**Procedures:** to approve, to release, to notify...	Approved data, brainstorm data.....

Information about Product Data Management (a general term for EDMS) may be found on http://www.ideal.com/pdmic .

2. What is an EDMS in Industry

CERN must try to get the maximum benefit from what has been developed in the industrial world.

Mik.Ferran@cern.ch

Industry has evolved constantly since CERN built its last big detectors and accelerator. There have been severe cuts in industrial cash since the global downturn of the late eighties and it seems clear that EDMS have been developed as much to **survive** in these **hard times -** by saving material, time and expense - as for their promise of technical excellence. All of these aspects are of interest for the LHC, especially in its **quest for quality** and need for **explicit communication** between different places and times.

The desire to reduce the time to market drove the development of **concurrent engineering.** This, in turn, favoured niche specialisation and allowed large physical distances to separate the clusters of specialists involved in creative design processes. The movement of industrial manufacture to cheap countries has accentuated the need for **remote collaboration.** These tendencies rely on good communication, which CERN's WWW can provide, and on keeping information in the computer where it is accessible to all on the same terms and can **survive staff turnover.**

The Task Force studied existing EDMS to see what advantages they promise CERN. A **Market Survey** elicited some thirty replies representing ten interesting products.

Visits to firms committed to setting up an EDMS (the firms were put forward by their respective EDMS vendors) indicated that a five year gestation period is needed to integrate an EDMS in a large enterprise to a significant extent. Lessons learned include that the installation of an EDMS can be disruptive so care must be taken to lose no good will in the initial stages; this would be a serious drawback.

3. An EDMS for CERN

3.1 As Soon As Possible

Choosing and installing an EDMS now is **essential** for CERN. The EDMS will serve to underpin and structure all contributions to the description of the LHC complex. This activity is at least as **urgent** at the moment as any other ongoing engineering task, for the effective management of engineering data, (easy availability, clear relation to other parts of the equipment, guaranteed correctness, good documentation) is as important as the quality of craftsmanship involved in the creation of that data - if the craftsmanship is ever to be appreciated. And if the worldly-wise point out that little of today's data is an accurate description of the final product, we can be sure that in the five-year lead-in time of the EDMS a great deal of final data will be produced.

CERN will soon begin to **shed experienced personnel** and lose considerable knowledge of in-house history and methods. Before these people leave, as much of the existing **knowhow as possible must be** abstracted and **saved** in the EDMS and its procedures. Clearly, this cannot be delayed. Furthermore, the current tendency **towards short contracts** for staff members, the unknown number of collaborators who will work at CERN during brief visits as well as in their home Institutes, combined with the exceptional length of the LHC programs, accentuates the need to shift much of CERN's knowledge out of cupboards and from human memory (in any case inadequate for such a vast undertaking) to a secure computer-based system, accessible from anywhere in the world, at any time.

3.2 Starting Simply.

In the beginning a majority of the members of the EDMSTF were from the **engineering** world. Focusing the discussion on mechanical engineering simplifies the Task and starts in a concrete area where modern industry proclaims an EDMS is indispensible. (All hoped that one day CERN will have an overall Product Data Management system, PDM, to help manage all engineering, electronics, computing, particle physics and maybe more.)

We are in a **learning** phase and **are limited** by our appreciation of what can be achieved. Nevertheless, we must not let our imagination be cramped by current restrictions, the number of characters in a name and so on. We should aim for a system which can be made to articulate a clear representation of the LHC and all its parts. It is not essential to fix details of the user interface now. A user might sometimes like to look at functional hierarchies, structural requirements, catalogues based on a spatial representation or the project's evolution in time, all of which should be possible. The EDMS implementation will mature according to users' preferences. **Clarity and simplicity** of concept are always required, and the user must have easy access to the functions he needs; it must never be forgotten that he is first and foremost an engineer, not an EDMS professional.

The first years of EDMS will concentrate on specific targets in LHC Experiment integration (Atlas, CMS, Alice) and the collider (EST, LHC), but in a growing partnership with other Divisions. As soon as the simplest CERN EDMS is established the **electrical, electronics, civil** etc engineers can expand this model with any special representations they may need to describe their worlds.

Engineering Data for the whole of CERN will come to share the same logical frame of reference and particle physics activities will benefit from having a **homogeneous interface** to the detector descriptions, services and beams.

3.3 An IdeallEDMS for CERN should do the following: (and more)

- ensure that every kind of data we need is **managed** (protected, crash-proof, coherent, gracefully rollable-back, up to date etc). Data may originate anywhere in the world, but when it is managed by the EDMS a copy whatever the format - is held in a safe place.
- ensure the data is **easily accessible,** (at a click) clearly, (2D or 3D graphical browsing) and quickly (even across the Internet, WWW) and without tripping over data we do not need.
- **unify** the total description of the LHC and its experiments, involving all data for design, manufacture, installation, performance, etc etc of the Experiment or Machine.
- be implemented for **common** networked **computer access,** PC, UNIX, X-Windows, Mac etc.
- be open to new software and communication media and ideas while respecting civilizing standards like STEP.
- carry immediate, simple (and total) **explanations, associated** with the data files.
- provide control mechanisms (approval, workflow ...), and **triggers** for cooperating processes, notification of responsibles by e-mail, contributions to and from planning mechanisms and other tools.

A separate document lists User Requirements as part of the Invitation to Tender IT 2374/PPE.

4. CERN's Boundary Conditions for an EDMS.

4.1 CERN needs a Corporate Information System.

CERN needs **one EDMS** which can serve the different experiments and accelerators and be available to CERN in general. Apart from the extra cost which a second or third EDMS would entail, CERN's different projects and Divisions are all obliged, at some level, to deal with one another or with the same services; the Safety Commission, the Finance Division, publicists, educators and so on. The use of different Data Management Systems would complicate these dealings. Adaptability of the EDMS to different departments is not too much to ask of their vendors: CERN has the same need for an enterprise-wide EDMS as Airbus, BMW or John Brown.

The cost of **customising** an EDMS to the working methods of the client is large compared to the initial cost of the package. Introducing the EDMS involves the deconstruction of ad hoc work habits and their reformulation in terms of the computer-based system. This will entail some discomfort for the engineer who was ensconced in a lifetime's experience of approved practices but this discomfort should be minimized. This will represent a challenge to the EDMS Administering Team for it must implement each essential aspect of the EDMS in such a way that it is seen to be a palpable improvement, free of the frustration associated with old-fashioned computerized systems. A "bonus" is the opportunity to unify corporate working methods, inasmuch as the methods introduced - and this must be done piecemeal - can be made to suit CERN in general as well as to the case in hand. In other words, we must beware of creating a set of tectonic plates of procedure which are internally coherent but are in conflict at points of contact with other plates. This is not necessarily difficult, but requires awareness of the needs throughout CERN, the creativity to reconcile them and the authority to impose solutions which are for the common good. The wisest advice for the detailed implementation of the new system will come out of a humble and critical reappraisal of existing methods.

4.2 CERN's Corporate Information must be open to the world.

The particle physics community will have other EDMS working in collaborating Institutes (KEK, DESY, Seattle, Fermilab ..). It may be necessary to consider zones of the Experiments (whole detectors) or the Collider (sections) which are being managed in a foreign EDMS as **"super-entities",** subject to the usual data management functions, check-in, check-out, promote etc, but at a higher level, the detailed evolution being managed by the foreign in-house system. Clarity and openness of the data at all levels - via WWW - will help interchange, helping Institutes to communicate with CERN, and among themselves. Collaborators' "EDMS" may vary in power from those accommodating site-wide systems in other Institutes to the special, in-house libraries of an electronics design package.

4.3 CERN's Corporate Information must be open to the future.

Permanent clarity and usefulness of the accumulating engineering data is essential. CAD tools and the data they use will evolve and CERN's existing data must migrate to the future while remaining explicitly true to the terms, understandings, accuracies etc under which it was produced. To ensure this, we must be careful of how the data is written; there will be too much data to modernize by hand - and the old hands which are familiar with it will no longer be there.

Modern techniques for data storage **are computer based,** they save together the values or numbers with the schema which describes what these values mean. Such schemata are written in formal compilable languages like EXPRESS, an ISO Data Definition Language, and are thus (forever) computer readable. Today's interfaces are learning to handle such data structures and it is reasonable to expect these methods to persist and develop.

We can hope that the CAD vendors we are committed to will soon provide such well-preserved CAD data but we should be able to **require that our EDMS data be perennial.** These computer-based semantics which allow data to be migrated into the future should also help communication with EDMS which may be adopted by collaborators.

We may not wish to specify technically how our data must be represented by the vendor to ensure its eternal life. But we must be aware that our chosen EDMS will either have to be replaced several times or will evolve beyond recognition over the lifetime of LHC. We must satisfy ourselves that **we will not lose** our corporate data organisation in these developments, and we must not lumber ourselves with sclerotic **heritage data** which cannot participate in future developments.

Part 3.
TF Activities.

5. Some of the Work done in 1995

Certain members of the Task Force spent a great deal of time and effort in reading and thinking, some in visiting firms and fairs, some attending demonstrations and talking with vendors and consultants. Over the year fifteen meetings of the TF (the minutes are available) drove and charted the committee's progress through the traditional ceremonies of our culture - these are listed in this section.

The EDMS field is new, the products are developing. By far the oldest vendor is Sherpa Corporation (1984) while Matrix, less than three years old, is more attractive and powerful in some ways than its experienced rival. The customers are new, none of the installations visited could boast a mature EDMS working right through the organization. So the perceived relevance of each EDMS to CERN's needs was the guiding star in the Task Force's investigation.

5.1 The Market Survey

The Market Survey, MS-2374XPPE, made in the summer, reaped hundreds of pages of promotional literature, at present in the keeping of Claude Hauviller. 69 firms contacted by CERN came up with 33 positive replies. Some products were unsuitable, some were offered by several vendors. In the end about ten products were interesting.

5.2 Public Demos at CERN

- April 27 Baghera
- June 29 CADIM
- September 21 Sherpa
- October 5 MATRIX

5.3 Visits to EDMS installations in autumn and trip reports.

•	October 26	Landis & Gyr	Metaphase	(report by Nils Høimyr)
•	October 27	Matra Defense	Sherpa	(report by Antti Onnela and Matt Tarrant)
•	November 2	VAI, Linz	ELDMS	(report by Nils Høimyr)
•	November 3	SBC (+Applix)	RCOM	(no report)

5.4 Consultants and their participation

- **Cray Research** are experienced in the formulation of European Space Agency standard procurement documents. One consultant spent two days at CERN, focusing mainly on the User Requirements Document. (10-11 October)

- **ClMdata** specialize in helping clients to buy (or sell) EDMS. Two consultants spent three days at CERN, interviewed stake-holders, examined and improved the procurement documents. (13-15 November) This was the major consultation exercise.

- **IXI** (Ingenierie Concourante et Systemes d'Information) based in Paris did an analysis of the procurement documents without the benefit of a visit to CERN, thus were able to estimate how good or bad they were from the point of view of an uninitiated vendor.

5.5 Papers produced. (An Invitation to Tender)

EDMS, Engineering Data Management System for the LHC Accelerator and Experiments: IT-2374/PPE, 4Parts.

- Technical Specification.
- Technical Specification. Annexe 1: User Requirements
- Technical Specification. Annexe 2: A Scenario for Call for Tender
- Technical Questionnaire.

5.6 Previous Papers (LHC Notes) on the benefits of an EDMS for LHC.

- What to be implemented at an early stage of a large-scale project. G Bachy, A-P Hameri. LHC Note 315
- Engineering Data Management - a Tool for Technical Coordination. G Bachy, A-P Hameri, M Mottier LHC Note 345
- How Engineering Data Management and System Support the Main Process Functions of a Large-scale Project. A-P Hameri, J Schinzel, R Sulonen. LHC Note 361

Part 4.
The Future

6. Milestones for 1996.

- The Invitation to Tender went out on 11 December 1995 and offers were accepted until January 26 1996.

- The choice of a favourite product will be made according to the established requirements. This product will be bought in a limited quantity for use in the Pilot Projects. (It is hoped that a single product may be agreed on initially, since the Pilot Projects constitute the "fiançailles" and trying to assess several partners at the same time in such an arrangement might make the situation unclear, expensive and, perhaps, unsatisfactory).

- Pilot projects must be planned and ready to go by Easter. All their necessary resources, money, named staff etc must be committed by then. The hoped-for deliverables should also be described.

- The formal adoption of the EDMS, allocation of resources, naming of those responsible and unveiling of initial plans to lead to the fullscale implementation will take place at the end of the summer of '96.

- It is clear that the EDMS Task Force is nearing the end of its study phase. Indeed it evolved and enlarged itself ad hoc to arrive at a CERNwide consensus before launching the procurement procedure. In the coming months the technical realities of the EDMS will become familiar and CERN will be in a position to define the resources and responsibilities for the introduction of EDMS, the system which will be known as CEDAR (CERN EDMS for Detectors and AcceleratoRs).

The present document is being rearranged and put on the Web, see http://cadd.cern.ch/cedar/. At first it will serve as an introduction to EDMS but will soon chart the introduction of the EDMS in CERN and evolve to include practical documentation which is an introduction to CERN's corporate engineering knowledge.

6.1 Pilot projects:

It is proposed to have three Pilot Projects

- *CMS Integration and services:* coordinator Jos Kuipers.

- *Parameters of layout and integration in LHC:* coordinator Josi Schinzel.

- *Design of ATLAS TRT:* coordinators Claude Hauviller and Bertrand Nicquevert. The Projects should last three months and regular contact between the teams should accelerate the learning process.

6 2 Final Choice

We do not yet have a clear idea of which product suits CERN best. It is hoped that one clearly best-suited candidate will be chosen for the Pilot Projects and that it will perform well and will be adopted straight away.

Mik.Ferran@cern.ch

The process of discerning which is the best candidate will be a many-body fit of weighted financial, social and technical criteria, adaptability, user-friendliness, speed, clarity, ease of use and forgiveness and so on. The Technical Specification, particularly the Users' Requirements, defines clearly what CERN needs. The offers and Pilot Projects will bring us closer to reality.

6.3 How much will the EDMS cost?

It is thought that the software will cost hundreds of thousands of Swiss francs. However this is product-dependent and salesmen's opinions say it will still not represent the major part of the cost of introduction.

Most of the cost of introducing an EDMS is in customising it to the working methods of the client. Given the rich collection of working methods existing at CERN the introduction of an EDMS provides an excellent opportunity to work towards a unified, and hopefully simpler, methodological style. EDMS will entail the investment of considerable resources (manpower) but it is certain that there is no other way to support LHC and its experiments successfully through the long, productive and evolutive life which is expected of them. In other words the EDMS cost is, like the activity it covers, inextricably bound up in CERN's engineering.

6.4 Implementation Plan. (elements)

This list of tactical operations **must be backed by a clear commitment of the management** to succeed, for at every turn implantation of the EDMS may face resistance from tried and proved conservatism. The need of a will to reengineer was often quoted in the reference visits. The voice of authority might help convince those who doubt the value of adapting to accommodate the EDMS to accept the new ways of working. Humility on the part of the EDMS team is equally important for they must take care to discern and preserve whatever accumulated wisdom there is in the current knowledge organisation methods.

How to ramp up from 0% to a 10% installation (i.e. the 10% of the collider data or the experiment data which we want to show off as under control and which shows EDMS in a positive light.)

- Establish a good **reputation** early. Salesmanship is essential. Cultivate enthusiasm. The customer is right.
- Contrary to human beings, **computers** are very good at **boring** tasks. At every opportunity we must seek to unburden the user of his most stupid obligations and make the EDMS his firm friend - on which he comes to depend - to devote his energy to creative and appreciative tasks.
- Start in sectors where it is easy to deliver a good result - and earn a good reputation. For EDMS beginners such as we are at CERN, **starting** in sectors which are **already well organized** will be easier - and the privilege of working with people who appreciate organization can teach us lot.
- We need a champion of the EDMS cause at the highest level, does one exist or do we need to cultivate one??
- Even while tackling the 10% plum sector we must build up a global view. We can't advance without knowing where to go. It is the responsibility of the user to analyse his own data management needs and functions - or take part in this process. Based on the analysis he can establish the Product Breakdown Structures and Work Breakdown structures which will be the frames of reference for implementing his data needs in EDMS - and lasting elements of the global view.
- A customer needs hand-holding at the beginning while he and his EDMSman learn to map the local data organization into the EDMS. This phase needs **manpower** and budget-holders must recognize this. But once the hand-holding is transferred to the EDMS which then reminds the user (kindly) of what he must do to keep his data perfectly organized, how he might relate or name his objects and so on, the expense will be repaid.
- The corporate dataset embodies the tradition of the Laboratory. Care must be taken to keep it in good health and move it into the future. This needs a permanent commitment of money and people.

- The EDMS will need an Administering Team. In the first instance the A-Team will help newcomers to fit their data into the EDMS. This exercise will be part of the running in of the EDMS. There will always be newcomers, new permissions will be given, new categories invented, new software tools installed. As a living dataset, the EDMS will always be evolving and improving, it will need specially privileged and skilled people to look after the insides - and the users.

6.5 CERN must plan for change.

We must adopt a pro-active stance towards our vendor partner, ready, even with regret, to dump his product. In any case we should follow the market and recognize when the time has come to move our data to another vehicle, - because our EDMS is slowing down - or becoming too expensive - or whatever, rather than waiting until the writing is on the wall. Our EDMS data must be ready to export. We must keep our data model alive, resilient and modern to benefit from technical advances.
We should keep STEP in mind as the best non-vendor-specific path. (**STEP** is the new **ISO standard** for the organisation and exchange of CAD data; it is relatively new but aims to eventually affect the whole engineering activity). We are free to choose our own vendor, but to be cost-effective we must use bought-in packages where possible i.e. we cannot be free of vendors but must be free to change vendors. There will be always be "best-of-class" products in niche markets with which our ordinary engineering processes wish to communicate in a standard way. That standard way will be through STEP. (http://cadd.cern.ch/cadd_step.html)