

DEVELOPMENT OF SOFTWARE PROCESS IMPROVEMENT INITIATIVES  
BASED ON ISO 29110 FOR SOFTWARE APPLICATION DEVELOPMENT

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DEVELOPMENT OF SOFTWARE PROCESS IMPROVEMENT INITIATIVES  
BASED ON ISO 29110 FOR SOFTWARE APPLICATION DEVELOPMENT

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A project report submitted in partial fulfilment of the  
requirement for the award of degree of  
Masters of Software Engineering

Advanced Informatics School  
Universiti Teknologi Malaysia

JUNE 2017

**To my beloved parents,**

for the inspiration

**To my beloved husband,**

for endless support, love and patient

**To my lovely siblings and my boys,**

for every minutes of your life that I have missed

**This thesis is dedicated to you**

## ACKNOWLEDGEMENT

### *Bismillahirrahmanirrahim*

I would like to express my deepest appreciation to my Academic Mentor, Prof. Dr. Shamsul Sahibudin, for his guidance, advices and motivation throughout six month of this project. It is great honors to learn and working with very experienced and committed supervisor. I also very thankful to the Industrial Mentor, colleagues and IT Department in general for their time, comments and commitments in order to complete this project.

A great appreciation also goes to the UTM AIS lecturers especially Software Engineering lecturers for their help throughout this 2 years course. The valuable knowledge and experiences they had shared are beneficial to the completion of this project. In addition, I would like to excess special thanks to the MSE-Pt 11 course mates for all their contributions and friendship through this 2 years journey together.

Last but not least, a special thanks to my beloved parents, siblings, husband and kids for their endless support, love, encouragement and sacrifice.

## ABSTRACT

A software process improvement provides huge benefits to the software development organization especially in improving the development process in order to produce a high quality software product. However, small and very small organization usually does not implement the software process improvement model due to various reasons. This project studied one of software process improvement model that specifically designed for very small entities – ISO 29110. The Software Application Section in IT Department has only six developers try to implement the ISO 29110 through the development of Best Practice Guideline. The project is divided into four phases where it begins with understanding software development process in Software Application Section, followed by development of Best Practice Guideline document. It continues with implementation on pilot project and analyze result after the implementation. The result after the implementation shows that the Best Practice Guideline provides comprehensive information towards software development process for pilot project. The responds received after the interview also proved that ISO 29110 is suitable for implementation in Software Application Section.

## ABSTRAK

*'Software Process Improvement'* memberi banyak kebaikan kepada organisasi yang membangunkan perisian terutamanya dalam meningkatkan kualiti proses pembangunan perisian bagi menghasilkan produk perisian yang berkualiti tinggi. Walau bagaimanapun, organisasi yang kecil dan terlalu kecil lazimnya tidak berminat untuk mengaplikasikan *'Software Process Improvement'* kerana pelbagai masalah. Kajian ini telah dijalankan untuk mengkaji sebuah *'Software Process Improvement'* model iaitu ISO 29110. Ianya diaplikasikan ke dalam *'Software Application Section'* yang mana mempunyai hanya enam orang pembangun perisian melalui pembangunan Panduan Praktis Terbaik untuk Proses Pembangunan Perisian. Projek ini telah dibahagikan kepada empat fasa bermula dengan memahami proses pembangunan perisian di dalam *'Software Application Section'*, diikuti dengan pembangunan Panduan Praktis Terbaik untuk Proses Pembangunan Perisian. Seterusnya, Panduan tersebut diaplikasikan pada projek percubaan dan analisa hasil daripada percubaan tersebut dibuat. Hasil selepas aplikasi ke atas projek percubaan menunjukkan Panduan Praktis Terbaik untuk Proses Pembangunan Perisian menyediakan maklumat dan panduan yang lengkap kepada kumpulan pembangun perisian. Maklum balas daripada temubual di kalangan warga *'Software Application Section'* juga menunjukkan ISO 29110 sesuai diaplikasikan ke dalam *'Software Application Section'*.

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## LIST OF ABBREVIATIONS

AP	-	Software Application
CMM	-	Capability Maturity Model
CMMI	-	Capability Maturity Model Integration
CMMI-ACQ	-	CMMI For Acquisition
CMMI-DEV	-	CMMI For Development
CMMI-SVC	-	CMMI For Services
CRM	-	Customer Relationship Management
CS	-	Computer Support
ERP	-	Enterprise Resource Planning
FSD	-	Functional Specification Document
ISO	-	International Standard Organization
KPI	-	Key Performance Indicator
KPP	-	Key Performance Plan
MPOB	-	Malaysian Palm Oil Board
MPOC	-	Malaysian Palm Oil Council
PA	-	Process Areas
PM	-	Project Management
PSP	-	Personal Software Process
SDLC	-	Software Development Lifecycle
SEI	-	Software Engineering Institute
SI	-	Software Implementation
SLA	-	Service Level Agreement
SME	-	Small And Medium Enterprise
SOP	-	Standard Operating Procedure
SPI	-	Software Process Improvement
SPICE	-	Software Process Improvement And Capability Determination

- URD - User Requirement Document
- UST - User Acceptance Test
- VSE - Very Small Entities

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

This introduction chapter briefly describes the project overview on Software Process Improvement (SPI) initiatives based on ISO 29110 standard for software application development in IT Department of Mewah Group. This chapter will covers the following areas: -

- a. Company Background
- b. Project Background
- c. Project Objectives
- d. Project Scope
- e. Project Deliverables
- f. Project Duration

#### **1.2 Company Background**

Mewah Group has more than 60 years' experience in palm oils and fats business. It is one of the largest palm oil refinery in the world (by capacity), producing range of refined and fractionated vegetable oils and fats (MOSB HR1, 2015). In 2010, Mewah Group is listed on mainboard of Singapore Exchange.



The first company was established in 1950s in Singapore as small refined palm oils product packing company and today become the group headquarters. The first processing plant in Malaysia was established in Semenyih, Selangor in 1987, followed by second plant in 1993 in Pasir Gudang, Johor (MOSB HR1, 2015). The third plant established in Pulau Indah, Selangor in 2001 (MOSB HR1, 2015). The fourth and fifth plant was opened in 2013 in Pulau Indah and Lahad Datu, Sabah (MOSB HR1, 2015). The sixth plant in Malaysia was opened in 2014 in Pulau Indah which biodiesel plant (MOSB HR1, 2015). Besides physical refinery plant, the company also has several marketing offices in South East Asia, Middle East, India, Africa and Europe.

The company is focused on two business segment which are bulk and consumer pack with numerous type of products such as edible oils and fats to food industry and oleo chemicals, cocoa butter substitutes for chocolate and dairy industries, various grades of cooking oils for normal household and bakery fats, special frying oils and many more (MOSB HR2, 2015).

As a palm oil factories, the companies in Mewah Group are registered and licensed with the Malaysian Palm Oil Board (MPOB) and the Malaysian Palm Oil Council (MPOC). Besides, the company also certified with various standards and certifications (MOSB HR2, 2015) in order to maintain its competitiveness such as:

- a. ISO 9001 Quality Management System
- b. ISO 22000 Food Safety Management System
- c. International Sustainability Carbon Certification (ISCC)

### **1.2.1 IT Department**

IT Department is a shared service department in Mewah Group organizational chart. Its primary responsibility is to provide information technology facilities to the company to ensure continuity in daily factory operation (MOSB HR2, 2015). It is called shared services because the IT Department provides services to all companies in Mewah Group. There are two sections in the IT Department which are Software Application (AP)

section that manage software and information system and Computer Support (CS) section that manage IT infrastructures (MOSB IT1, 2017).

The department is led by a General Manager. In general, there are one Technical Manager, four managers, five assistant managers and 24 IT executives (MOSB IT1, 2017). The total number of IT personnel's in both sections are 35 person. As IT Department have to manage few factories and offices in various location, IT Department is divided in three locations – Central, Southern and Singapore. The Central Team which located in Pulau Indah, Selangor is responsible to manage systems and IT infrastructures for factories in Westport, Semenyih and Indonesia (MOSB IT1, 2017). The Southern Team which located in Pasir Gudang is responsible to manage systems and IT infrastructures for factories in Johor and Sabah. The Singapore Team located in Singapore is responsible to manage systems and IT infrastructures for offices in Singapore, Indonesia, China and overseas sales offices. The organizational chart of IT department is described in Appendix A.

The responsibilities of IT Department is divided into two section which are AP Section and CS Section. However both section always work hand in hand to ensure IT facilities work smoothly. The responsibilities of IT department are described as follows:-

a. AP Section

- Software licensing and software maintenance contract management (for purchased software).
- System/ software development and enhancement.
- System/ software maintenance.
- System/ software supports including daily troubleshooting and housekeeping
- User training

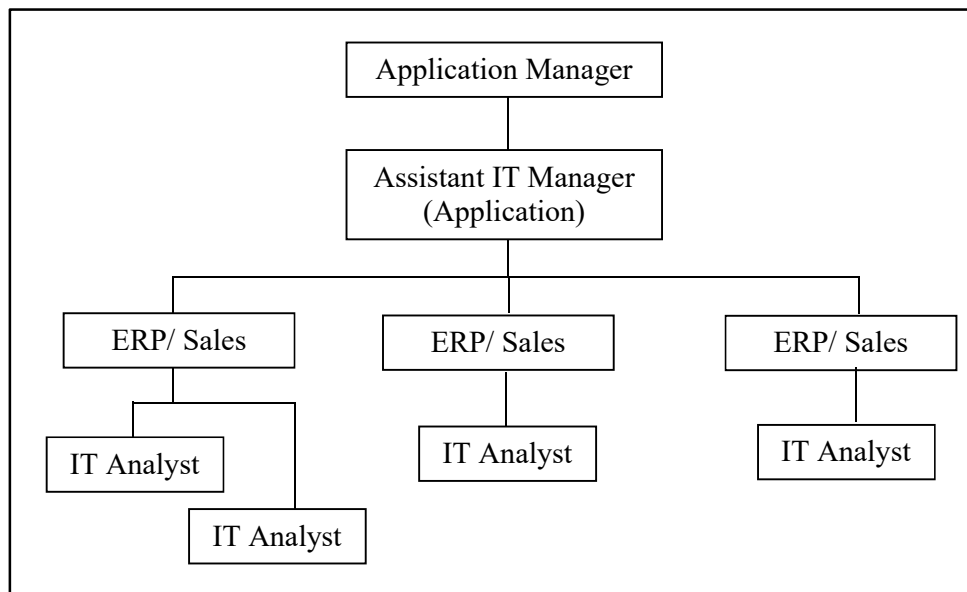
b. CS Section

- Hardware licensing and hardware maintenance contract management.
- Business software administration such as application setup, configuration and administration of integrated systems.

- Email and communication system administration
- Network infrastructure and security administration
- Server system administration
- Computer and IT equipment management and support

### 1.2.2 Application Section - Central

The section is led by Application Manager, one Assistant IT Manager and four Analysts. AP Section is responsible to manage systems and software application for seven companies in Central region. The AP Section is divided into three sub-section (MOSB IT1, 2017) where each Analyst focus on their own sub-section. The AP Section organizational chart is described in Figure 1.1.



**Figure 1.1** AP Section Organizational Chart

AP Section implemented pair programming where two analyst are paired in development project. The senior analyst usually is paired to a junior analyst or new joined staff. The main purpose of using this method is to enable the experienced analyst transfer knowledge to other analyst and also share the workload.

### **1.3 Background of the Problem**

AP Section hold huge responsibilities in managing systems and software applications in Mewah Group. Throughout the year, there are many request for new software applications and also huge number of software enhancement projects. However, in these recent years AP Section faced a serious problems when a lot of projects are either failed to meet targeted deadline or deployed to the production server with numbers of defects. The management had identified various reason that led to this failure and persistently try to improve the weaknesses of the teams. The activities can be categorized into two group which are software development project and daily operational support. The problems in each category are described in following sub-sections.

#### **1.3.1 Software Development Project**

AP Section is using waterfall model for software development lifecycle. Each phase must completed and approved before the next phase continues. The development man-days is range from 2 weeks to 24 weeks depends on the project size and complexity. In 2016, there only 11 projects completed within deadline from total 25 projects in schedule (KPI report, 2016). The percentage of projects completed within targeted deadline is rapidly decrease compare with last 2 years. There are various reasons identified as the failure factors such as requirement changing from time to time even after the requirement document already signed, the requirements captured in the initial stage is incomplete and therefore lead to many changes during user testing phase, the user needs is getting complex but the developer skills or the platform is limited and project timeline is not suitable.

From the 14 projects failed to complete within deadline, 6 projects are actually reschedule due to major changes requested during UAT stage. The process owner realize the critical functionality is missing only during UAT session and it must be added into the system in order for the application to functions properly. Since the development team is very small, between one to three people, most of the time, one person do all the works. Therefore the analyst usually kept the documents in their individual location.

In addition, the sub-section in AP Section has their own sets of documents. The documents and deliverables format is different from each other because everyone has their own preference. Furthermore, the version control is not established and therefore it is not easy to trace the document changes. The incomplete documents then led to the difficulties during daily operational support and enhancement tasks especially on large applications.

### **1.3.2 Daily Operational Support**

Besides development project, AP Section also responsible to support all operational applications and systems especially ERP, HR and Administration, accounting and finance. The daily support activities may include data patching, defect fixing and user guidance. As the AP Section is very small team but have very busy tasks, the documentation is kept as simple as possible. However, sometimes the document is too simple and missed out important information. Besides, the version control is not established where a lot of enhancements documents are not updated to the main document. Therefore, sometimes it is hard to trace the changes have been made to either documents or program files itself. In many occasions, the developer has to review the source codes in order to understand the problem and it is consume a lot of precious time.

The operational support for new joiner or junior developer also become a challenging job because there is no proper documentation for reference. The learning process become difficult and take longer time to familiar with the applications and domains. Usually the senior developer with more experience will help to understand the problems and providing solution for faster results.

## **1.4 Problem Statement**

The current problem faced by AP Section are:

- a. Total numbers of projects fail to meet deadline has increased every year.

- b. There is no standard guidelines or templates for the documents to be delivered during development project.
- c. The analysts face difficulties in daily operational support and usually consume a lot of times due to improper documentations.

## **1.5 Project Objectives**

The objectives of the project are as follows:

- a. To study existing Standard Operating Procedure (SOP) and processes in AP Section.
- b. To conduct gap analysis between existing procedures in AP Section and ISO29110.
- c. To propose a best practice guideline for software development lifecycle in AP Section based on ISO 29110.
- d. To evaluate the effectiveness of developed best practice guideline.

## **1.6 Project Scopes**

The project will involve AP Section-Central only where few tasks will be performed in order to fulfill the project objectives.

- a. Conduct gap analysis between existing processes in AP Section and ISO29110 standard.
- b. Develop a best practice guideline for software development lifecycle based on ISO29110 standard.
- c. Implement best practice guideline developed in pilot project.

## **1.7 Importance of the Project**

The important of this project for AP Section in specific or IT Department in general is the IT Management able to identify the flaws in current software development lifecycle and also find the suitable solutions. In the project also, the AP Section team members able to explore the software process improvement models and it benefits to the organization. The best practice guideline produced at the end of the project will become one of the important reference in the AP Section.

In terms of academic value, the researcher learned to select the suitable standard based on organization requirements and to tailor to the standard to organization process, needs and limitation.

## **1.8 Project Duration and Expected Deliverables**

The total project duration is 19 weeks and are divided into four phases which are Phase 1: Preliminary Study, Phase 2: Development of Best Practice Guideline, Phase 3: Implementation of Best Practice Guideline in pilot project, and Phase 4: Review and Analysis. Project schedule is illustrated in Appendix B and Gantt chart is displayed in Appendix C. The details of activities in each phases and methodologies used will be described in Chapter 3.

The expected work products to be delivered at the end of the project are:

- a. Gap Analysis report.
- b. Best Practice Guideline based on ISO 29110.
- c. Deployment Package.
- d. Closure report.

## **1.9 Chapter Summary**

In summary, the AP Section encounter issues with software development activities and its affect the team performance as well as individual performance. This project is aimed to provide solution through development of Best Practice Guideline based on ISO 29110. Besides, the project also is aimed to create awareness on the importance of software process improvement and its benefits to the organization.



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