UNIVERSITI TEKNIKAL MALAYSIA MELAKA

A STUDY OF VISUAL MANAGEMENT SYSTEM TO MANAGE WAREHOUSE LOGISTIC RESOURCES AT LIKOM

This report is submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Manufacturing Engineering Technology (Product Design) with Honours.

by

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I hereby, declared this report entitled A Study of Visual Management System to Manage Warehouse Logistic Resources at LiKom is the result of my own research except as cited in references

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APPROVAL

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ABSTRAK

Masa depan industri pembuatan akan disasarkan untuk menggunakan alat lean. Internet of Things (IoT) telah membuat perkembangannya berkembang ke dalam industri perkilangan dan telah membawa kepada kawalan yang lebih baik apabila dilaksanakan untuk mengawasi sumber-sumber logistik pembuatan dan gudang. Dalam kajian ini, pernyataan masalah adalah data di jabatan gudang LiKom tidak menggambarkan dan melihat data logistik gudang adalah ketidaknyamanan. Objektif kajian ini adalah untuk membangun, mensimulasikan dan menilai sistem pengurusan visual untuk memvisualisasikan data di jabatan gudang LiKom. Lawatan kilang telah dilakukan untuk mengkaji pengurusan sumber logistik gudang sedia ada di LiKom sebelum sebarang cadangan dibuat. Sistem Pengurusan Visual kemudiannya dibangunkan menggunakan Open As App untuk pengurusan sumber logistik gudang di LiKom. Sistem ini memvisualisasikan data status barangan penghantaran harian, memudahkan proses tontonan data sumber daya logistik gudang dan mengurangkan masa yang diambil untuk proses membuat keputusan. Hasil dan kerja masa depan juga dibincangkan.

ABSTRACT

The future of manufacturing industries will be targeted on utilizing lean tools. The Internet of Things (IoT) has made its progress evolvement into manufacturing industry and has led to improved control when implemented to monitor manufacturing and warehouse logistic resources. In this study, the problem statement is data at LiKom warehouse department is not visualize and viewing of warehouse logistic data is inconvenience. Objective of this study is to develop, simulate and evaluate a visual management system to visualize the data at LiKom warehouse department. A factory visit had done to study current warehouse logistic resources management of LiKom before any improvement is suggested. A Visual Management System was then developed using Open As App for the warehouse logistic resource management at LiKom. This system visualizes the data of status of daily shipping goods, eases the data viewing process of warehouse logistic resources and reduces the time taken for decision-making process. Results and future work was also discussed.

DEDICATION

This thesis is dedicated to my beloved parents that have taught me a lot of things in my life and encouraged me all the way. Their encouragement and supports has made sure that I give it all it takes to finish that which I have started. This project also is especially dedicated to my supervisors for his willingness to spare his time to guide me along from the start of my project until the completion of this project.

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LIST OF SYMBOLS AND ABBREVIATIONS

3D	:	3 Dimensional
IT	:	Information Technology
CIM	:	Computer Integrated Manufacturing
DFM	:	Design for Manufacturability
PLM	:	Product Lifecycle Management
OEM	:	Original Equipment Manufacturer
IoT	:	Internet of Things
2G	:	Second Generation
HDTV	:	High-Definition Television
AI	:	Artificial Intelligence
CPS	:	Cyber-Physical System
M2M	:	Machine-to-Machine
ICT	:	Information and Communication Technology
CNC	:	Computer Numerical Control
CAD	:	Computer-Aided Design
FFF	:	Fused Filament Fabrication
IC	:	Integrated Circuit
CPU	:	Central Processing Unit
MIS	:	Management Information System

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CHAPTER 1
INTRODUCTION

1.1 Background of Study

Currently, the world is on a crossroad of technological revolution which will basically change how we live our life, work, and communication between one another. The complexity, scope and scale of this revolution are likely to be anything humanity has experienced. In First Industrial Revolution, the mechanical revolution, water and steam power enable mechanized production. The Second Industrial Revolution, the electrical revolution, mass production was available with the aid of electricity and division of labors. The Third Industrial Revolution, the digital revolution, establishment of micro-controllers, automated manufacturing powered by IT and the introduction of Internet enable computer and automation to happen which building our modern world. The ongoing Fourth Industrial Revolution will blur the borders between digital, physical and biological existence around the world.

One of the outstanding technologies in The Fourth Industrial Revolution is digital manufacturing which utilized integrated and computer system consists of 3D visualization, simulation and some analytics and collaboration tools in order to produce product and design manufacturing process together. Some manufacturing initiatives such as computer-integrated manufacturing (CIM), Lean Manufacturing (LM), flexible manufacturing and design for manufacturability (DFM) which features the requirement during designing product and process play an important role for the establishment of digital manufacturing system. Digital manufacturing plays an important role for integration between shop floor application, equipment and product lifecycle management (PLM) by permitting interaction between design and production regarding the product-related information. This interaction enable shorten time-to-market, realize volume goal and cut down cost saving since expensive downstream changes are reduced.

The applications of digital manufacturing covered many industries. For instance, a locomotive original equipment manufacturer (OEM) can model the whole manufacturing process including machining, tooling, sequencing for assembly and factory layout digitally while designing process of the vehicle is been carried out simultaneously. Immediate feedbacks will be provided by manufacturing engineers to designers regarding part manufacturability. The cooperative interaction between these two departments will construct an integrated view of product and process design. Besides that, digital manufacturing tools will improve user experience by presenting information regarding the task performed. These tools provide a better and faster decision making solution.

Management system can be defined as systematic framework consists of procedures, processes and policies applied during management of an organization to ensure objectives are achieved. A management system can manage risk and adjust performance which operate the organization in a more efficient and sustainable way. Many elements of organization's operations for example financial success, product quality, legislative, operation safety, client relationship, worker management regulatory conformance are covered under the objectives to be fulfilled by management system.

Visual Management System is a type of management system that communicating information by utilizing signal, diagrams or chart instead of texts. Visual Management System is an approach to act as a solution of wastage reducing in industry 4.0 since its goal is to make the situation effortlessly understand with shortest observation time as possible. This is an important traits for a management system to suite industry 4.0 since it reduce the waste of various resources like time taken to understand the data, time taken to transfer the data and the paper used to transfer the data. Furthermore, it makes the reviewing of data easier since all of the data is been stored in system.

1.2 Problem Statement

Digital manufacturing system which is one of the next generation of manufacturing will be target on utilize lean tool. Implementation of Internet of Things (IoT) to monitor manufacturing resources in manufacturing industry has results in improved control (Steenkamp, Hagedorn-Hansen and Oosthuizen, 2017). Approach toward resource management will affect the future of manufacturing. This is because customers' requirement and value creation are the main focuses of future manufacturers since future of manufacturing industries are mass customization and mass personalization. Manufacturing industries need to transform into having a faster innovation cycle and complicated production process production in order to be able to compete with the others in the market. In order to adapt this transformation, new Visual Management System is required to be integrated into production processes since it establish improvement in term of performance and control (Steenkamp, Hagedorn-Hansen and Oosthuizen, 2017). In this context, data of warehouse logistic resources at LiKom is not visualized towards industry 4.0 concepts. Besides that, data viewing of logistic resources is inconvenience since they are using paper as a media to present daily data to several persons in charge.

1.3 Objectives

The objectives of this study are listed as:

i. To study the current management system for warehouse logistic resources at LiKom.
ii. To propose a framework of Visual Management System for warehouse logistic resources management to ease the decision-making process
iii. To simulate and evaluate the proposed framework.

1.4 Scope

Scope is limitation that set the level of research of a study. In this study, the current logistic resources management system is studied and a framework of Visual Management System for logistic resources management at warehouse of LiKom is proposed. The proposed framework is then been simulated and evaluated.

1.5 Significance of Study

This project will demonstrate concepts that built up part of a framework of online data collection that can improve resources management in a Lean Manufacturing system. Higher level of control of warehouse logistic resources is available for enterprise with higher level of data collection and processing. The advancement in managing resources will lead to positive influences through the whole sub-sequential process. For example, cost, time, and quality will be influenced positively with the usage of visual management tool since it creating a more informative and transparent environment. In short, it releasing the potential of Lean Manufacturing and has the power to drive performance, engage and enthuse the whole company to better results

1.6 Thesis Arrangement

First chapter of this report introduced background, pointed out the problem statement, listed out the objectives, stated the scope and discussed about the significance of this study.

Second chapter of this report discussed about history of First, Second and Third Industrial Revolution. Then it Fourth Industrial Revolution which is currently ongoing is been discussed, its design principles, challenges and impacts also been discussed. After that, manufacturing system and its type is been discussed. Then, digital manufacturing system is been studied. At the end of this chapter, management system and its development are been studied and discussed.

Third chapter of this report discussed about the overall project planning, a flow chart has been drawn in order to visualize it. Then, overview of this study also was plotted in flow chart to visualize it. Lastly but not least, research methodology had been discussed in orderly manner about every steps in the overview of study.

Fourth chapter of this report discussed about the proposal of a new framework to improve the performance of LiKom warehouse department. The pros and cons between the proposed framework and the current framework is also been compared. Then, the setting up of the Visual Management System and then the usage of it is been shown step by step. Last but not least, a discussion about the implementation of the proposed Visual Management System is been done.

Fifth chapter of this report discussed about the conclusion of this study. Some recommendation also been done for further improvement.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

Currently Industrial Revolution 4.0 are currently ongoing and features a series of new technologies including Big Data, IoT, automation, AI, data exchanges, cyber-physical systems, robots and autonomous or semi-autonomous industrial techniques. Then, Industry 4.0 design principles, challenges and impact are discussed. Information transparency, decentralized decisions, technical assistance and interoperability are a few principles involved in designing Industry 4.0. Challenges and impacts of Industry 4.0 toward society, economy and the industry are studied. Furthermore, manufacturing system and digital manufacturing system are also been studied. A few type of manufacturing are listed and the difference is explained. Then, approach, method and advantages of digital manufacturing are studied. Last but not least, management system is studied.

2.2 Industrial Revolution 4.0

2.2.1 First Industrial Revolution

The Industrial Revolution was the transition included from manual production method to machines, different iron processes, brand-new chemical manufacturing, rising usage of steam power, improvement of machine tool and the growth of factory system which took place from 18th to 19th centuries (Clark, 2014). Before the industrial revolution, manufacturing was being completed with the aid of simple hand tool or basic machines by most of the people who settled in small and rural neighborhood. Their daily activities revolved about farming and suffering difficult life as incomes were miserable, experiencing starvation and facing a variety of diseases which was common at that time. A handful of causes led to the occurrence of Industrial Revolution at Britain. With gigantic preserves of coal and iron ore which are foundation of Industrial revolution, politically-stable society, world's leading colonial power which serves as warehouse of raw materials and marketplace for products, growth of mechanization and factory system is the most cost-effective method when demand of British good increase (Ferreira, Pessôa and Dos Santos, 2016). In short, the major causes to the first Industrial Revolution were the expansion of trades and growth of business in Britain.

There are three outstanding sectors which key innovations existed and enabled the economic lift off which Industrial Revolution generally defined. They were textiles industries, steam power and iron founding. The production of cloth was done by single worker in the hut which they lived and products were transported by packhorses in early 18th centuries. The creation of Flying Shuttle by John Kay at 1733 empowers the textile industries because it allows a more rapid woven of cloths with a greater width. This process is been machined later at 1780s with power loom advanced by British Inventor Edmund Cartwright. The spinning jenny was created around 1764 by James Hargreaves enable multiple spools of threads to be manufactured simultaneously by a single worker (Spear, 2016).

First practical steam engine which invented by Englishman Thomas Newcomen was operated primarily to pump water out of mines. James Watt, the Scottish inventor enhance Newcomen's product and the steam engine was available for power machinery, locomotives and ships. The improved steam engine also facilitated rapid improvement of efficient semi-automated factories on a big scale in at places where waterpower was not accessible (Bruland and Smith, 2013).

In the early of 18th century, Abraham Darby explored the usage of coke-fueled furnace as oppose to charcoal-fired furnace previously which is enormously lower in cost and uncomplicated. This invention played a vital role in Industrial Revolution because it enable larger blast furnaces and bring about larger scale of economies. In the mid-1750s, usage of steam engine to power blast air enabling a huge boost in iron production and also overcoming the limitation of water power. At 1850s, Henry Bessemer established the first modest process which made mass production of steel available. This drive the Industrial Revolution further and faster because steel and iron both became fundamental material for everything (Spear, 2014).

There were a few industries experienced vital transformation during Industrial Revolution such as transportation, communication and banking. Raw material and finished product were carried and transported by house-drawn wagons or by boats along streams. At the early of 19th century, first railway steam locomotive was built by Richard Trevithick. This allowed England's Liverpool and Manchester Railway offered daily and timetabled passenger services, which was the first in the world at 1830. More than 6000 miles of railroad tracks was owned by Britain by 1850. John McAdam, a Scottish engineer promoted a new mechanism for road construction at around 1820 which produce a more uniform, more reliable and less muddy roads. On the other hand, communication became simpler with the introductions of electrical telegraph. Electrical telegraph brought huge social and economic impacts at 1866 which a telegraph cable laid across the Atlantic Ocean successfully (Tepper and Borowiecki, 2015). This first form of electrical telecommunications enable people transmit message across large geographical distance for example across both continents and oceans almost immediately. Last