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Kampus Sultan Abdul Jalil Shah



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ESTABLISHING CMMISM MEASUREMENT AND ANALYSIS, AND INTEGRATED
PROJECT MANAGEMENT PROCESS AREAS
AT HEITECH PADU BERHAD

NURAMINAH BT RAMLI



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A technical report submitted in partial fulfillment
of the requirements for the award of the degree of
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ABSTRACT

Software process improvement has been proposed to HeiTech Padu Berhad (HeiTech) to improve software process development productivity and system quality, and simultaneously assess its current practices in order to deliver quality software within time and budget constraints. HeiTech has selected CMMISM (SE/SW) model with Staged representation and IDEALSM life-cycle model. HeiTech's mission is to be certified by CMMISM Level 3 by the year 2006. Measurement and Analysis and Integrated Project Management process area are two process areas discussed in this report. HeiTech is facing improper activities on implementing Measurement and Analysis, and Integrated Project Management issues in their current practices. Therefore, a few work products have been produced in response to establish both process areas. They were elaborate concisely in this report. For Measurement and Analysis process area, the work products are HeiTech Measurement and Analysis Guideline, HeiTech Measurement and Analysis Plan, Measurement and Analysis Plan Template, and Measurement and Analysis Report Template. A measurement process based on ETVX has been used and a few measures derived by using PSM approach been proposed to be collected and analyzed. Measures proposed were based on current practices in HeiTech itself. Integrated Project Management process area work product involved with improving Project Management Plan that was established before. Coordination and collaboration issues are the main concern in this process area. The improved plan contains technical and support activities to coordinate all activities among stakeholders associated with the project. To achieve an effectiveness of SPI, motivations and cooperation among staff in the organization in practicing the improved process area are important.



ABSTRAK

Proses Kemajuan Perisian (SPI) telah dicadangkan penggunaanya kepada HeiTech Padu Berhad (HeiTech) untuk memajukan produktiviti proses pembangunan perisian dan kualiti sistem dan secara tidak langsung, HeiTech akan menilai keberkesanan praktik yang dilaksanakan untuk memastikan kualiti perisian terpelihara dalam masa dan kos yang telah ditetapkan. HeiTech telah memilih projek memajukan perisian dengan menggunakan model CMMISM, berasaskan perwakilan berperingkat dan kitar hidup IDEALSM. Matlamat HeiTech ialah untuk mencapai penganugerahan CMMISM Peringkat 3, pada tahun 2006 *Measurement and Analysis* dan *Integrated Project Management* adalah dua proses yang diterangkan secara mendalam di dalam laporan ini. Masalah yang dihadapi ialah HeiTech tidak mempunyai pelaksanaan yang teratur bagi kedua-dua proses tersebut. Oleh sebab itu, hasil kerja bagi kedua-dua proses telah dikeluarkan dan ianya telah diterangkan dalam laporan ini. Bagi proses *Measurement and Analysis*, hasil kerjanya ialah *HeiTech Measurement and Analysis Guideline*, *HeiTech Measurement and Analysis Plan*, *Measurement and Analysis Plan Template*, dan *Measurement and Analysis Report Template*. Proses pengukuran berdasarkan kepada ETVX dan beberapa jenis pengukuran telah dipilih menggunakan pendekatan PSM. Pengukuran ini dipilih berpandukan kepada pelaksanaan kerja di HeiTech. Manakala bagi proses *Integrated Project Management* hasil kerja yang dihasilkan melibatkan memajukan *Project Management Plan* yang telah dihasilkan sebelum ini. Pelan yang baru ini mengandungi aktiviti yang melibatkan teknikal dan sokongan. Untuk mencapai keberkesanan dalam memajukan proses perisian, motivasi dan kerjasama daripada seluruh warga organisasi untuk menggunakan proses yang telah diubahsuai adalah penting.

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LIST OF ABBREVIATIONS

ADVISE	-	Application Development Information System
CMM	-	Capability Maturity Model [®]
CMMI	-	Capability Maturity Model [®] Integration SM
COTS	-	Commercial of the shelf
CUS	-	Customer-Supplier process categories
DAR	-	Decision Analysis and Resolution
eKMS	-	Electronic Knowledge Management System
ENG	-	Engineering process category
EPG	-	Engineering Process Group
ETVX	-	entry-task-validation-exit
GG	-	Generic Goals
GP	-	Generic Practices
HeiTech	-	HeiTech Padu Berhad
HTPADMS	-	HeiTech's Application Development Methodology and Standard
I-C-M	-	issue – category – measure
IEC	-	International Electro technical Commission
IPM-CMM	-	Integrated Product Management CMM
IPPD	-	Integrated Product and Process Development
ISO	-	International Organization for Standardization
IT	-	Information Technology
MA	-	Measurement Analysis



MAN	-	Management process category
MSG	-	Management Steering Group
NASA	-	National Aeronautics and Space Administration
OPD	-	Organizational Process Definition
OPF	-	Organizational Process Focus
ORG	-	Organization process category
OT	-	Organizational Training
PA	-	Process Area
P-CMM	-	People CMM
PDCA	-	Plan-Do-Check-Act
PI	-	Product Integration
PMC	-	Project Monitoring & Control
PMD	-	Practice and Methodology Development
PNB	-	Permodalan Nasional Berhad
PP	-	Project Planning
PROMISE	-	Project Management Methodology
PSM	-	Practical Software Measurement
QIP	-	Quality Improvement Paradigm
RD	-	Requirement Development
REQM	-	Requirement Management
RSKM	-	Risk Management
RUP	-	Rational Unified Process
SA-CMM	-	Software Acquisition CMM
SAM	-	Supplier Agreement Management
SE	-	System Engineering
SEI	-	Software Engineering Institute
SG	-	Specific Goal
SP	-	Specific Practices
SPAWAR	-	U.S. Space and Naval Warfare Systems Center
SPI	-	Software Process Improvement
SPICE	-	Software Process Improvement and Capability



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Determinations

SS	-	Supplier Sourcing
SUP	-	Support process category
SW	-	Software Engineering
TS	-	Technical Solution
VAL	-	Validation
VER	-	Verification



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LIST OF SYMBOLS

- SM

-

Service Mark
- ®

-

Registered Mark

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CHAPTER 1

INTRODUCTION

This chapter will discuss about overview of the company and project involved.



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1.1 Company preface

HeiTech Padu Berhad (HeiTech) which was originated from Permodalan Nasional Berhad Information Technologies (PNB IT) is one of the massive information technology (IT) companies in Malaysia. It has been associated in the nation-building effort undertaken by public agencies. As the new millennium progresses, HeiTech look ahead to a wider role they can play in creating IT infrastructures in both the public and private sectors, not just in Malaysia but abroad as well.



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HeiTech's services are providing total business solutions in IT, including system integration, application development, data center management such as Record Management, and network such as Network Setup & Management, Structured Cabling and Renovation Works, Internet and WAN Connectivity, and business recovery. HeiTech Padu also provides totally custom software applications that will streamline any enterprise, Facilities Management, General Technology Strategy Consulting, Upgrades and Maintenance to complete the loop.

To ensure the success of the customers by delivering the highest quality of work and by focusing on the key competencies in software development, applications development, network management, disaster recovery, facilities management and records management is HeiTech's mission. This mission comes from believe on alphabet 'e', will stand for everybody. For example eCommerce, alphabet 'e' in front of the word means will stand for everybody. This criterion encourages HeiTech to establish their mission.

As a giant company, HeiTech tries to implement organization rather than functional organization and "one man operation" is their slogan. HeiTech has about a thousand of employees that include permanent staff and contract staff. They have five main divisions below executive chairman, Dato' Mohd Hilmey Mohd Taib. There are Finance, Advance Research and Development, Marketing and Business Development, Human Resource Development and Admin and Operations. Figure 1.1 shows the structure of HeiTech Padu's organization.

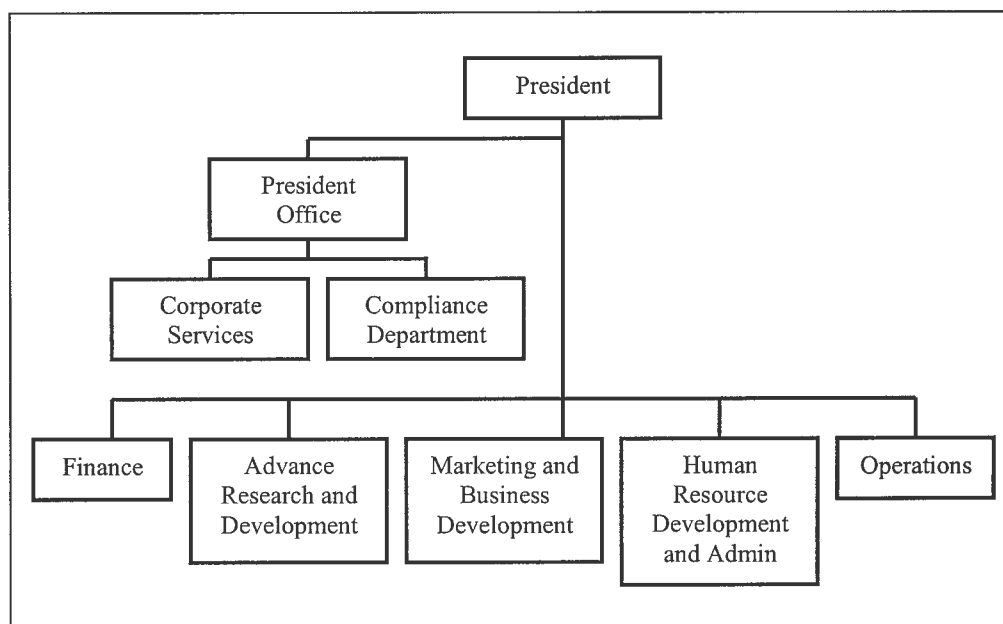


Figure 1.1: HeiTech Padu Structural Organization

Operations Division is one of the five divisions in HeiTech Padu. There are several functions and most of the projects handle under Project Office. The several functions are Project Administration and Operational Support, Project Oversight and Compliance, Project Support and Project Application Development. The CMMISM is one of the projects running internally under Project Support in Project Office. Figure 1.2 shows the Operations Division hierarchy.

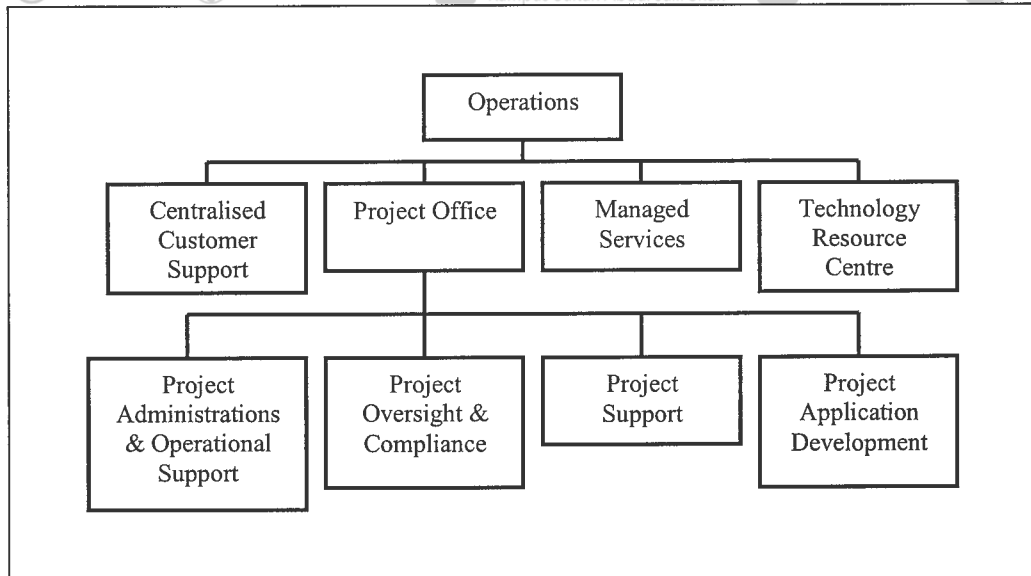


Figure 1.2: HeiTech Operations Division Organization Chart

1.2 Project Background

Process improvement is one of the important aspect in any field either hardware or software to improve quality of a product. It has proven to increase product and service quality in achieving organization's business objectives or goals. Shewhart, Juran, Deming and Humprey from Software Engineering Institute (SEI) discovered that the quality of the product is largely determined by the quality of the process that is used to develop and maintain it. As for software, Capability Maturity Model[®] IntegrationSM (CMMI) is at the forefront of process improvement for product and service development and maintenance.

As stated in the Software Engineering Institute (SEI) website, CMMI was initiated based on a 1997 review of SEI activities by the Office of the Under Secretary of Defense (OUSD) and the interest expressed to the SEI by CMM user community. CMMI was developed by members of the industry, government and SEI and the project was sponsored by the Office of the Secretary of Defense (OSD) and the National Defense Industrial Association (NDIA) Systems Engineering Committee.

CMMI stands for Capability Maturity Model[®] IntegrationSM is a model for improving and appraising the performance of development organizations. CMMI has four (4) models, CMMI-SW, CMMI-SE/SW, CMMI-SE/SW/IPPD and CMMI-SE/SW/SS. CMMI-SW model includes Software Engineering and applied only for software development, while CMMI-SE/SW model includes System and Software Engineering. CMMI-SE/SW applied to the computer system and software. CMMI-SE/SW/IPPD model consists of System Engineering, Software Engineering and Integrated Product and Process Development. It is applied to the system, software and the use of team. Another model is CMMI-SE/SW/SS which comprises of System Engineering, Software Engineering, Integrated Product and Process Development and Supplier Sourcing. This model applied to the system, software, team and COTS acquisition.

All the CMMI models consist of two (2) types of representation; staged or continuous. Both representations have similar process areas, but different way of implementing and organizing the processes. Staged representation consists of five (5) maturity levels. Each level consists of various process areas. The assessment of staged representation is based on level. If the organization has been qualified for CMMI level 3, meaning that the organization had established process areas in Level 2 and 3, and implements practices defined by the process areas. Continuous representation will be assessed according to the single process area or a set of process areas established. The organization will be appraised by a qualified lead appraiser from Software Engineering



Institute (SEI). Any organization interested in applying CMMI must select the best fits in the organization's process improvement needs and suitable with the organization's environment.

HeiTech under their Operations Department take a challenge to perform CMMI in order to ensure the quality of the product produced and competes with other IT companies in the local and international business. HeiTech hopes that CMMI will improve their software process and fulfill customer's need and satisfaction.

HeiTech thinks that they need to improve their software process because of the unlimited outsourcer especially in technology wise, and deficient in process standardization which will result in low quality performance for most of the running projects. Successful projects did not share its success strategy with other projects. Most of the projects are facing critical situation and unmotivated employee that might give pessimistic impact to the project and the organization as well.

To introduce the CMMI project, HeiTech has to create Engineering Process Group (EPG) to manage organization's process assets, continuously evaluating the organization's processes, and running the organization's improvement activities. Other task for The EPG is to maintain the latest Software Process Improvement (SPI) techniques and methodologies. EPG, lead by Madam Yanti Salwani has done some research to ensure that CMMI models introduced is the best for HeiTech.

The EPG has decided to select CMMI-SE/SW staged model and decided to achieve CMMI level 3 which has eighteen (18) process areas. To accomplish maturity Level 3 of the model, HeiTech must establish all eighteen process areas comprise process



area in Level 2 and Level 3 itself. Table 1 shows the CMMI staged representation for maturity Level 3 and Level 2, to be established and implemented by HeiTech.

Table 1.1 : CMMI Staged Representation for maturity level 3
(Source: Software Engineering Institute, Carnegie Mellon University)

Level	Process Area	Abbreviation	Category
3 Defined	Requirement Development	RD	Engineering
	Technical Solution	TS	Engineering
	Product Integration	PI	Engineering
	Verification	VER	Engineering
	Validation	VAL	Engineering
	Organizational Process Focus	OPF	Process Management
	Organizational Process Definition	OPD	Process Management
	Organizational Training	OT	Process Management
	Risk Management	RSKM	Project Management
	Decision Analysis and Resolution	DAR	Support
2 Managed	Requirement Management	REQM	Engineering
	Project Planning	PP	Project Management
	Project Monitoring & Control	PMC	Project Management
	Supplier Agreement Management	SAM	Project Management
	Measurement Analysis	MA	Support

Currently, HeiTech has established six (6) process areas. The process areas are Project Monitoring Control (PMC), Project Planning (PP), Process and Product Quality Assurance (PPQA), Requirements Development (RD), Risk Management (RKM) and Requirement Management (RM). All the established process areas have been stored in repository known as eKMS and being used widely on running projects. HeiTech is planning to be assessed by certified assessor from Software Engineering Institute by the year 2006. This assessment will determine that HeiTech is qualified with CMMI Level 3. For that purpose, all the process areas cover in Level 2 and Level 3 must be established and being used in the project that is going to be appraised before the assessment begins.

1.3 Importance of the Project

HeiTech has introduced its own formal standard called Application Development Information System (ADVISE) and methodology known as Project Management Methodology (PROMISE). ADVISE is a process guidance for developing applications system. It contains a practical application development process, deliverables, checklist and also guidelines. Besides that PROMISE only covers on policy and guidelines for acquisition and procurement. Both ADVISE and PROMISE are suppose to be used for all projects. Lacking of awareness on the advantages of ADVISE and PROMISE, and other internal problems within the projects, caused project manager to ignore the standard and methodology.

Due to the need of process improvement, HeiTech introduced CMMI, which is relevant and parallel with ADVISE and PROMISE. Besides that, CMMI has many advantages. CMMI will expand the scope and visibility into the product life cycle to



ensure the product meets customer needs and expectations. CMMI also incorporates lessons learned from additional areas of best practice such as measurement analysis, risk management and supplier management. Objectives of this CMMI are to deliver project within allocated time and budget constraints, reduce bugs and improve customer satisfaction.

Major benefits can be achieved by using CMMI in the organizations. They will know their trade progress. Everybody in the project knows exactly what their tasks and how their work relates with one another. Understanding where they stand, getting structural, logical, time proven road-map for improvement and positioning themselves as a best practice company will help them to succeed.

Advantages for HeiTech are the project is well prepared and equipped with improvement strategies for the technology changes to curtail workloads. This will create an effective environment with a consistency improvement especially to improve product quality such as reduce bugs, increase cycle time, reduce cost, increase work efficiency and improve software maintainability. CMMI also can help this organization to standardize, increase quality, and repeatability within software development area.





1.4 Project Objectives

Objectives for this CMMI project are:

- i. To establish the process area of Measurement and Analysis (MA) and Integrated Project Management (IPM).
- ii. To produce related work product for Measurement and Analysis and Integrated Project Management.

Work products for Measurement and Analysis process area are:

- a. HeiTech Measurement and Analysis Guideline.
- b. HeiTech Measurement and Analysis Plan.
- c. Measurement and Analysis Plan Template.
- d. Measurement and Analysis Report Template.



Work Product for Integrated Project Management is

- a. Project Management Plan.

1.5 Project Scope

Author only concentrate on two process areas of CMMI, Measurement and Analysis, and Integrated Project Management. Scopes for both process areas are:

- i. Propose the plan.
- ii. Review the process area for practical use in HeiTech Padu Berhad.
- iii. Study the process areas by constructing the appropriate documents.

