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Digitalisation of meetings –from white-boards to smart-boards

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Abstract

Information is a vital resource in development activities of any business. These systems also play a very important role in the knowledge sharing of an organisation. In order to properly bridge over from the information system to the organisation system, the transformation process from data, via information, to knowledge becomes important to understand. A challenge is to create appropriate conditions in both the organization system and in the information system enhancing knowledge sharing among employees, and promote organizational learning. This paper will analyse an industrial example of weekly planning meetings for preventative maintenance, this will be illustrated in the OS-M-IS model i.e. were the information sharing exist in a current situation (whiteboards). A future situation of the same case will be tested and evaluated in a lab environment (with SMART boards and iObeya) as a first step.

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1. Introduction

Production systems (PS), especially assembly systems, are becoming more and more complex. For the organizations to keep up with this complexity, it is crucial that the information systems are developed and transformed. A lot of research is being performed to create more effective and efficient ways to share data, information and knowledge in manufacturing. Areas like industry 4.0, Internet of things and cloud based manufacturing are just a few of these strategies.

In an assembly system, the information system (IS) provides assembly operators with the appropriate information that allows an assembly of products in the right time and quality [1]. Thus reducing the perceived complexity for assembly operators [2]. A well implemented information system should provide the right information (what), at the right time (when), and in the right way (how) [3], and this is not easy to achieve. Information overload is discussed as receiving too much information and could have a negative effect on both individual and organization [4].

To decide what information to present is hard, as Ensley claimed in her information-gap theory in 2000 [5]. Collecting more data does not necessarily result in more or better information. The problem with today's systems is not the lack of information; rather finding what is needed, when it is needed. This was similarly stated by Hollnagel and Woods [6]; "*The belief that more data or information automatically leads to better decisions is probably one of the most unfortunate mistakes of the information society.*"

Information is a vital resource in development activities of any business [7]. These systems also play a very important role in the knowledge sharing of an organisation – when people are aware of possibilities to share knowledge and form communities, information systems could be vital [8]. In order to properly bridge over from the information system to the organisation system, the transformation process from data, via information, to knowledge becomes vital to understand [9]. A challenge is to create appropriate conditions in both the OS and IS [10] to enhance knowledge sharing among employees, and promote organizational learning.

This paper will discuss how information and organization structures are divided in the meeting arena of visual management and classical Obeya-rooms using an industrial case.

2. Visual management and Obeya-rooms

The relation between architecture, management and organisational theory has been treated earlier but not in combination with visual communication [11]. Visual management focuses primarily on visual control in form of boards, andon signals, kanban systems but also the intricate relation between visual communication and management. In lean production there is a space called Obeya, the big room or the war room [12]. The Obeya, in its physical unifying aspect, makes the communication flow more efficient as a home for a cross-functional team comprising for example engineers, designers, suppliers, assembly workers and representatives from the sales department [11]. To visualise information in and by a room like an Obeya is a timesaving way to present and discuss the project through the visualizations for guests and visitors, it creates shorter ways for the information flow, supports fast and accurate decisions and problems are localised immediately [13]. By keeping competences close to production knowledge is captured and retained within the company [11].

3. OS-M-IS model

One vital challenge for industry today is to achieve a high-quality, innovative, and efficient organisation. Main results from Gullander et al [10] shows that there is a need for making the information system and the organisation system work well together and to create appropriate conditions enhancing knowledge sharing among employees, and further organizational learning, known as knowledge management [14]. An innovative structured arena that can glue the systems together is important to achieve flexible organisations (in time and space). A model has been developed to create a structure for a complex situation and to support three important functions:

- 1 Enable innovative and creative meetings in real time.
- 2 Ability store important knowledge generated
- 3 Decision-making and learning in individual, group and organizational system level.

The model is illustrated in Figure 1.

The OS and IS are respectively divided into five sub-areas while meetings are considered in the time and space dimensions. Below follows a brief explanation to each of the three main areas.

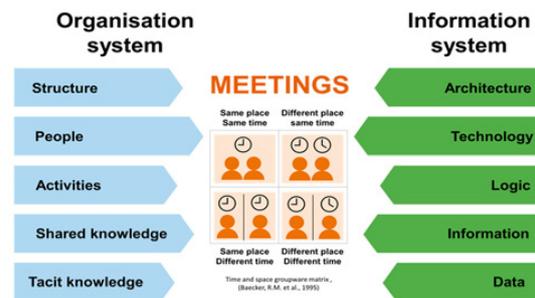


Fig. 1. The MEET-model, modified from [10]

3.1. Organisation system(OS)

Knowledge shared among employees can be classified as either tacit or explicit [15]. Tacit knowledge such as individual's know-how, skills and intuition is not easily codified or articulated because it is embedded in an individual's brain or experiences. Explicit knowledge is more easily expressed and possible to communicate in the form of written documents, such as reports, manuals and drawings [15]. Crossan, et al. [16] provides a structure for organizational learning including learning/renewal in organizations in four processes (Intuiting, Interpreting, Integrating, and Institutionalization) in three levels (Individual, Group, and Organization). This will be done through different kinds of activities i.e. planning, improve, structure etc.

3.2. Meetings

Generally, a meeting is an assembly of people for a particular purpose, which can take many forms. Meetings can be formal and informal, and are characterized by location, ground rules and norms for information exchange [17]. Exchange of information directly between people is the basic purpose, but this communication can be made or supported by different types of information systems, e.g. for presentation, calculation, simulation, or communication. This makes it possible to arrange meetings between people not co-located, and also to transmit information between people over time. These time and space dimensions combined create for different meeting types: same time/same place, same time/different place, different time/same place, and different time/different place [18].

3.3. Information system (IS)

The overall structure, both software and hardware, of the information system is named Architecture and it is the highest level of IS in the OS-M-IS model (Figure 1). The strategy should be aligned with the process of designing, implementing and evaluating information spaces that are humanly and socially acceptable to their intended stakeholders [19]. In 1987, Brancheau and Wetherbe [20] stated that organisations that prosper in the future will be those that integrate appropriate new IS technologies into their entire operation, which is still true 25 years later. Technology is an important enabler of new collaborative work forms with attractive characteristics, technology alone

is not sufficient to enable new, high performance lean engineering practices [13]. McLuhan provided a well-known aphorism “the medium is the message” [21]. When interpreting this, we can state that a medium shapes content in ways that are advantageous to the biases of that medium, as all media have biases. These biases influence not only the content but also the experience of the user [22]. Efficient information flow rely on six measurable criteria; relevance, timeliness, accuracy, accessibility, comprehensiveness and format [23]. The first three are connected to the logic level in the OS-M-IS model, seen in Figure 1, while the others belong to the information level, and plays an important role for information quality [24].

4. Case

The case company is part of a global organisation and the factory itself has ~170 employees. They have worked with lean and virtual management within the organisation for a long time. The department at the company had first started with visual meetings at one meeting using one whiteboard to visualise the information on. Then the number of whiteboards grew to three at a second meeting and then five in a third meeting. Some of the questions we were interested in were; Why this growth of whiteboards? What happens when the walls are full? Is there a better way to present the information?

4.1. Method used

Interviews and observations have been performed over a period from October 2013 until February 2015. Interviews has been performed with totally 10 persons, were several has been interviewed more than one time over this period. The first round of interviews was to collect data of the use of whiteboard after approximately six months, the second round of interviews were when they have used the whiteboards for a year and these questions were also about using digitalisation of information, how this could look and what they felt they could benefit from it. Furthermore, phenomenography [25] has been used as a qualitative method to try to describe the interaction between objects and the individual, described as a phenomenon. In phenomenography a distinction between what is called the first and second order perspective, where the first term describes what an object actually is, facts, it can be observed from outside. Second-order perspective instead describes how an individual perceives the object. The first order perspective is immutable, while the second order perspective, when individuals perceive an object, phenomenon, differ [26].

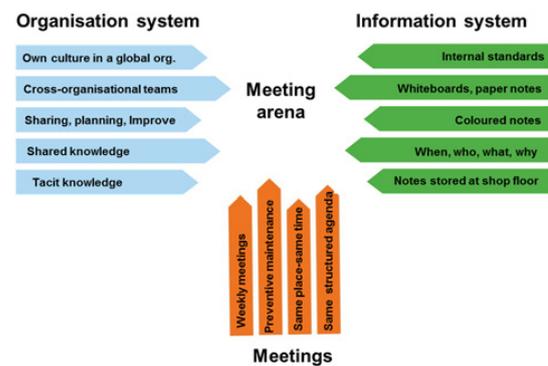


Fig. 2 the facts of the meeting in the case

4.2. Whiteboards- First order perspective – Facts

The interviews were conducted at two different occasions. At the first occasion semi structured interviews were held with a production engineer and an operator. Ten open questions were asked related to the different sub-areas within the meet model and the weekly meeting, the answers given was both facts about the meeting and perceptions of the technology i.e. the whiteboard. Observations of three meetings were also performed to collect facts about the meeting. The facts are presented by using the structure of the Meet-model, illustrated in figure 2.

The *meeting arena* is located at the shop floor in the center of the department. The specific meeting is a weekly meeting for preventative maintenance and was structured with help of whiteboards in the beginning of 2014. The *people* participating in the meeting, known as people in the OS-M-IS model, are from different functions (manufacturing, technicians, maintenance, production management, operators, team-leader, service and specialists). This cross functional group will meet around three whiteboards (*Technology*), illustrated in figure 3. There are two main *activities*; sharing last week's tasks and status by go through the structured notes on the whiteboard and planning next week's activities. The meeting is weekly scheduled with a predefined agenda (*Logic*). The personnel are adding new *information* by adding new notes on the board. The finished notes are stored in a box beside the whiteboard; this information is only available if reading the notes directly from the box. *Data* such as trends and statistics are not available just by looking at the box, which could be seen as lost/hidden data.



Fig. 3 one of the whiteboards used for the meeting

4.3. Whiteboards - Second-order perspective -how an individual perceives the object

The first round of interviews was after approximately six months after starting using the boards. The overall perception of the whiteboards was very positive; all interviewees thought that the information sharing and structure of information had increased. Furthermore, clear visualisation of responsibility of the different tasks is perceived as positive. Some of the people think that it is too much information. The responsible for information sharing thinks that it takes much time to write at the boards and write the same thing at more than one board.

4.4. Whiteboards – Discussion

From the interviews and observations it is clear that the visual aspects of using the whiteboards in this way is effective and appreciated. However, considering the questions regarding the increasing number of whiteboards, the strategy might not be perfect. The responsible technicians responded that it is easy to think that all information is good information, which leads to more whiteboards. Viewing the information in such ways cannot be considered optimum since filtering information is an important part type of improvement.

Hence, there were three main points of improvements.

- Too structured agenda which results in more meetings for discussion and reflection, before and after, which could lead to important information is already discussed at the pre-meetings.
- It is easy that the meeting is seen solely as reporting and information sharing not knowledge sharing.
- The area needed for boards is getting bigger and it is hard to find space (and walls)

The interview for the second phase contained of 10 open question* were focus were on information and knowledge sharing through the whiteboard and how the operator interpret this (second order perspective), seven people were interviewed containing all parts of the team at the meetings. Storing information to show trends etc. has not been prioritised the first year and is a possible improvement. We have focused on information sharing and that the structure of the meeting should work.

There were mainly four areas of possible improvements that the persons saw if going from regular whiteboards to smart-

* How often do you attend the meetings? • If you are regular representative for your department? • What is your role in the meeting? • What information share / provide to you? • What information presented at White-board today is important for your work? • Do you miss any information? • Is there any information you would like to have more clearly presented? What? • What information would you want to take advantage of without having to go and look at White wood board? What? When? Why? • Would you like to have real- time meetings more often / more often than once a week? • How does the white-board help you in communication and learning?

boards;

Connect current data from information systems automatically into the boards. This will save time for the personnel that handles the data. If the data comes from another person or program it could be connected automatically.

Possibilities to choose different presentation modes. Some of the personnel wants to see work orders and tasks in a more visual way i.e. as a layout instead of a table. This could be possible using digitalisation.

Connect different boards to each other to avoid writing the same information many times.

Dynamic information up-dates. If someone receive new information it would be good to be able to post it on the board even though you are not in place (flexibility in time and space)

4.5. Smart boards- First order perspective - Facts

Interactive whiteboards (IWB) have been used for a long time, but mainly for education. Skarin has reviewed international research regarding students, motivation and knowledge due to interactive whiteboards and concluded as: *Students' motivation and skills increase, they develop both increased independence and collaboration abilities in a group. Increased motivation among students in turn leads to increased involvement in lessons, which promote learning. Effects on motivation and commitment found in the teaching that focuses on learning as a process rather than on solving specific tasks* [27]. This could be useful in industry as well. An important aspect is to use the boards as interactive boards and not only as an expensive whiteboard end projector, which has shown to be quite usual in education environment. This could be lack of interest or knowledge among the teachers [28].

In this case we have used SMARTboards as IWB and iObeya as software. iObeya is the 1st Digital Visual Management platform for Lean [29], Agile practices that are on the market today. One of the costumers says: *“After a successful 6 month pilot, we have decided to deploy iObeya on a large scale within the Volvo Group. Digital Visual Management avoids misunderstanding and brings efficiency to global teams, through reduced travel, development time and emails. iObeya is a “must” for a global company working Lean.” Philippe COLOMBO (GTT – Process & IT – Head of Knowledge Management and Visual Management, Volvo)*

4.6. Smart boards - Second-order perspective -how an individual perceives the object

The same case will be tested and evaluated in a lab environment as a first step, illustrated in Figure 4. Furthermore questions such as; what information should be stored? How should it be stored (and tagged) to be easy to find the next time? In what media should it be stored? I.e. text, movies, pictures audio etc. will be answered and illustrated. The meeting cube at the CSI-lab was developed to create a test-bed for industry to be able to test new technologies.



Fig. 4 Meeting cube at the CSI-Lab

As a first step, the maintenance manager and technician join in for a course in the smart board to see if there were interested in the technology and to avoid seeing it as a projector and board, mentioned earlier. Furthermore a demo of a virtual room was tested (seen in Figure 5). The first reaction were very positive and she saw the potential of achieving the possible improvements.

The demo will be further modified in the lab environment before testing it at the company. All the possible improvements will be added to the demo and be tested. Further interviews and observations will be needed in order to give a clear evaluation. This will give the company the chance to test it before investing in technologies that might not be used [30]

5. Conclusion

Virtual management has been proven to be a good way to communicate across functions in a company. We believe that to be able to filter and share information, digitalization of the obeya rooms and virtual management is vital. This digitalization enables more efficient meeting arenas that allows a more flexible organization in a more globalized environment. Furthermore, time-saving and dynamic updates is seen as great potential.

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Fig. 5 example of the demo of the iobeya room

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