PRESENTATION OF PRODUCTION ORIENTED DATA AND KNOWLEDGE

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Abstract: *This article describes a concept of presentation of knowledge and information in a manufacturing company. The main idea of application mechanism construction is technique of graphic presentation and visualization, which is system's key feature. Technological descriptions and interactive data base play here complementary role.*

***Keywords**: Knowledge base, Data mining,*

***ACM Classification Keywords**: E.Data, E.5.Files, E.5.6. Sorting, searching*

Introduction

Information management systems equipped with a graphical data presentation are one of tools to support the production process. Their goal – wieldy understand - is to provide possibility to monitor production process up to date by managers. The action may also relate to activities within production process directly. Such systems play complementary role by completing lacks in information about production. Other very important feature is production personnel training. This is achieved by introduction of production automation based on modern software and systems support in production designing and management as well as systems of presentation and knowledge exchange. All these actions are related to information visualization methods for better understanding subject of deliberations and analysis.

Visual representation of information

For a long time people were using abstract symbols as essential tools allowing to transfer knowledge or to describe more accurately reality and phenomena in surrounding world. It often appeared that such a message carries more information than most accurate verbal descriptions. Such message was appreciated by scientific community. Detailed scientific analysis allow for easier interpretation of obtained measurements on condition that they will be presented as images and pictures. For this purpose one should use advanced techniques allowing for conversion of obtained data into a static graphical format or dynamic animation. Techniques presenting data in visual form provide better effectiveness of analysis of information. This is direct result of human physiology. Human brain receives information from surrounding world with two hemispheres. Left hemisphere coordinates analytical operations, understanding of symbols and verbal communication. Right hemisphere is responsible for intuition, understanding of space and thinking in global terms. This allows us to see complexity of the world around us and correlation between phenomena.

Presenting data as graphic allows for understanding reality in terms of the right hemisphere. This situation enables achieving generalized picture of data by person analyzing studied problem. Afterword during the research process by using more analytical methods it is possible to find various types of regularity, relations and anomalies. It is highly probable, that humans brain development had been shaped by signals transmitted by sense of sight. Information in form of image, dominates in all signals received by all senses. The above especially relates to humans and in consequence determines possibilities of human thinking.

Using visualization and graphic presentation techniques in building of data base and knowledge systems is therefore highly appropriate and advisable. Reality acceptation in a way described above allows to better understand this issues.

Information and knowledge

Information and knowledge systems made for production processes purposes are not new concept. They are part of group known as KM (Knowledge Management). The goal of this kind of applications is to cluster both information and knowledge.

Information as procedures, instructions available in the process is its general available part, easy to formalize. They can be described by methods that are widely used in presentation systems as text, sound, image, animation etc.

Knowledge however is an intellectual potential, which can be used by a company through its employees. It is difficult to formalize and sometimes even impossible to put in database. Knowledge presentation systems are intelligent applications, whose task is to learn and evolve [Grudzewski 2005].

Creation of universal application which presents both information and knowledge is very difficult. Building process of such tools is determined not only by diversity of production technologies but also specific and individual approach to production management. Often this approach is a secret. Secret that makes the company competitive and is strictly protected. Thus one could say that statement that knowledge and information management systems for companies are individual solutions “custom made”. Selection of technology is a secondary issue here because many available programming techniques offers similar solutions. Information and knowledge are included in general accepted presentation methods and thus these elements are joined together by designers in a way they like.

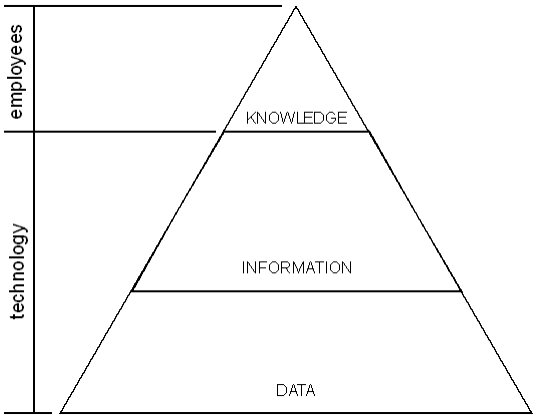

Figure 1. Pyramid hierarchy of knowledge [Alter 1996]

Looking at the pyramid of “hierarchy of knowledge” (fig.1) through prism of production, one can see that data are observed facts, images, and events. Annotated data (interpretation) are becoming information, going further categorized information one can take as certain pattern. Description of information functioning (pattern) and its application gives possibility of its practical use. Thus, use of such information is considered as knowledge. By generalizing, summery of cases and methods of solving problems related to those cases gathered in informatics frames can be called base of knowledge. Assuming that the base of knowledge is to be source describing reality as accurately as possible, to describe such defined knowledge it is necessary to have resources that would give the best view. Knowledge-orientated companies are applying solutions of corporate portals, which

are integrated systems used in efficient communication within company. These systems offer full functionality to its users and enable them compact access to distributed information. Knowledge management relies on information obtained from corporate portals, thus building advanced subject data base available within the community. The solution is already successfully used in practice eg. SAP software. These systems are very complex. For some cases eg. In production, existence of information and knowledge base may be associated with particular technological application and don't have to be connected with extensive portal application. For small businesses wanting to implement management of information and knowledge methods it is sufficient to use properly prepared mechanism with most needed components – that is basic technological base containing information about produced goods. As a supplement such base (correctly and reasonable prepared) makes basis for employees training. By applying techniques of presentation and visualization it is a complete tool to support production and data exchange between technologists and production workers. Like any well designed software tool it has high efficiency in terms of speed of reaction and firm answer. Additionally equipped with elements of presentation and visualization allows for a full description of problem. Such technological base of information and knowledge is a tool which is easy to implement in any manufacturing company. Advantages of implementation are easy to imagine.

Information and knowledge exchange platform

Information and knowledge exchange platform should be a system which is open within the enterprise and focused on its activity. Presented materials, visualizations and tools forming mechanisms of the organization with knowledge contained in the system should be somehow derivative of technology, which company uses on an ongoing basis. Such approach has several advantages. One of the upsides is clarity and transparency of the knowledge exchange environment, which is fundamental element for cooperating teams. Discussions and references to specified visualization environment both designing (CAD) as well as training presentations, allow for quick and accurate assignment of topics and comments. Explanations of components and production techniques form a compact base understandable to the production level employees as well as technologists as a group of experts. Another advantage of using visualization technology is easiness of generating materials, which will be used to build examples data base. Those examples are used in experiences exchange platform. General schemes of devices or mechanisms produced in a company, enriched by decomposition for subsystems and components will help to get familiar with their design. It is very important both for employees actively involved in production process and new people trained as new company resource. According to the argument listed above one can say that increase of quantity of graphic materials will lead to increased assimilation of presented information avaibility of technological documentation related to presented detail will allow for quick reference to the norms, manuals and production remarks [Tufte, 2001]. This will allow for an easy way to find a solution for problems occurred during production process. Platform for sharing with observations (problems in production process) will feed data base with presumptive problems, they will also help to identify defects of production process and possible imperfections occurred during designing. Thanks to such solution there is a possibility to create feedback loop between production and design phase.

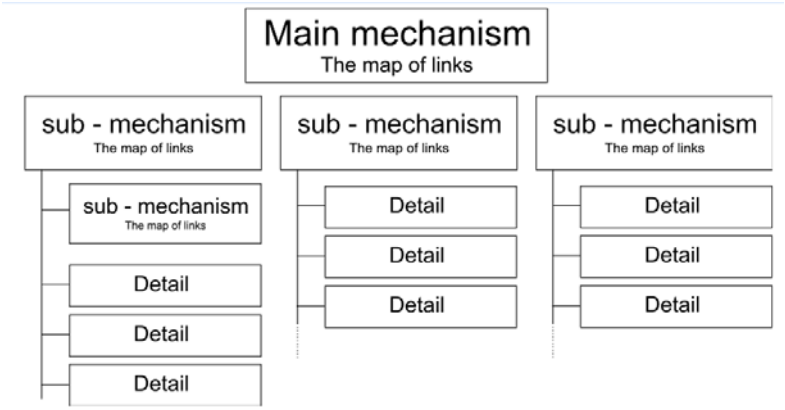

Figure 2. Cascade system layout

Construction of information and knowledge exchange data base has a cascade layout. This layout bases on decomposition described elements (fig.2). The starting points in gathered categories are blueprints of produced mechanisms. Decomposition means, marking components in blueprint and attach detailed description to specified detail. If the detail is still a complex structure, decomposition occurs in a next level. There are as many levels as components (individual). Invariably, the starting point is graphic presentation and visualization of given level of decomposition. Graphic presentations consist of drawings, 3D animations and pictures of whole element or production critical parts. Each element is shown as a 3D animation in order to present detail as accurate as possible (fig.3) Elementary components have dimensional drawings. The key is to show and specify particular important operations in production as an animation.

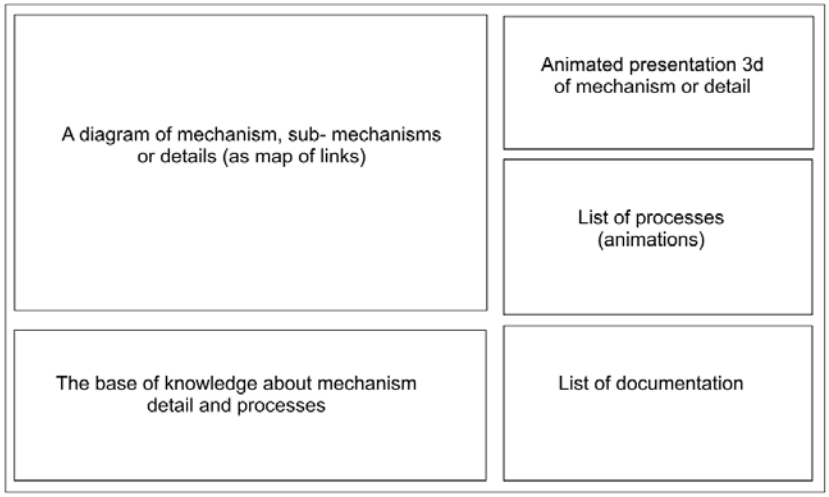

Figure 3. A window diagram of one of the levels in the system.

Every level has its technological description analogical to its complexity. If this is a mechanism, than the characteristic contains essential information about mechanism itself. If described element is a detail, its characteristic is analogical to the one above but extended eg. by technological description associated with used material and detailed dimensional drawing. To each level of decomposition there is assigned a set of rules and instructions, which can be important in reading of description. An essential element in such designed application are smart tags which are links to some key words in specific descriptions of detail, operation or standards or

instructions linked directly to specific level. Since the documents (instructions, norms, procedures) can be set shared between different levels and details, in information data base they occur as relations multivalent to described elements. Such a system allows to assign all necessary documents in a transparent matter.

So far there were presented mechanisms of data presentation includes in production information data base but in order to the system has characteristic of knowledge data base it has to enable possibility to record this knowledge and allow for an easy access to it. Each level has list of experts and knowledge data base, which draws attention to possible problems with production, assembly, storage, etc. This is an open list continuously updated. Roles of experts are entrusted to managing production personnel. Managers role is to moderate each levels and details of processes. Role of experts can be established fixable. To make knowledge data base easily updated its users (production personnel) should have possibility of asking questions and adding comments to threads that have been set up within the knowledge data base by experts or production workers themselves. All questions and comments are recorded in knowledge data base and are moderated by experts. Moderation should make the information clear and complete in order to fulfill production needs. Marking key words for each discussion is responsibility of appropriate expert. This shapes topics and comments in a way to make searching mechanism in an easy way. Data searching mechanism allows for using multi criteria queries categorized by levels, processes, details, tasks, etc. using key words and free returns. The effect of search is a list of items with easy access to the source in a form of a reference to discussion or found production information. Through the link, system operator moves to the level in which discussion had been registered. Operating system developed by these assumptions is an application with controlled access to resources which allows identifying currently logged on users. This helps users to determine availability and readiness of individual experts.

Conclusion

Described system includes basic structure, which allows to create simple form information and knowledge database in manufacturing company. Such data base is built mainly of multimedia presentation and visualization. It becomes a tool to support production which is easy to receipt. Technology descriptions are a supplement that makes proposed construction easy to use and functional mechanism. Knowledge data base is an complement to the system adding very important feature of flexibility allowing for constant problems record and enabling production modification by adjusting it to the technological needs and requirements.

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