

Original Article

Visual Management in the New Environment Industry 4.0: Analysis, Benefits and Challenges

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Abstract - The actual industrial revolution Industry 4.0 will completely switch the industry in an intelligent process transformation called “smart technologies”. Industry will benefit from an efficient and sophisticated products to avoid waste time in most factories. Immediately after the appearance of this new revolution, new solutions and new products are needed; this is to be considered in the framework of the lean tool Visual Management (VM) to cooperate with the current technology Internet of Things and, as a result, the digital Visual Management (VM) tool instead of the traditional visual management. This work aims to analyze the integration of VM tools in Industry 4.0 based on the proposed application. In fact, the VM will play a significant role in this industrial revolution. This work identified the possible benefits and challenges of integrating VM in this environment and discussed the adaptation possibilities. To maintain the explosion of information flow brought about by the Internet of Things (IOT) and get beyond the challenges presented by connected industry solutions, Virtual Machine (VM) deployment in this new industry VM 4.0 is necessary. The outcomes of integrating Visual Management with Industry 4.0 show how these technologies may be used to handle industrial concerns and boost productivity.

Keywords - Industry 4.0, Lean manufacturing, Lean 4.0, Visual Management, Visual Management 4.0.

1. Introduction

At the Hannover Fair, Industry 4.0 was introduced [1, 2]. It was created as part of an initiative to remotely automate production, which was started by the German government’s high-tech policy. The goal is to spur industry interest in and transition to this new revolution, which is predicated on a cyber-physical production system that suggests object-to-object communication [3]. Many things should be modified to use this new technology, such as lean manufacturing tools developed at Toyota Company after World War II [4]. One of the lean tools that is already in use and plays a significant role in manufacturing to maintain factory order is Visual Management [5]. In a previous study, we discussed the evolution of the following tools and their roles throughout the industrial revolutions: visual management, Kanban, Andon, and the recently established term Lean 4.0. For example, it might be appropriate to separate marketing and sales solutions from supply chain management; otherwise, the new visual management environment could take control of managing the flow of information and the data explosion brought on by IOT to display the necessary information in the various departments that depend on each other within the smart factories. In this work, we examine how visual management operates and how it has been adjusted to the new Industry 4.0 environment. In another way, what are the benefits and challenges?

2. Industry 4.0

Using the concepts of Cyber-Physical Systems (CPS), the fourth industrial revolution, or Industry 4.0, made factories smarter by utilizing cutting-edge information and communication systems and emerging technologies that are a part of the broader Internet of Things (IOT) trends [8]. This fourth industrial revolution uses cloud computing and other automation technologies to impact the manufacturing environment [3]. It is typified by a merging of technologies, making it more difficult to distinguish between physical objects, machines, sensors, connectivity, and communication. It enhances performance through the use of digital technologies and internet access, fostering a sense of immediacy and information sharing throughout all business divisions. It talks about how the production environment is becoming more automated and digitalized and how digital value chains are being developed to facilitate communication between goods, their surroundings, and business partners. [9].

3. Lean and Industry 4.0: Lean 4.0

Many Production sites can be controlled by Lean employing coordinated techniques and principles [4]. In the industrial world, it is greatly valued as it immediately contributes to the integration of humans and machines [3]. According to enterprise management, lean manufacturing can be defined as a customer-focused approach aimed at



achieving maximum results [1,2]. The concept of lean manufacturing is based on the idea that gains may be made by employing the most cost-effective methods and paying particular attention to eliminating waste or muda in Japanese [10]. It calls for “half of the human effort, half of the manufacturing space, half of the investment and half of the engineering hours for a new product in a half of the time” [11]. Additionally, it seeks to expel all forms of waste [12].

Combining Lean Management (LM), which focuses on removing waste from management processes, with Industry 4.0 to boost productivity, cut costs, and shorten cycle times while maintaining customer needs is known as Lean 4.0. With the connectivity and constant access to all departmental data and information, this integration in the smart industrial transformation will support and optimize decisions within businesses. It gives an example of a use case for cloud computing and machine condition monitoring that can raise maintenance productivity overall [13]. Lean 4.0, like Industry 4.0, is a component of the Internet of Things (IOT), which enables communication across various factory departments to realize the goals of the entire industrial structure, including smart factories, reducing waste and rework, improved quality, and dynamic maintenance activity planning.

4. Classical Visual Management

As described, visible management, also referred to as visual management, is the process of revealing the management and operation station through an intuitive method so that the team can visually monitor the work being done and swiftly identify appropriate solutions and preventative measures [14]. Consequently, it enhances a remarkable transparency in industrial structure [13]. First, the visual management tools were physically put on boards by hand. Therefore, anyone could alter them [15]. Standard operating procedures displayed at manufacturing workstations serve as a contemporary illustration of traditional visual management [16].

Visual management optimizes management and organization through sight. Its purpose is to track and facilitate the transmission of information for all members at all levels. This visual communication is intended to achieve the objectives set and to obtain precise monitoring of developments. The organization of visual management is, in fact, the communication medium, which is then separated into sections that correspond to the KPIs or the essential data that the team needs on a daily basis. For a considerable amount of time, all Toyota Production Systems staff have been using visual management. As such, it is a cornerstone of Lean. For a good implementation, this visual expression methodology is linked to the TPM method and the 5S method. The application of this system requires simple tools such as panel tables where indicators will be displayed. It is

necessary to display titles to understand the purpose directly. The displays make it possible to identify whether the expected results are achieved or not. As well as actions and additional information that indicates how to improve or correct a result or dysfunction and to facilitate reading. In other words, visual management guarantees transparency and pushes the responsible to be involved and react to the relevant indicators of each department and organize the known top five meetings, which makes it possible to manage the various activities efficiently. In case of a deviation or anomaly, the visual management provides unprecedented responsiveness. This involves identifying the problem, dealing with it by the teams, and monitoring the indicators. Responsiveness, quick reaction and immediate understanding are the best ways to collect the key information, which can be recorded quickly and solved. Visual management can be considered as an improver for the performance of the company which allows the involvement of all members to increase continuous improvement in a process.

5. Visual Management 4.0

VM 4.0 adoption entails selecting digital transformation and moving to digital visual management in terms of integrating connected and digital solutions from the outset. Smart visual management for the modern industrial environment 4.0. The primary goal is to quickly and easily obtain information so that you may take appropriate action to improve a variety of production operations. This is accomplished by expanding the utilization of human potential resources in addition to developing digital technologies [5].

6. Physical Visual Management vs Visual Management 4.0

Physical visual management is just as effective as digital visual management, however, it encounters more limits in terms of capabilities. Indeed, digital management allows a multitude of possibilities, storage, display as well as more precise personalization depending on the department. Its greatest strength is updating, and the data represents the business situation in real time. This gives the teams the opportunity to be more responsive.

In addition, the parameter setting of the indicators can be more varied, and calculations and statistical reports can be fed in real time, which means that the use of icons, images, colors, diagrams, and text transmits information. These are employed to condense and support the primary message that is presented through the visual message. Visual management 4.0 is often more relevant when dynamics are assigned to lean tools (like VSM and Kanban) and completed with statistical data utilizing the Internet of Things, together with solutions for real time data control and corporate intelligence. This can improve the company’s overall quality management as well as its visual management, enabling the prompt

detection of errors. Additionally, two technologies that have completely changed the way some tasks are carried out are simulation and augmented reality. These two tools ensure skills through staff training and contextualize data [17]. It also makes it possible to represent processes and risks of sharing information between teams. It also allows you to have an immediate and precise report about the situation of the company.

Digital visual management is, in fact, an integrated lean tool into software that allows it to be projected on any medium. The indicators can be monitored, configured remotely and projected. It is an open, wide door to information transparency. Thanks to its implementation, everyone in the industrial structure knows where the team is in the process and can, therefore, play a useful role in meeting objectives. In terms of motivation, this ability to interfere is essential for future manufacturing. It is more appreciable as digital visual management in terms of avoiding several tedious reports and the associated wasted time. Thus, digital visual management is an integral part of the factory of the future. It is essential to manage and animate the displays in order for the strategy to provide the desired outcomes.

Nothing can proceed if the information walls are out of the current, which could provide the Team with significant challenges. Because data is updated and visualized in real time, allowing for the possibility to discover anomalies and make decisions virtually instantly, connectivity and Internet of Things technologies facilitate and streamline more effective and efficient visual management [6]. The digitization of visual management allows more flexibility for the manager (from his position, he can modify a result and broadcast it in real time), as well as more impactful, dynamic display makes it possible to target the audience and modulate their communication. The tools implemented in a visual management strategy should keep the values of the company and human sensitivity to ensure the harmony of the missions and the productivity of the team.

It is not mandatory to make an absolute choice between the two types of visual management. In the current industry the same organization, with direct identification of indicators as well as direct statistics reporting. The highlighting is instantaneous, and thanks to the digital support, the interaction is much easier. Digital visual management creates a natural management dynamic thanks to monitoring. Real time data aids visual management by providing better risk conditions. Visual control and anomaly detection in the system [6]. Additionally, the testing of various production factors and the design of several flows will require the use of simulation techniques, which will improve movement planning. This will assist in locating the sources of waste [7], freeing up more time for performance management as opposed to labor-intensive data entry and reporting.

Table 1. Development of visual management

Classic VM	VM 4.0
Communication space	Interactive digital boards
White display boards	Dynamic digital boards
Rotating display boards	Intuitive digital boards
White Panel	Tablets

The traditional visual management approach primarily uses visual communication techniques (such as whiteboard communications spaces) to convey information and monitor industry operators' accomplishment of goals. This task is made easier by the need to present performance indicators and workplace procedures. The world is evolving at a rapid pace, and new technologies are becoming more and more integrated into both our personal and professional lives. This is evident in the table that above.

The quick change impacts both management techniques and the way businesses manage their workforce. Time management and getting rid of jobs that do not offer value are essential for success, especially in the industrial sector, if you want to become more competitive. Time management that does not bring value is essential for success, essentially in the industrial structure where digital management is replacing outdated visual management boards with more sophisticated solutions. The visual management transition is utilizing the new approach which is displayed in table 1.

The primary objective is to enable all relevant staff members to use interactive touch displays to send information to any department. This includes smart tablets for operators and interactive tools for leaders, and all of them will be able to record and store any information that is discussed during a meeting. Certain programs are set up on the server and linked to various modules, enabling various departments to manage their problems with ease. The information is stored to enable managers to make quick decisions.

7. Discussion and Results

The results of this article, based on researchers' views and industrial experiences, show the benefits of opting for digital visual management in terms of operational issues which can be resolved faster (2-3 times faster) and the efficiency of this tool to manage performance with detection of deviations and the continuous improvement in other words the reduction of data entry time (a field manager spends 20 to 30 % of his mission to enter and compile data) which could have an important impact on the return of investments.

Management visual 4.0 applications as personalized software which is specially designed for companies and their digital visual management. Containing several modules, but there are still issues and problems that are considered unsolved. In consequence, research in this field is needed in the future to reach more understanding of these applications.

8. Conclusion

In the production or operational sectors, operators may need physical visuals rather than digital ones because of the changes in the procedure. But then, digital visual management is more privileged for the piloting, the analysis of the indicators and the implementation of corrective actions. This always ensures access to data; a new challenge

for businesses to increase performance in terms of high quality tools and applications is the shift to digital visual management. This could guarantee more accurate real time information updates using connected tools, smart screens and applications compared to using physical boards. These screens will help to organize brainstorming sessions, schedule, add lists of absent or travelling employees, and even use a smartphone app to access remotely in real time.

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