



## RELATIONSHIPS BETWEEN ENTERPRISE ASSET MANAGEMENT AND MAINTENANCE MANAGEMENT THESE DAYS

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### **Abstract:**

*The initially purely technological interventions and techniques today integrate more and more knowledge of organization, management, documentation, informatics or base knowledge (e.g. logic, statistics..) to the every day's professional use. Taking the following systems as the synthesis of these knowledges we can determine the tracking of value-creating processes by the convergence these areas:*

- management-helping logistics-specific systems from the maintenance-managing modules of early general management systems,*
- economical systems (like controlling) observing the asset condition and efficiency from financial asset management,*
- operating- and diagnostic-specific informational systems originating from former CMMS systems.*

*Although emerging from different directions, the expected changes will spread with the above convergence.*

### **Keywords:**

*Maintenance, maintenance-managing, CMMS, EAM,*

## **1 DEVELOPMENT OF THE PROCESSES AND SYSTEMS OF THE CARE FOR THE PRODUCTION EQUIPMENT**

In the course of the development of maintenance, which goes back high in the past, already some thirty years ago the intuitive, merely repairing-conserving type methods gave way to the third generation era. Its priorities are a system-based approach and efficient realization, together with conservation and retention of the basic functions of the devices. Such quantitative properties, as availability grade, energy efficiency, economic efficiency and degree of environmental load are increasingly gaining emphasis not only in the case of production equipment of the main processes, but also in the case of the devices of auxiliary processes or even real estates.

Spreading and practical use of methods necessitates the availability of the supporting informatics, both IT devices and IT systems. This presentation gives thought-provoking statements on the development of enterprise asset management resulting from several aspects and various sources.



## **2 THE ESSENCE OF ENTERPRISE ASSET MANAGEMENT AND BROADENING ITS SCOPE THESE DAYS**

According to the huge amount of publications on maintenance, the interventions and methods, which were merely of technical nature in the beginning, became to integrate more and more organizational, managerial, documental, informatics related, economic or general knowledge (e.g. logics, statistics, etc.) into the every day professional knowledge. Considering the systems like

- logistics-specific systems supporting enterprise management,
- economy-based systems monitoring the status and efficiency of the enterprise assets (e.g. controlling), as well, as
- operation- and diagnostics-specific information systems, generated from maintenance philosophies

as a synthesis of the previously mentioned knowledge's, it can be established, that monitoring of value-creating processes is realized by convergence of these areas. With their help the most diverse information demands can almost immediately satisfied, should they come from the levels of operative interventions, process management or enterprise management.

## **3 RESOURCES OF ENTERPRISE ASSET MANAGEMENT AND THE CONVERGENCE OF THE DEVELOPMENT**

The integrated information systems supporting enterprise management combine the financial and the so-called „Point Of Production” systems. Enterprise modules control among others purchasing, stockpiling or marketing data bases, while the production modules track the technology, support production or the prevention of disturbances. Their main characteristics are by now, that they fulfil three main tasks based on real time acquired and processed data:

- archiving standardized data arriving from a broad spectrum, that assures the traceability and reproducibility of processes;
- feedback and feed-forward based on actual data and target data, i.e. the control or surveillance in the traditional meaning; as well, as
- rapid reaction optimization based on known algorithms.

The development seen in the figure below was promoted by such factors, as standardized data bases, using ever larger, speedier and more complex algorithms, networks, providing immediate data transfer between different geographical locations, as well, as solutions automatically acquiring and transferring process data on a technical line. Data tables, first resulting directly from production, being immobile and capable only to perform certain operations, became capable for more and more complicated calculations. Later they became capable of accepting data from more and more sources. Later again not only the amount of stored and processed data developed to a great extent, but also the served area, and thus the depth of data acquisition.

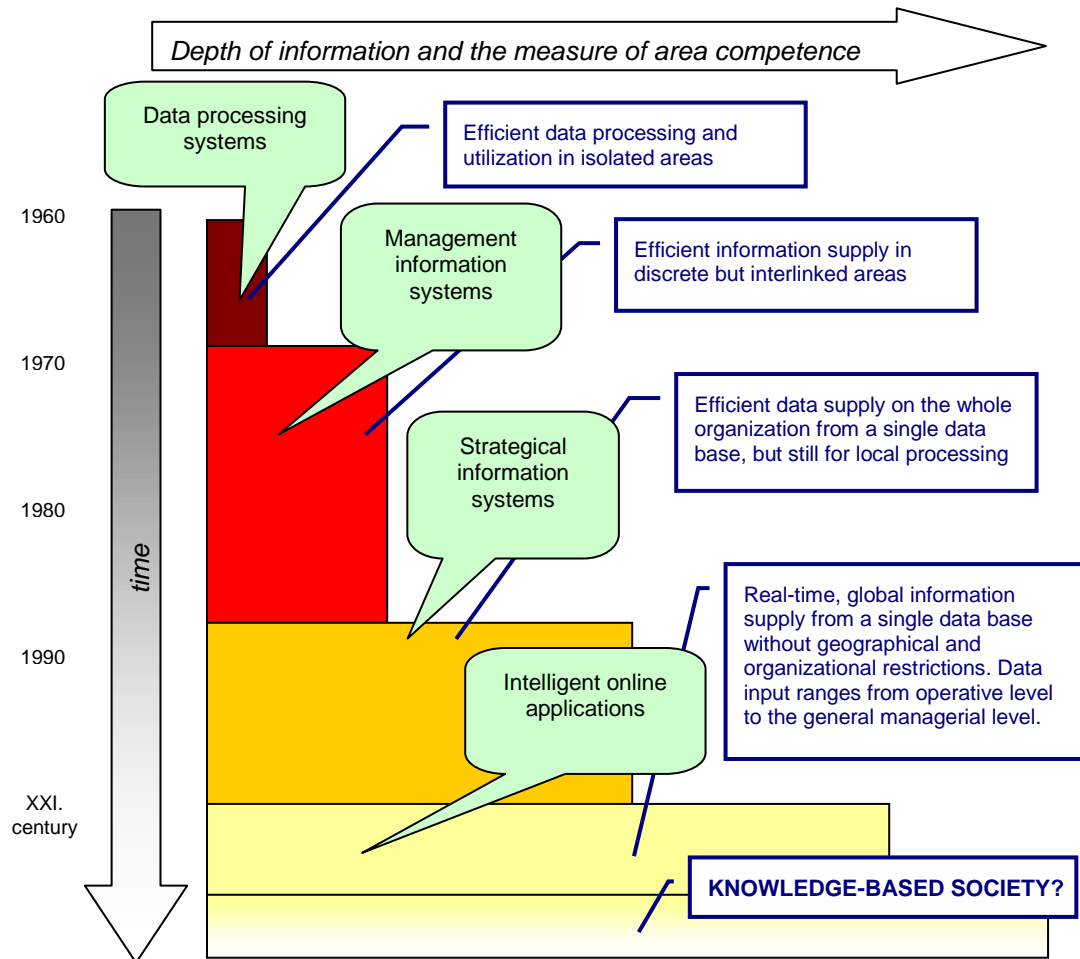


Figure 1: Development of the enterprise information systems (EIS) and their effects

Development of maintenance technologies were hindered by a great number of naturally occurring or innovation-generated problems. Already in times of inventing and necessary maintenance of wheels, the effects of the harmful environment or e.g. material combinations, as well, as human error had to be taken into consideration. Technical progress provided new and new challenges for maintenance processes. The integration into more and more new systems, the breakthrough of informatics used in the devices and the maintenance systems, or the emerging of other aspects, as information safety, personal and other safety aspects, could serve as examples. Further examples are those arrangements, which are intended to assure compliance with the most diverse expectations, e.g. technical requirements, environmental protection, hygiene, work safety, quality management, military or information safety requirements, and obtaining certificates. Although accomplishing all this is proven to serve reliable operation, establishing them and making them a daily routine involves resource consumption and a temporary loss of efficiency in most cases.

The appearance of all these new aspects necessitated the inclusion of the objectives of not only the maintenance personnel, but also of the operators and the management, as well, as the external interested parties (regulations, standards, etc.). Thus both the TPM (total productive maintenance) prioritizing efficiency and the RCM (reliability centered maintenance) which puts the reliable operation of functions required by the users in the foreground, strove to take these factors according their significance into account. The need for the development of an information base concerning operation of resources and adequate flow of information, for proper organization of maintenance



processes, as well, as for an overview on resource levels emerged simultaneously. Accordingly, first the optionally expandable CMMS applications were developed.

The four basic elements of the CMMS systems are the facility-/equipment data base and modules for work and cost scheduling, inventory control and purchasing. Their purpose is to establish and continuously develop a thesaurus for the actual data and observations, the efficient tracking of processes, to help operative and strategic decisions by enabling in-depth analyses. CMMS is basically neither a maintenance system nor a strategic approach, still it is a method of operation, which creates enterprise culture, determines the flourishing of the enterprise. Before its implementation the maintenance regime and the attached logistics system have to be considered and adjusted, because if not, then we will be able only to process incorrect information with insufficient efficiency.

In order to establish a maintenance practice, serving enterprise goals in the long run, the following four areas have to be improved:

- establishing an appropriate maintenance strategy,
- implementation of TCM or RCM as most appropriate for the operation characteristics (as necessary),
- establishing and implementing the preconditions for a computerized maintenance management system,
- training and motivating the employees involved into the new maintenance system.

The traditional integrated enterprise management information systems (EIS) also have transformed. The EIS systems tried to adjust for the growing ratio of small and medium enterprises and the development of informatics. The number of functional modules increased, now they include purchasing, storage, production, marketing, finance, accounting, controlling, inventory control, quality management, human resources, and last but not least maintenance.

In areas, where failure-free operation is necessary, the so-called Enterprise Asset Management (EAM) came up as an independent area and software. Functions of the originally mainly financial and controlling type device were extended to physical devices, too.

Asset management therefore, as it is today, has developed from three sources: the early CMMS systems, the applications of financial asset management and the maintenance modules of the general EIS systems.

Optimal operation of the machinery, real estates or e.g. the public services necessitates supporting informatics and a real time uploading of actual operating parameters. Asset management softwares help preventive maintenance and control, as well as control of keeping to regulations. They provide possibility to decrease downtime, costs, inventory of spare parts and auxiliary materials, as well, as control of maintenance documentation. Integrated software packages of EAM integrate CMMS data bases and services, and production and equipment controlling systems. Generally they may be linked to other enterprise management systems, as well (equipment and inventory control, controlling, etc.).

Although the enterprise asset management (EAM) applications have developed from various directions, a spreading of the already present changes is to be expected, including the previously presented convergence:

- „cloud-based operation”,
- operating by services, using outsourcing,
- mobile data collection and distribution,



- efficient information transfer between data input and output points and the central processing unit (like RFID – Radio Frequency IDentification),
- further integration with monitoring systems, if necessary, combined with alarm techniques,
- spread of certain modular softwares with adjustable parameters.

As this paper deals mainly with expected changes in maintenance management, we certainly have to mention, that all these tendencies require the broadening of professional competence of the maintenance providing organization, i.e. the development of training and abilities, a flare of knowledge, and an ability of enhanced, flexible adaptation to the changes.

Some examples on convergence of the previously described areas and systems:

- the PM (plant maintenance) module of SAP covers all maintenance activities within the enterprise including their planning and support of transactions. SAP PM is closely interlinked with e.g. material management (MM), office automatization (Office & Communication, OC), production planning (PP), project system (PS), asset management (AM), human resources (HR), quality management (QM), in which a maintenance activity automatically generates certain processes. Through reports and orders it enables the study and maintenance of the technical parameters of the stations and their equipment, should it be immediate, planned or condition-based maintenance.
- MA Free CMMS/EAM cloud based service
- CARL Source CMMS/EAM 2010 of four configuration levels from small enterprises to the much larger multinational organizations.

#### **4 'VISION' OF THE FURTHER DEVELOPMENT OF ASSET MANAGEMENT**

According to the outlined tendencies the systems are providing more and more functions in more and more data collection areas, they are operating with increasing competency overlap, which obviously results in increasing similarity, increasingly standardized structure and e.g. data processing logics. In extreme cases they could be integrated into a unique system, promising a general usability for all users. This, however, raises the question, how far they can retain their ability to provide answers to special questions by taking account of the specialities of the given field, based on the information set of the data base.

If this direction should be justified, it is to be expected, that specific new applications would emerge, better reflecting the technical changes in the specialities (e.g. maintenance management) and process control, which would be novelties also from the informatics aspects, therefore leading to certain divergence. Is it possible, that we are experiencing the first period of a pulsing phenomenon?

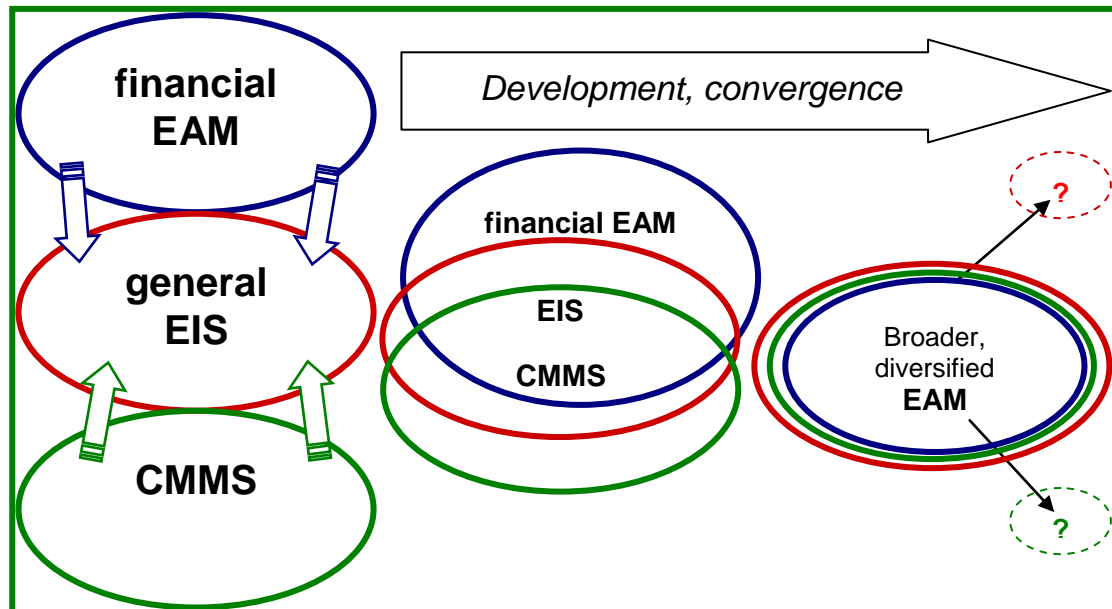


Figure 2: Convergence of management supporting systems

Development rate of informatics will certainly not be interrupted, and several new effects with definite directions will be active.

- Inherent motivation of software and system developers, which may even be independent from customers' requirements, has an extreme driving force on these changes.
- An ever increasing demand is experienced for the capability to evaluate and control all risk factors compromising safe course of business in each elements of the system.
- Of utmost importance is to increase operation safety of the informatics system, as it is becoming more and more complicated, and any elements of a system containing more and more interlinks may generate faults in different areas, which are hard to estimate in advance.
- A further result of the dependence on informatics is, that the system, which performs surveillance over the total organization, will be prone to attacks at various points. An up-to-date supervision of the defence points, therefore, also requires considerable resources.
- Increasingly strict safety measures and methods are needed also in EAM systems, to efficiently safeguard trade secrets concerning market leading products, processes, systems and interested parties.

As the world interlinked with informatics according the 'vision' mentioned in the title of this chapter is no more an exclusive reign of sci-fi, also maintenance professionals are required to prepare for utilizing the growing amount of information at a professional level, to develop a routine for using the up-to-date technical devices, should they be on any level of the organizational hierarchy. Maintenance is no more an isolated organization dedicated merely for solving technical problems, but an important element of a system eager for information.



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