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Visual management system to manage manufacturing resources

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Abstract

The next generation of manufacturing will be focused on utilizing lean tools within production industries. Internet of Things (IoT) has made its progress evolution into the manufacturing industry and has led to improved control when implemented to monitor manufacturing resources. Smart production systems can integrate the virtual and physical worlds and accomplish improved transparency of production processes. These smart production systems will go beyond the traditional means of collaboration to move companies from good to great. In this study a visual management system was developed for resource management research for the Stellenbosch Technology Centre's Laboratory for Advanced Manufacturing (STC-LAM). This system gathers shop floor data and display it in a dashboard. Results and future work was also discussed.

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1. Introduction

The future of manufacturing will be influenced by the attitude towards resource management. Maximum profit with minimum capital investment was generally accepted above the more modern approach of maximum value creation with minimum resource consumption [1][2][3]. Manufacturers of the future should, therefore, be focused on the consumer's needs and value creation niches within production [1][3][5][6]. As a result, industries can be forced

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to have shorter innovation cycles and complex production processes [7]. The importance of this new attitude becomes evident with the emerging popularity of social manufacturing. This new trend in manufacturing which ties into the current production paradigm transformation can be observed in Figure 1 [1][2]. Social manufacturing will be the driving force for the customisation and personalization of products according to the paradigm and in doing so become a smart service for customers [5][6].

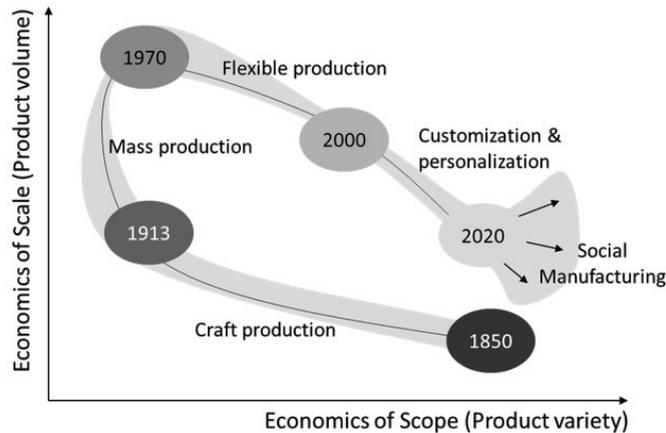


Figure 1: Production Paradigm Transformation [1][2]

In order to adapt to this new paradigm, new visual management systems need to be incorporated into production processes. This can help to promote improved control and performance within the complexity of the new production environment [7][10]. A system of its kind can include, amongst others, a virtual counterpart of a workshop which would generate work packages, schedule them, and track the progress of execution. A visual management system can be implemented within a smart production system environment focused on increased production efficiency and cost reduction. Conversely, it can be implemented on, and customised to, each level of management within a production enterprise. In essence, this system can gather information from multiple sources and use intelligent processing techniques, based on historical operations and future projects, to generate smart resource management scheduling.

To accomplish this feat, a visual management tool unique to a manufacturing process, is necessary. This visual management system must incorporate the entirety of the manufacturing process to promote transparency throughout the company [6][11]. It would serve two purposes. Firstly, it would serve as an access point to collaboration and smart services, where clients, managers or other factories can share resources and secondly, it can be used to enhance resource management techniques through the use of digital visual management tools [10][14].

Therefore, a study into the the implementation methodology of a visual management system will be explored within a production enterprise. This visual management system can significantly help with the business's growth, but for the tool to be implemented correctly, the data gathering scope has to accommodate all the possible activities of the production systems [13][14].

2. Literature Study

2.1. Manufacturing in South Africa

Manufacturing, mining and agriculture represent the main industries in South Africa, with manufacturing contributing to approximately 17% of the GDP [15][16]. While the manufacturing industry shows growth potential, the low skill level of workers, and the unreliable electricity supply will eventually make this service become less

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