Faculty of Manufacturing Engineering

REDUCING DOCUMENT REJECTION RATE IN ELECTRONIC DOCUMENT MANAGEMENT SYSTEM WORKFLOW BY E-CERTIFICATION AND VERIFICATION STAGE

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DECLARATION

I declare that this thesis entitled "Reducing Document Rejection Rate in Electronic Document Management System Workflow by E-Certification and Verification Stage" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : ……..……

Name : Rashitah Binti Rahmat

Date : ……

APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Master of Science in Manufacturing Engineering.

Signature : ……..……..

Supervisor Name : Associate Professor Ts. Dr. Effendi Bin Mohamad

Date : …….

DEDICATION

Thank you Allah for granting me the strength to finish what I have started.

To my parents

To my husband

To my children

To my colleagues

ABSTRACT

A study is conducted at a paperless ISO9001:2015 certified semiconductor manufacturing plant to improve document approval workflow. Interlinked floor automation systems run the manufacturing line. Online systems such as manufacturing execution system, statistical process control and recipe management systems have parameters and settings extracted from data in electronic document management system (DMS) automatically upon document update. To ensure that products are delivered to customers on time, changes to specifications must be done and approved promptly. Rejected documents during approval workflow require documents to be revised and resubmitted for approval. This rework activity may prolong a document approval process. One of the factors that affect document rejection rate is wrongly written process parameters which cause failure in data extraction. This resulted in many processes on the manufacturing floor to be placed on hold, hence delaying committed delivery to customers. The objectives of this study are to identify factors that influence rejection of documents in the approval workflow, propose solutions to reduce number of documents rejected in the approval process and evaluate the effectiveness of these proposals. Scope of this study covers internal and external documents registered in the company which include policies, job descriptions, organization charts, specifications, technical reports and records. Two proposals to reduce document rejection rate are creating an online application called E-Cert and the introduction of verification step before the document approval workflow. In the first proposal, E-Cert, a 3-level electronic certification process for specification writers has been introduced to ensure that only certified writers could revise or edit any specifications. The new certification process was successfully implemented and the data has been closely monitored for the period of 6 months. In the second proposal, a verification stage is added prior to document revision submission in DMS to filter out any incorrectly written tool parameters and process settings. This verification stage is done for two types of documents: process related and statistical process control related. Data monitored after implementation showed document rejection rate based on wrongly written process parameters was reduced significantly. Document rejection rate for process category document reduced from 48.8% to 6.5% while for statistical process control category the rejection rate improved from 40.5% to 4.2%. Results obtained from both improvements done to DMS have reduced the document rejection rate in the approval process.

PENGURANGAN KADAR PENOLAKAN DOKUMEN DALAM ALIRAN SISTEM KERJA PENGURUSAN DOKUMEN ELEKTRONIK MELALUI E-PENSIJILAN DAN PERINGKAT PENGESAHAN

ABSTRAK

Satu kajian dijalankan di kilang pembuatan semikonduktor bersijl ISO9001: 2015 untuk meningkatkan aliran kerja kelulusan dokumen. Sistem automasi perkilangan yang saling berkait menjalankan talian pembuatan. Sistem dalam talian seperti sistem pelaksanaan pembuatan, sistem kawalan statistik dan sistem pengurusan resipi pembuatan mempunyai parameter dan tetapan yang diekstrak daripada data dalam sistem pengurusan dokumen elektronik (DMS) secara automatik apabila dokumen dikemas kini. Untuk memastikan produk dihantar kepada pelanggan tepat pada masanya, perubahan kepada spesifikasi mesti dilakukan dan diluluskan dengan segera. Dokumen yang tidak diluluskan sewaktu kemas kini sedang dibuat perlu disemak semula dan dihantar semula untuk diluluskan. Aktiviti ulang ini boleh memanjangkan proses kelulusan dokumen. Salah satu faktor yang mempengaruhi kadar penolakan dokumen adalah parameter proses yang salah dituliskan yang menyebabkan kegagalan pengekstrakan data. Ini mengakibatkan banyak proses di lantai pengilangan yang ditangguhkan, oleh itu melambatkan penghantaran yang dilakukan kepada pelanggan. Dua cadangan untuk mengurangkan kadar penolakan dokumen adalah membuat satu aplikasi dalam talian yang dipanggil E-Cert dan pengenalan langkah pengesahan sebelum aliran kerja kelulusan dokumen dimulakan. Dalam cadangan pertama, E-Cert, proses pensijilan elektronik 3 peringkat untuk penulis spesifikasi telah diperkenalkan untuk memastikan bahawa hanya para penulis yang disahkan dapat mengemas kini atau mengubah sebarang spesifikasi. Proses pensijilan baru telah berjaya dilaksanakan dan data telah dipantau dengan teliti untuk tempoh 6 bulan. Dalam cadangan kedua, peringkat pengesahan ditambahkan sebelum penyerahan semakan dokumen di DMS untuk menyaring sebarang parameter alat dan tetapan proses yang salah ditulis. Peringkat pengesahan ini dilakukan untuk dua jenis dokumen: berkaitan proses dan kawalan proses statistik. Data yang dipantau selepas pelaksanaan menunjukkan kadar penolakan dokumen berdasarkan parameter proses bertulis yang salah dikurangkan dengan ketara. Kadar penolakan dokumen untuk dokumen kategori proses dikurangkan daripada 48.8% kepada 6.5% manakala untuk kategori kawalan proses statistik kadar penolakan bertambah baik dari 40.5% hingga 4.2%. Hasil yang diperoleh daripada kedua-dua penambahbaikan yang dilakukan kepada DMS telah mengurangkan kadar penolakan dokumen dalam proses kelulusan.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

DEV	-	Development
E-CERT	-	Electronic Certification
ECN	-	Engineering Change Notice
EDMS	-	Electronic Document Management System
E-HRM	-	Electronic Human Resource Management
EPR	-	Eletronic Patient Record
FMEA	-	Failure Mode and Effect Analysis
HRD	-	Human Resource Development
IATF 16949	-	Automotive Quality Management System Standard
IECQ QC 0800000	-	Hazardous Substance System Management
ISO 9001	-	Quality Management Systems
ISO/IEC 25010	-	Software Product Quality
ISIT	-	Information Success Information Technology
MES	-	Manufacturing Execution System
NGO	-	Non-government Organization
OCAP	-	Out of Control Action Plan
OHSAS 18001	-	Occupational Health and Safety Management Certification
PDCA	-	Plan-Do-Check-Action
PDF	-	Portable Document Format

PROD	-	Production
PS	-	Problem Statement
QMS	-	Quality Management System
RO	-	Research Objective
RQ	-	Research Question
SME	-	Subject Matter Expert
SPC	-	Statistical Process Control
TQM	-	Total Quality Management
UAT	-	User Acceptance Test
VBS	-	Visual Basic Script

LIST OF PUBLICATIONS

Indexed journal

1. Rahmat, R., Mohamad, E., Jaafar, R., Saptari, A., Mohamad, N. A., Yuniawan, D., and Ito, T., 2019. Improving Electronic Document Control Approval Process Through E-Certification. *Journal of Advanced Manufacturing Technology (JAMT)*, 13(1), pp. 33-44. (Published).

2. Mohamad, E., Jiga, I. A., Rahmat, R., Azlan, A., Rahman, M. A., and Saptari, A., 2019. Online Booking Systems for Managing Queues at the Road Transport Department. *JIE Scientific Journal on Research and Application of Industrial System*, 4(1), pp. 21-32. (Published).

Conference proceedings

1. Rahmat, R., Mohamad, E., Jaafar, R., Novareza, Oyong, Mohamad, N. A., and Ito, T., 2019. Enhancing electronic document control approval process through a verification stage. JSME/IDECON 2019 Conference, 23-24 September 2019, Sendai Japan. (Accepted).

CHAPTER 1

INTRODUCTION

1.1 Introduction

ISO 9001 Quality Management System has been implemented worldwide for various reasons, which will be discussed in this study. The flexibility of this standard has enabled ISO 9001 to be adopted by any type of organizations, regardless of type, size and product provided. ISO 9001 elements such as control of documents, training, corrective and preventive actions are broad enough to be used for any type of organizations wanting to start the process of the implementation of quality management system. Various literature reviews have published successful stories of different organizational backgrounds, which include studies from medical fields conducted by (Rodríguez-Cerrillo et al., 2012; Purcell, 2013), service industries such as hotel chains Bangili (2012), non-governmental organizations as explained by Simmons (2011), and education institutions according to Lehr (2012).

Questionnaire surveys have been conducted for both ISO-certified and non-ISO certified, with the responses showed that organizations practicing ISO 9001 perform better in terms of workmanship, as described by Iwaro and Mwasha (2012). They agreed with Priede (2012) statement that closely monitored projects and properly written procedures would result in effective quality management system implementation. As illustrated by To et al. (2012), the key benefits of ISO 9001 include gaining of competitive advantage which results in the improvement of the business performance and attracting new investments. Furthermore, other advantages of using the ISO 9001 are enhanced brand reputation, improved cost-benefits of an organization and streamlined operations. These result in

reduction in waste and customer complaints, improved product,service quality and customer satisfaction (To et al., 2012).

Control of documents play an important role in an organization, regardless of its nature. Documentation, which includes procedures and records, are essential to a corporation as they are evidence of an organization's compliance to a requirement and to create transparency and accountability when needed (Okello-Obura, 2013). Well-defined and documented consistent procedures contain comprehensive information. Easy to read procedures enable employees to better understand their work method, reduce the risk of missing out on any steps hence, executing tasks consistently and efficiently.

Control of documents and records sit in clause 7.5.2 of ISO 9001:2015. This requirement applies to any type of document control system from paper, paperless and now to cloud environment. Requirements for controlling documents based on this standard are as follow;

i) document approval before use

ii) document review, update and re-approve

iii) changes and current revision status are identified

iv) current version of document is available at assigned locations

v) external documents

vi) obsolete documents

Paperless document management system has been adopted worldwide (Veselá and Radim, 2014). There are numerous types available and it is up to an organization to select which one suits best to their business operation (Rodriguez and Piattini, 2015). It is very important to choose the right one for implementation without compromising on the quality

of the service or products manufactured by the firm. Factors that contribute to this are price of the software and the length of implementation process of ISO 9001.

1.2 Problem statement

Automated processes are necessary to cope with the constant changes from customers (Müller, 2018). Figure 1.1 from Muller (2018) shows how information needs to be processed in order to get the required performance. Process improvements are put in place too to make a request or order to be realised.

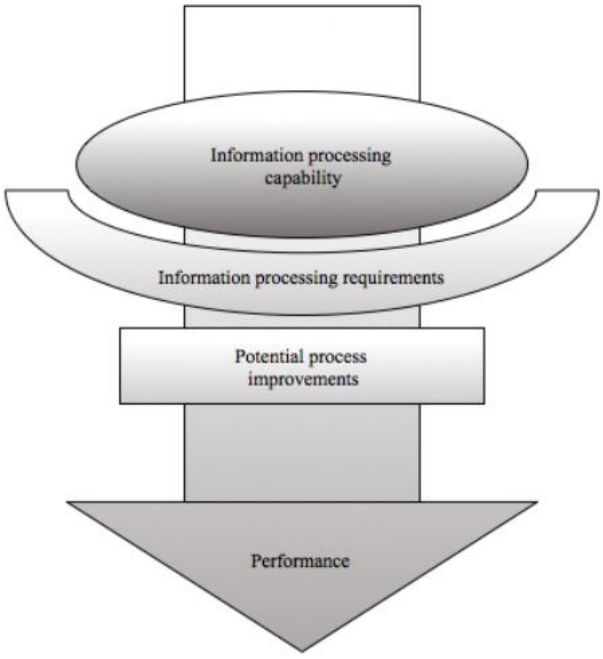

Figure 1.1: Information processing affecting the performance (Muller, 2018)

Special emphasis are adopted on selected processes through improved information flow and automated processes to ensure its efficiency and effectiveness (Smith, 2010). As described by Ramaswamy (2016), organizations invested in digital technology documented benefits through business processes reengineering and data analytics. Findings from Harlan

(2014) showed that even though automation on workflow is carried out, efficiency of a particular process still depend on the users although they increase customer satisfaction. Likewise, for paperless document control, pre-defined workflows for approvals speed up any request for document reviews. These workflows create consistent and standardized process and disallow individuals deviating from the process. Document approval workflow generally includes a document writer submitting a document for approval via document control. Ideally, the total number of documents approved should be equal to the total number of documents submitted for approval, assuming that no document submissions are rejected. In practice, not all documents submitted will be approved.

Rejected documents require them to be revised and resubmitted for approval. For several manufacturing-related cases, documents need to be revised and approved urgently due to customer-related issues. Therefore, resubmitting documents raises issues as it prolongs the document approval process. Product specifications that need to be modified based on the newly revised document will not get updated promptly. Delay in product delivery will result in related external parties to be notified. Unsatisfied customers would damage the relationship with the organization and have a negative impact on the organization's reputation.

There are a few reasons on why documents get rejected in the approval process. This can be due to documents not having enough information or justification for the change to be made, or technical details are incorrectly written.

1.3 Reserach objective

The objectives of this research are as follows:

a) To investigate the factors that influence the rejection of documents in the approval process that will prolong the manufacturing process in Silterra Malaysia Sdn. Bhd.

b) To propose solutions to reduce the number of documents rejected in the document approval process in Silterra Malaysia Sdn. Bhd.

c) To evaluate the effectiveness of the proposed solutions in reducing document rejection rate in the approval process.

1.4 Significant of research

The purpose of this research is to improve the current document control system. Ideally, every time a revised document is submitted for approval, it should be approved without any issues raised by the authorities.

Reduction in the number of documents rejected in the approval process also translates to less rework to be done by document writers, therefore improves on the delivery time for the documents to be received by customers which overall will have a positive effect in customer satisfaction. Enhancement to the document approval process will not add any additional costs to the company. Automation would help speed up the manual work and reduce errors and slipups made by employees in an organization.

1.5 Scope and limitations

The scope of this research covers documents registered in Silterra Malaysia Sdn. Bhd. document management system. These outlooks include policies, job descriptions, organization charts, specifications, technical reports and records. The rules and flow of the system comply to ISO 9001:2015, IECQ QC 080000:2017, IATF16949:2016, ISO 14001:2015 and ISO 45001:2018 standards. This research is limited to documents used for manufacturing purposes both internally and externally for Silterra Malaysia Sdn. Bhd.