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Impacts of Industry 4.0 on mass customization systems

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1 Introduction

In the last few decades, competition between manufacturers gradually became tough, mainly due to globalization [3]. To deal with this new industrial situation, manufacturers offer to customers more and more customized products. This resulted in the so-called mass customization systems [2]. The performance of these systems is close to the performance of mass manufacturing of standard products systems, because they use the same methods and tools to optimize industrial performance.

However, mass customization systems have complex flows of material and information. Moreover, in these systems, customers wait during processing or assembly of their orders, unlike in make-to-stock systems. Therefore, cycle time should be as short as possible. Also, the need of customer involvement in all product development phases is getting more important for mass customization.

In parallel, latest advancements in information technology is able to play crucial role with the urgent need for tools that support the complexity of such systems. In the last decade, various tools (i.e. RFID, barcode etc.) have been implemented to increase efficiency of these system but there is always a gap for further improvements.

Advancements in IT provides new opportunities to create added value in the manufacturing sector. Adopting future manufacturing systems force the industry to change the way it operates, its business model and concept. Present day enterprise resource planning (ERP) solutions needed manual operators to enter the data related to production and processes. Future manufacturing systems focused on merging real and virtual worlds [1] then it is possible to integrate machine data directly to information cloud. Moreover, with the help of the internet, a great variety of manufacturing “Things” and “Services” can be connected to create the “Things” and “Services” Internet, i.e. Internet of Things (IoT) and Internet of Services (IoS). All these transformations mark the transition of current industrial production to the fourth stage (i.e. Industry4.0) which is characterized by smartness and networking.

The application of industry 4.0 concept to current manufacturing systems involve four main important tasks to implements [4]:

1. Customer Involvement.
2. Communication between machines (Smart Machines).
3. Communication between product and machine (Smart Products).
4. Communication between Humans and machines (Augmented Operator).

2. Discrete events simulation model

In order to study the impacts of Industry 4.0 upon mass customization, we developed a simulation model with the above characteristics of industry 4.0 along with customer involvement in the customization process by using Flexsim software. Our motivation is to compare the current mass customization model with industry 4.0 model in order to draw some concrete results. Below mentioned are the base models upon which we will build simulations. In order to simplify the case, we have only chosen Picking and Assembly units. Figure 1 describes the mass customization model with industry 4.0 concepts while Figure 2 describes the current scenario of mass customization (i.e. without Industry 4.0 concepts). Currently, we are trying to replicate these two model in simulation environment in order to get some significant results for comparison.

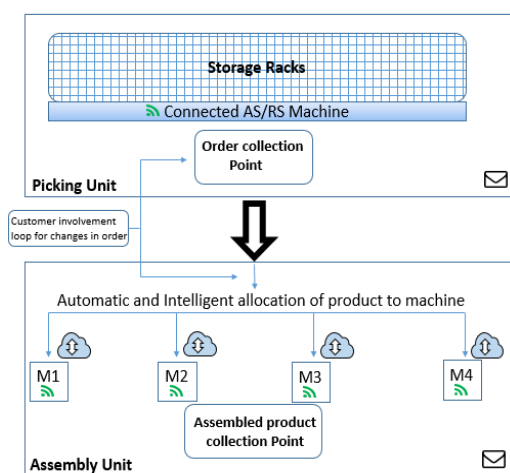


Fig1: mass customization with Industry 4.0

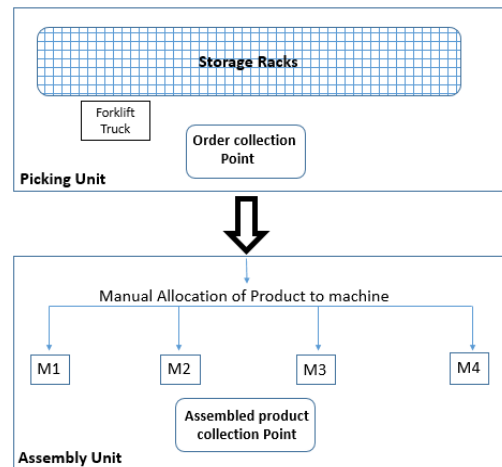


Fig2: mass customization without Industry 4.0

3. Conclusion and perspectives

Impacts of industry 4.0 on manufacturing seem to be promising especially for mass customization systems in relevance to product completion rate on time, customer satisfaction rate, customer involvement and waiting time in queue. Unfortunately, literature about this topic is very limited. Therefore, we addressed this subject. We developed a simplified simulation model in order to proof our assertions about the positive impact of industry 4.0 on mass customization systems. Then, as a 2nd step, we will work on an industrial case by simulation in order to obtain realistic results. Thirdly, we will try to implement industry 4.0 solution, in order to directly measure real results.

4. Bibliography

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