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The Efficient Information Tool to Smart Factory: ERP

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Abstract: The current study on smart factory and ERP meets some problems, such as disconnected and independent information models. In order to move current situation of ERP forward towards smart manufacturing and smart factory, this paper attempts to present an overview of advancing the field by combine the ERP and smart factory, and suggests manufacturing executives that ERP is a fast and efficient path to achieving smart factory. For the sake of transition from traditional manufacturing to smart manufacturing in smart factory, a systematic framework based on five indexes which contributes to implement ERP system successfully is proposed. Particularly, the proposed framework includes three key issues, i.e., (a) smart report on the shop floor, (b) transparent equipment state, (c) transparent production process, and (d) smart quality management of machine.. As a reference, this paper is promising to bridge the gap from ERP implementation to smart factory, so as to effectively facilitate their production efficiency and cost reduction increasingly.
Keywords: ERP, smart factory, IIOT, industry 4.0.

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1. INTRODUCTION

Along with the applications into manufacturing of some new emerging industry strategies, such as smart factory and smart manufacturing, it makes both chances and challenges for industry and academia. However, the one of the most typical challenges is how to apply information technologies and information systems to achieve the goals as indicated above. In order to realize smart factory, this paper attempts to present an overview of interconnecting and communicating the link between physical process and cyber space technology. Specifically, how to apply the information methods such as ERP is the most important hurdle. There is widespread understanding that the information degree is higher, the possibility of building smart factory successfully is bigger (Berning et al., 2002). However, there are relatively few studies concerned with the concrete and specific path that enterprise can achieve the goal of smart factory. In this paper, its target is to advance the field by combine the ERP and smart factory, and suggests manufacturing executives that ERP is a fast and efficient path to achieving smart factory.

2. LITERATURE REVIEW

Since German government advocated the concept of industry 4.0, more and more attention has shifted from M2M (machine to machine) to IIOT (industry internet of things). M2M focuses on the communication between machine to machine (Cheng et al., 2018). However, the IIOT expands to the combination from machine to objects, workforce, and other infrastructure (Lee, 2015). There is a broad that IIOT contributes the integration of supply chain, because machines can detect, analyze, monitor and communicate with each other (Cheng et al., 2018). In the studies of smart factory, scholars focus their explanatory lens mainly on two realms, that is, either the IIOT (industry internet of things) perspective or the ERP augment (Oatmeal & Guryev, 2018). One real takes an internet-based perspective and argues the IIOT (industry internet of things) and cyber-physical system focus on the return of smart factory investment (Davis et al, 2012). The other realm remain insists the single function of ERP and neglects its impact on smart factory (Lee, 2015).

2.1 Concept and Characteristics of Smart Factory

From the birth of industry 4.0, smart factory has captured much attention of manufacturing executives. The last five years has witness the extraordinary ascent of making smart factory effort. The increased attention of smart factory is no longer a novel phenomenon in the manufacturing industry, but how to build the smart factory still remains a spirited debate among international management researchers (Lee, 2015). Smart factory is the heart of industry 4.0(Davis et al, 2012). It devotes big data, powerful analysis machine, and board information and communication technology to the evolution of supply chain (Cheng et al., 2018). At the same time, the operation process and production line are in the high level of digitization and automation. The machine in the production line can use self-optimization and self-configuration to complete complex tasks. Smart factory converges the information technology and operation technology to transform and improve the supply chain (Oatmeal & Guryev, 2018).

Even though there is no single way to successfully achieving the goal of smart factory, manufacturers should unlock different and diverse abilities (Lee, 2015). For example, from the horizontal perspective, enterprise should integrate a considerable amount of operation systems. What’s more, enterprise should make vertical integration of different manufacturing system such as PLM and MES. The successful operation of smart factory is contingent upon the information degree, operation process and communication.

2.2 Current Situation of ERP Implementation

In recent years, there is a renewed interest in (ERP) applications. Which combine cyber-physical technologies with operation process such production line? Having implemented an Enterprise Resource Planning (ERP) system, many companies are interested in integrating their supply chain internally and externally with the aid of the internet-based methodologies (Cheng et al., 2018). Given its importance, it is not surprising that a lot of enterprises pay much attention to operate ERP for their more advanced improvement, smart factory (Strandhagen et al., 2017). Although the scope of applications varies, the primary needs for implementing ERP

tools remain the same: To detect and monitor holistic activities while anticipating the market but at the same time being flexible enough to handle changes in the short term and reducing the impacts of these changes on the long term perspective(Davis et al,2012). The added emphasis on meeting management objectives, such as meeting due dates, reducing production time, increasing customer satisfaction, and reducing inventory, is an additional reason for using an ERP tool (Burning et al., 2002).

3. HOW TO APPLY ERP TO CURRENT FACTORY?

The smart factory which is birthed by industrial 4.0 seems magnificent, however, for the most enterprises around the word, realizing that does not

Automatically translate into replacing a batch of manufacturing facilities or taking much investment (Ranjanet al., 2017). In the environment of industry 4.0, the most necessary think for enterprises is to make up for the information, digitalization, and cyber-physical technologies (Radziwona, 2016). From the top designation, the smart factory building can be rammed sand (Davis et al, 2012). For the sake of transition from traditional manufacturing to smart manufacturing in smart factory, a systematic framework based on five indexes which contributes to implement ERP system successfully is proposed in this section.

3.1 Smart report on the Shop Floor

There is widespread understanding that the smart report on the shop floor is decided by the degree of integration between machines (Cheng et al., 2018). Media facilities communicate with monitoring machine through the worker-machine interface (Ranjanet al., 2017). It can obtain the production amount and processing time. At the same time, the production information can be brought back to the SFT through the Web Service after scanning the code of personnel and work list by worker (Park & Tran, 2014). They are phenomenon in smart factory as indicated above, what's more, the most critical information tool is ERP which contributes to digital communication and interaction.

3.2 Transparent Equipment State

In the smart factory, ERP implement crop mobility management efficiently. For instance, enterprise can install tricolor lamp to meet the management. There are three color lights displayed on device with special meaning, red means fault, yellow means stop, green means set, color-less means pause. At the same time, the information is thrown back to SFT through the interface and the status of the machine is brought out in real time without human triggering (Davis et al, 2012). Smart machine can collect production parameters and monitor abnormalities (Tao et al., 2017).

3.3 Transparent Production Process

Transparent production process benefits from the cyber-physical system and IIOT in smart factory. We can understand by using the example of

Cloth dropping machine in textile industry. In the process of pressing, the production quality can be affected if the shop floor is not produced according to the pressing time, temperature and pressure value provided in the setting table (Park & Tran, 2014). Therefore, how too

accurately and in real-time return the time, temperature and pressure value has become a topic that managers want to break through. According to theoretical and empirical experience, manufacturing executives explore an efficient path, ERP (Lee, 2015). ERP benefits to record the actual production hours and returns the real-time changes of temperature and pressure during production. It can collect the time in each compression, temperature and pressure value, then verify the manufacturing schedule provided by the engineering department. If the yield is not up to standard, it can also be used as a basis for the engineering department to adjust manufacturing settings.

3.4 Smart Quality Management of Machine

Quality management involves production capacity, equipment maintenance, and spare parts and so on. When enterprise receives a sales orderly, it will evaluate the order to evaluate what kind of machine is best and what machine is the most economical and practical, including the purchase of mechanical spare parts, maintenance and so on. In this regard, foreign companies in Europe and the United States have special project personnel and special enterprise cost control personnel to carry out accounting, in order to achieve the greatest benefit in the least cost (Davis et al, 2012).

For the purchase of machinery, foreign companies such as Europe and the United States will invest a considerable amount of money. At the same time, they are also strict for subsequent maintenance. In production, the normal operation of the equipment and the quality of the tools are important factors affecting the production schedule and product quality (Park & Tran, 2014). Maintenance refers to according to the characteristics of the equipment, Overhauling and cleaning to prevent the deterioration of equipment and prolong the service life of the equipment. Smart quality management plays a prominent role in smart manufacturing in smart factory.

4. CONCLUSION

Managing ERP successfully to achieve smart factory goal has always been a tough and challenging task for manufacturing enterprise. The progress of information is down to the thirsty for higher productivity, perior cost efficiency and better quality good and service. Although information management has attracted academic attention for decades, there are still gaps in the literature. Existing research on information management tends to focus on two disconnected and independent models. Given that information tolls such as ERP is vital for traditional factories of all types and sizes worldwide (Ranjanet al., 2017), more efforts are required for researchers to contribute to this promising and important area. This work provides a reference for bridging ERP system forward towards smart factory. It makes sense to implement information technologies and tools such as ERP under traditional manufacturing conditions and to develop them further in order to ensure their suitability in smart factory. However, there is still a long way to go for transferring the vision of smart factory into the reality thoroughly based on current ERP implementation.

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