FRAMEWORK OF MEASUREMENT ENGINEER WORKLOAD AT PUBLIC WORK DEPARTMENT DISTRICT OF MALAYSIA

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UNIVERSITI TEKNOLOGI MALAYSIA

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A capstone project report submitted in partial fulfilment of the
requirements for the award of the degree of
Master of Project Management

Faculty of Civil Engineering
Universiti Teknologi Malaysia

JANUARY 2015

To my beloved wife Wan Nurul Liza Binti Mior Abdullah and my beloved children,
Ammar Faris, Ammar Haris and Ammara Zahra
"This is a gift to you for your sacrificed precious time, love, joy, support, encouragement and strength given to me. May it inspire you to a lifelong learning and sharing knowledge"
and to people around me especially my parents who constantly encouraged, supported and committed to me.

Not forget to Rabitah Binti Kamaruzaman and Ammar Darwish

In loving memory of Rokiah binti Husain

ACKNOWLEDGEMENT

Alhamdulillah, praise to Allah the Almighty God who gave me truly strength to me for completing this thesis. Most thankful also to my wife and my children for their love, support, understanding and encouragement given to me. Deepest and sincere appreciations to Dr. Norzaida Binti Abas who has been an ideal capstone supervisor for her advices, criticisms, patience, guidance and encouragement in aiding the writing of this capstone project report in countless ways. I would also like to thank my PWD supervisor, Ir. Abu Bakar Bin Mohamed Said for his advice and guidance in this research.

I would also like to extend my gratitude to the examiners and panels for their suggestions and constructive comments in making this thesis better. I am indebted to Faculty of Civil Engineering, School of Graduate Studies (Engineering) for their assistance and professionalism throughout the duration of the course. Special thanks to Universiti Teknologi Malaysia (UTM) for providing the assistance in supplying the relevant literatures.

My sincere appreciations also extend to all respondents who had generously spent their time to participate the questionnaire survey in part of capstone project data collection. Gratitude is also owed to various people namely family, friends, colleagues and students group of MAZ09 who not giving up to help and support along the way to the successful completion of this capstone project report. Last but not least, special thanks are expressly dedicated to Complex Project Management Branch, Public Work of Department Malaysia (PWDM) for funding my Master degree study.

ABSTRACT

Public Works Department (PWD) serves as a technical agency to the government of Malaysia under Ministry of Works. In carrying out the responsibility in managing the development of Malaysia's infrastructures and public facilities, PWD must effectively and efficiently manages all its resources such as time, cost, manpower and quality of work. In particular, many efforts were undertaken by PWD to improve the quality of project management in the PWD, however there are still some problems in delivering projects on time to clients. One of the main problems is inadequacy of staff, especially engineers to supervise projects and maintenance of government's assets. Therefore, this study aims at identifying the variables influencing engineers' workload at PWD District offices within Peninsular Malaysia. To investigate engineers' workload, a survey is conducted to collect relevant data from engineers working at PWD District offices within Peninsular Malaysia. One of survey findings indicates the most influencing variable is the inadequacy of manpower at district offices. Comprehensive analysis is conducted on collected data and the results are used to determine the ideal mean average number of projects for each engineer at PWD District offices. The average number is derived according to a proposed workload computation program and proposed to be used as a standard number of projects per engineer. This study also proposed recommendations for the top management of PWD to fully utilize existing engineer manpower in order to efficiently supervise the projects especially at PWD District offices.

ABSTRAK

Jabatan Kerja Raya (JKR) berfungsi sebagai sebuah agensi teknikal kepada Kerajaan Malaysia di bawah Kementerian Kerja Raya. Dalam menjalankan tanggungjawab untuk menguruskan infrastruktur negara dan kemudahan awam, JKR perlu mempamerkan prinsip dan pengurusan cekap dalam semua aspek termasuk masa, kos, tenaga kerja dan mutu kerja. Secara khususnya, JKR telah melaksanakan pelbagai usaha untuk meningkatkan kualiti dalam pengurusan projek JKR namun masih terdapat beberapa masalah untuk menyerahkan projek dalam masa yang telah dijadualkan kepada pihak pelanggan. Salah satu punca utama kepada masalah tersebut adalah kekurangan kakitangan terutama jurutera untuk memantau dan melaksanakan penyelenggaraan aset kerajaan. Oleh itu, kajian ini adalah bertujuan untuk menentukan pembolehubah-pembolehubah yang boleh menyumbang kepada beban tugas jurutera di pejabat JKR dalam kawasan Semenanjung Malaysia. Dalam menentukan beban tugas jurutera tersebut, kajiselidik telah dijalankan untuk mendapatkan data daripada semua jurutera yang sedang bertugas di pejabat JKR Daerah dalam kawasan Semenanjung Malaysia. Salah satu hasil daripada kajiselidik tersebut adalah pembolehubah utama yang telah dikenalpasti iaitu kekurangan kakitangan di pejabat JKR Daerah. Analisis secara menyeluruh dijalankan kepada data yang dikumpul dan maklumat tersebut digunakan untuk menentukan bilangan purata min projek yang ideal kepada setiap jurutera di pejabat JKR Daerah. Bilangan purata tersebut diperolehi daripada cadangan program pengiraan beban kerja dan telah dicadangkan untuk digunakan untuk menentukan bilangan standard projek bagi seorang jurutera. Kajian ini juga mencadangkan syor-syor bagi pengurusan atasan JKR untuk menggunakan sepenuhnya tenaga kerja jurutera sedia ada dengan cekap bagi menyelia projek terutama di pejabat JKR Daerah.

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LIST OF ABBREVIATIONS

CFS	Contract for Service
CPK	Cawangan Pengurusan Korporat
EOT	Extension of Time
G.O	General Order
GDP	Gross Domestic Product
LAD	Liquidated Ascertained Damages
PWD	Public Work Department
SKALA	Sistem Kawal dan Lapor
SPSS	Statistic Package for Social Science
UTM	Universiti Teknologi Malaysia

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Public Works Department (PWD) serves as a technical agency of the Government of Malaysia under the Ministry of Works. PWD plays an important role since the First Malaysia Plan (1966-1970) in the planning and implementation of development projects and infrastructure maintenance to various ministries, departments, statutory bodies and state government as stipulated in the infrastructure development policies and public facilities. The items include roads, buildings, airports, ports and jetties. Moreover, PWD also provide advice on technical matters to the government, local authorities and statutory bodies. In carrying out this responsibility, PWD should exhibit effective principles and effective management of all aspects including time, cost, design and quality work as a core service in managing the development of the country's infrastructure and public facilities. Thus, there are three (3) core activities in the services provided by the PWD (PWD Annual Report, 2012);

i. Planning, design and construction of the project (Project Management)
ii. Maintenance of roads and government buildings (Asset Management)
iii. Technical advice to the Government at the Federal, State and County

From the core activities above, project management is the main business of PWD. PWD has been implementing various development projects across the country. In 2012, a total of 389 projects have been implemented by the PWD with an allocation of RM 7.30 billion (PWD Annual Report, 2012). While for the year 2013, a total of 396 projects were implemented by the PWD (SKALA, 2014). In the 2014 Budget, the Prime Minister still emphasised on the commitment of the Government to strengthen the country's economic growth and improve the welfare of the people through various construction projects under the Tenth Malaysia Plan (10th MP). The Government has allocated a total of RM 46.5 billion for Development Expenditure for the entire nation. Through the implementation of this project, the construction sector will directly contribute largely and very significantly in driving the economy to the Gross Domestic Product (GDP). This is because the construction industry has a multiplier impact factor and large chains where it acts as a catalyst to the growth sectors of the economy (Minister of Public Works, 2013).

Therefore, PWD is highly dependent on human resources in technical area, especially engineers in managing the development of the country's infrastructure and basic facilities. To date, there are about 3,687 engineers (professional) and 18,657 supporting staff (MyKJ, 2014). They comprise of a variety key areas such as Architects, Civil Engineers, Mechanical Engineers, Electrical Engineers, Quantity Surveyors, Building Surveyors and Land Surveyors.

To ensure proper coordination are executed in order to achieve the objectives of the organization, PWD has its own organizational structure. There are three main levels namely:

i. PWD Headquarters Office of the Director General and Director of Branch Offices.
ii. Offices of the State Director of Public Works (Except in Sabah and Sarawak)
iii. Offices of the District Engineer (Except in the Federal Territory, Sabah and Sarawak)

The functions of these three (3) levels are:

i. PWD is responsible for planning and designing development projects, monitoring the implementation of projects and the preparation of policies, guidelines and technical advice to the State PWD.

ii. State PWD is responsible for designing, implementing and maintaining the state of development projects such as roads and government buildings. PWD is responsible for all state projects. On the same time, the State PWD also directly responsible to the Director General of the Malaysian PWD Headquarters to execute federal projects in their respective states (except PWD Sabah and Sarawak).

iii. District PWD directly responsible to the Director of the State PWD to projects implementation and asset maintenance of the Federal and State Governments in their respective regions. There are 79 District PWD offices, which is headed by a District Engineer and assisted by a few number of engineers (Assistant District Engineer).

Being the lowest level, District PWD plays the most important role to PWD Malaysia in implementing and maintaining the project and assets of the government rather than State and Headquarters PWD. Almost 70% of the projects in PWD Malaysia were implemented by team project in PWD District office. The project teams at the office District PWD are the front line to PWD Malaysia. They have responsibility to ensure the projects implementation was follow the vision, mission and objectives. The success or failure of the project in the District PWD will have a significant effect on the overall performance report PWD Malaysia. They need to ensure that the workload of the project in their office must be completed within time, cost and quality that have been determined.

1.2 Background of the Problem

1.2.1 Introduction to PWD District Office

District PWD is the implementing department and pulse to development of a district. Apart from planning, design, implementation, supervision and monitoring of development projects and maintenance work of federal and state governments, the District PWD also provides technical advice to government departments and agencies in the area involved. The scope of works at PWD districts office is similar to the PWD Headquarters Kuala Lumpur. However the number of staff is less at districts level. These pose problems because PWD has to serve a number of projects not only to government departments and agencies in the province, but also the projects from the headquarters (Federal) and State.

Every District PWD has their own organizational structure which is predetermined by Human Resources Department (CPK), PWD Headquarters Malaysia. Therefore, each district has different number of staff, number of projects and number of assets to maintain. Usually, the allocation of human resources is subjected to the requests from individual PWD District office and also the location of the district. Developing area would have bigger organizational structure than rural area.

1.2.2 PWD District Organizational Structure

Every State PWD is headed by a Director, while, District PWD is headed by a District Engineer. The function of District PWD could be divided into several categories as follows:

i. Road Division: Planning, monitoring road and infrastructure development projects. The division is also has to manage the development of the street.

ii. Building Division: Planning and monitoring of development building project.

iii. Asset Maintenance: Maintain Federal and State Government assets such as buildings, roads and bridges.

iv. Electrical Division: Planning and monitoring electrical work for any project development in district.

v. Administration: Reception of warrant (budgets), manage the receipt to Vote Book, acceptance of bills claim (voucher provision), maintenance receipts, preparation of reports, maintenance of Petty Cash, Finance Division correspondence, preparation of annual budgets and provide employees salary.

1.2.2.1 Road Division

This section has tasks such as supervise road projects, bridges projects, repairing existing roads, widening roads, manage road signs, drainage, street lighting and many other tasks to meet the comfort and safety of road users . The main duties of the Road Division:

i. Plan and Manage
   - Planning on implementation of the project
   - Review the human resource needs to district office.

ii. Design of Road Infrastructure
   - Provide consultation on soil investigation and geotechnical design
   - Conventional Design

iii. Managing Resources Requirements for Road Project
   - Management of the estimated budget and the operating budget for the development of new roads
   - Management and monitoring provisions of the financial performance of road project

- Management of material / equipment and material for road works

iv) Manage the Procurement Working

- Manage procurement made by quotation
- Manage Procurement made by tender

v) To implement, supervise and monitor the Roads and Bridges Project

- Construction and supervision of road construction sites (conventional / design and build)
- Project roads
- Testing, commissioning and final inspection

vi) Handing over Completed Road and Bridge:

- Monitoring products have been handed over to client

vii) Review Roadside Development

- To review the application of variable soil conditions
- Create a temporary occupation license application
- To review the license application scrap materials
- To review the application of the plan layout earthworks, roads and drainage
- To review the application route of public utility installations
- To review the application of reserve land

1.2.2.2 Building Division

The main responsibility of building division was to supervise any building projects. They have to deal with many client projects such as the projects from the Ministry of Education, Ministry of Higher Education, Ministry of Finance, and more. They have to deal with local customers, clients at the state and federal levels. The main duties of the Building Division were:

i. Designing and Managing the Building Project

- When planning the implementation of building projects

ii. Building Infrastructure Design

- Service soil survey (only for small-scale building projects)

iii. Operating Requirements Resources
   - Manage the allocation and monitoring of the financial performance of the project
   - Management Placement of staff

iv. Manage the Procurement Work
   - Manage procurement made by quotation
   - Manage Procurement made by tender

v. To implement, supervise and monitor the Building Project
   - For the construction in conventional method contract
   - Testing, commissioning and final inspection

vi. Handing over project
   - Monitoring project has been handed over to client

1.2.2.3 Asset Maintenance Division

Asset Maintenance Division has a very important task. They have to maintenance of buildings, roads, bridges, electricity for the state and federal government assets. They also provide service to any official ceremony / program at level district, state or federal.

Apart from official duties as above, the District PWD engineers need to be involved in informal activities such as:

i. District PWD engineers to help local authorities and to cooperate in implementing the project and activities such as official and ceremonial functions.

ii. District PWD engineers need to engage in community service activities in addition to continuously forge cooperative relationships.

ii. District PWD engineers to get involved in social activities such as the Sports Club.

Based on the tasks mentioned above, an engineer in the PWD District played an important role not only as a project manager at the district level but need to head office administration and social and community activities in the area. Participation in these activities ensures a close relationship with the community and governments agencies. Therefore, competence in the District PWD engineer positions, not only lead to a technical field, but with the social and communication skills.

Consequences from variety of engineer workload, there are related to many project problems at District PWD office. Some major problems related to project in the District PWD was (SKALA, 2014):

i. Contracts in construction, Past and Pending Closing
ii. Contracts and Late / Closed Period of Completion
iii. A contract that has been completed but not yet closed accounts
iv. The contract expired uncompleted apply / not apply Fine (LAD).
v. Contract Late
vi. Contract not complete
vii. Contract with EOT
viii. The project has a lot of problems after completion (Project no quality)

Data from Human Resource Management, PWD Malaysia in 2012, the overall number of employment engineer from all disciplines are about 3,684 people in various grades. The technical support staff personnel PWD is about 18,661 people. Additional of 271 engineers designated as "Contract For Service" (CFS).

Based on the distribution of engineer for 2014 according to the state are shown in table below (MyKJ, 2014) not including engineer in three (3) of the Federal Territory and officers seconded to other ministries (Kader), Sabah and Sarawak:

Table 1.1: Numbers of Engineer and Districts in State (Adopted from MyKJ, 2014)

No.	State	No. of Engineer	No. of District
1.	Johor	46	10
2.	Kedah	25	12
3.	Kelantan	31	11
4.	Melaka	11	3
5.	Negeri Sembilan	26	7
6.	Pahang	39	11
7.	Perak	33	9
8.	Perlis	2	1
9.	Pulau Pinang	26	5
10.	Selangor	31	9
11.	Terengganu	21	7
	TOTAL	291	85

Based on Table 1.1, there are only a total of 291 engineers allocated to the State/District PWD office. The remaining 3,393 engineer was allocated in headquarters. In percent, only 7.9% of engineer provided from overall of engineer deployed to serve in the State PWD / District. Therefore, the are problem with management of human resources office in headquarters. The lack numbers of engineer leads to many workload in District PWD office. The workload will affect employee performance because they are working under pressure.

1.2.3 PWD District Project Problem

Based on Project Status Report Continued 9th Malaysian Plan (No.27 / 2011) as the table below, indicated the 88 projects that cannot be completed in the year 2011 in accordance by Headquarters, State and Districts:

Table 1.2: Number of Project Delayed managed by Headquarters, State and Districts for year 2011 (Adopted from Project Status Report Continued 9th Malaysian Plan, 2011)

PENGURUS PROGRAM	TIDAK SIAP	PENGURUS PROGRAM	TIDAK SIAP	PENGURUS PROGRAM	TIDAK SIAP
CPPT	38	CKS	12	CPUM	1
CKBA	12	JALAN	10	CSFB	1
CKK	12	JOHOR	1	CERUN	1
SELIA TAPAK	TIDAK SIAP	SELIA TAPAK	TIDAK SIAP	SELIA TAPAK	TIDAK SIAP
TERENGGANU	16	MELAKA	3	CPPT	2
KELANTAN	14	PAHANG	3	CKS	2
JOHOR	9	SELANGOR	3	LABUAN	1
PERAK	7	CKBA	3	P.P. SABAH	1
CKK	7	P.PINANG	2	CPUM	1
KEDAH	4	K. LUMPUR	2	PROKOM	1
PERLIS	4	JALAN	2	CERUN	1
DAERAH SELIA TAPAK	TIDAK SIAP	DAERAH SELIA TAPAK	TIDAK SIAP	DAERAH SELIA TAPAK	TIDAK SIAP
BESUT	11	PETALING	2	JELI	1
KOTA BAHRU	3	HULU TRG	2	ALOR GAJAH	1
TANAH MERAH	3	MERSING	1	JASIN	1
BACHOK	3	LEDANG	1	BENTONG	1
PERAK TENGAH	3	KOTA SETAR	1	BTG. PADANG	1
JOHOR BAHRU	2	KUALA MUDA	1	MANJUNG	1
SEGAMAT	2	LANGKAWI	1	DUNGUN	1
KOTA TINGGI	2	MACHANG	1	MARANG	1
HILIR PERAK	2	TUMPAT	1	SETIU	1
TIMUR LAUT	2	PASIR PUTIH	1		

1.3 Problem Statement

Organization structure and human resource are two very important concepts in managing the modern organization. Human resources is a modern term commonly used to define the functions within an organization that is responsible for implementing strategies and policies involving the management of individuals. (Shahrul Nizam Siajam, 2010). Organizational structure and human resource are now a critical point that must be managed successfully to ensure all government development objectives set in National Plan are achieved satisfactory.

There are circulars and General Orders (G.O) given by Jabatan Perkhidmatan Awam (JPA) where the instruction and guidelines on the structure of organization and staffing ratio or norms. However, these guidelines do not include the structure and human resource norms for project teams in the fields. With no specific guidelines available, the norm for HR requirement for projects is unknown and often left to organizations to decide base on request, demand, personal experience and preference. Furthermore, each PWD District has many differences from one another criteria to the human resources cannot determine the actual needs of engineers in the office.

Therefore, it is important to determine with certainty the level of standard engineer workload and the current level engineer workload before any improvement is proposed in human resources and JKR District organizational structure. Research has consistently shown high levels of workload have a negative effect on performance (Bower et al., 1997; Urban et., 1995).

District PWD is the front line in the implementation of a project. District PWD Superintending Officer is the person in charge for the projects worth RM 20 million and less regardless of whether the projects are implemented in a conventional or Design and Build. For projects worth RM 20 million and above, often the

designated Superintending Officer is the Director of the State PWD, while District Engineer acts as the Superintending Officer's Representative. Only large-scale projects are monitored by the Special Forces of the PWD Headquarters or at the State PWD.

As such, the specific purpose of this study is to propose a workload measurement framework for engineers at PWD District office. By doing so, the engineers could achieve their maximum potential without compromising the quality of work. The establishing this workload measurement framework could aide in the betterment of management and performance at PWD Districts. Subsequently, this will increase the image of PWD Malaysia as a whole.

1.4 The Aim and Objectives of the Study

The aim of this study is to measure and determine the standard workload of engineer and the current workload of engineer in PWD Districts office. The following objectives will ensure this aim is met:

i. To identify the variables influencing workload of engineer at PWD Districts office
ii. To identify average numbers project workload for engineer at PWD Districts office using framework of time measurement
iii. To propose the standard project workload of engineer at PWD Districts office

1.5 Scope of Study

The scope of study will cover only engineer who currently working at PWD District office. There are 75 districts office around country with 225 engineers.
Limitation of the study:

i. Not inclusive of PWD Sabah and PWD Sarawak (because the management totally under state jurisdiction)
ii. Not inclusive PWD office in three (3) PWD Wilayah Persekutuan which is PWD Wilayah Persekutuan Kuala Lumpur, Putrajaya and Labuan. (Don't have PWD District and management function as PWD State)
iii. The study assumes that the candidates selected for sample study have the same capabilities in technical and management knowledge and skill.

1.6 Significance of the Study

The outcome of this study is important because the proposed workload measurement framework could be used as guidelines to Human Resources Department, PWD Malaysia in managing engineers at PWD Districts. Appropriate workload value for engineer would be determined so that top management at PWD could use this information to reallocate staff, restructure and realign the organization structure at PWD District level to increase productivity and improve overall management as a whole.

1.7 Overview Research Methodology

The research methodology can be divided into three (3) phases. They are:

i. Phase 1 – This phase was the preliminary study to determine the purpose of the study (objective and scope), formulate of research problem and research question, the significant of study for the organization and collection data and information from literature review regarding research problems.

ii. Phase 2 – This is the investigation phase which is involves with distribution of questionnaire to the respondents in PWD Districts. Those collective data and information will be analyzed by comparative and descriptive analysis.

iii. Phase 3 – This phase was to analyze data and information from phase 2. Those collective data and information will be analyzed by comparative and descriptive analysis. From the result in the analysis, the will be conclusion and recommendation to PWD in improving the project management system.

The sequence of the study is best presented by figure in flow chart below:

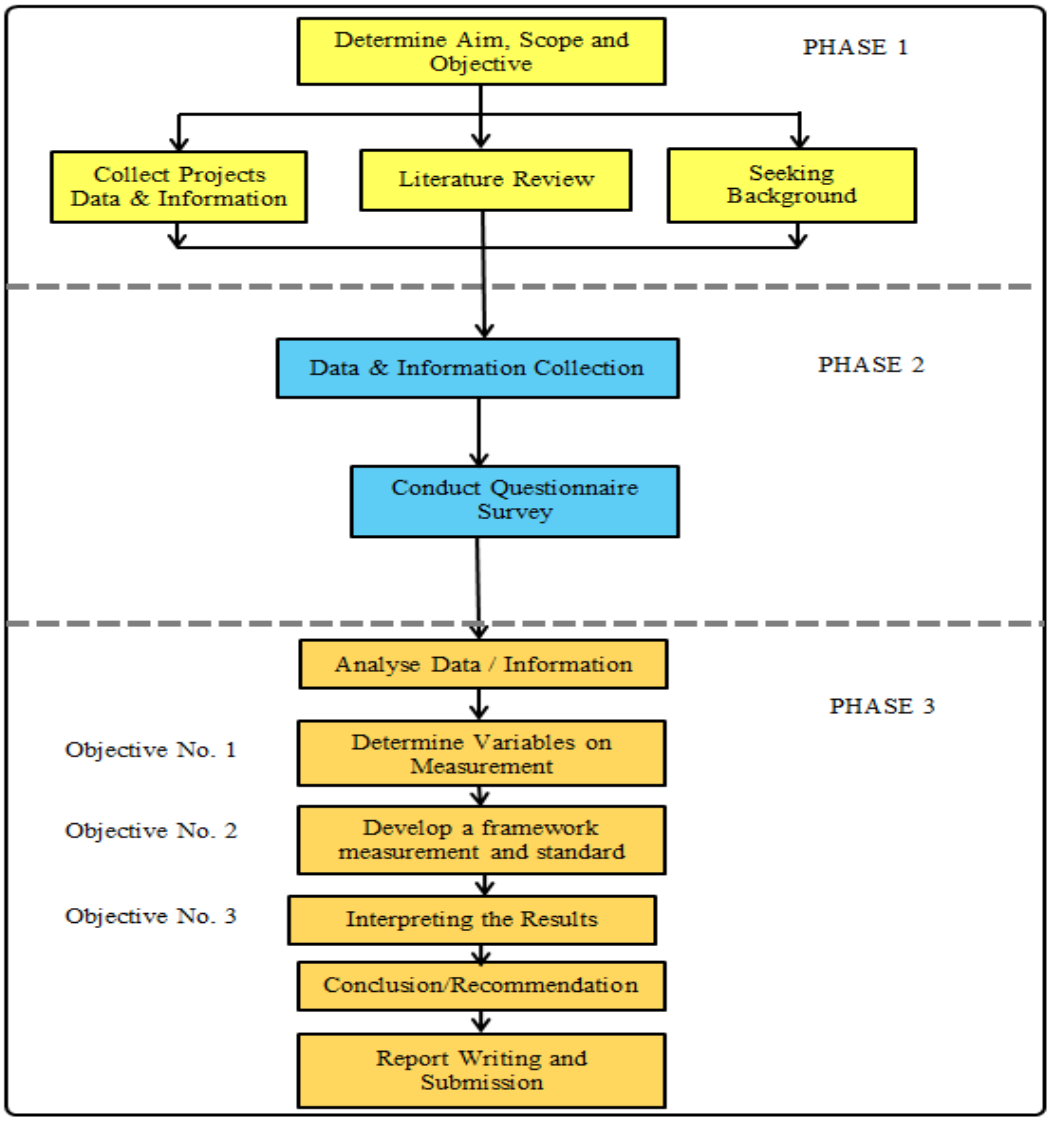

Figure 1.1: Schematic of Research Methodology

1.8 Summary of Chapter

There are six (6) chapters in this report. The Chapter 1 will be briefly discussed about Introduction, Background of the Problem, Problem Statement, Aim and Objective, Scope of the Study, Significance of the Study, Overview of Research Methodology and summary of all chapters.

Chapter 2 will be the Literature Review that will discuss related to this study. The literatures outline the introduction to workload, workload management principles and process workload management. Related study on staff workload is also being look into for understanding and reference for this project.

Research Methodology is covered in Chapter 3. The focus is to provide the steps and guidelines for researcher in order to achieve their aim and objectives of the capstone project.

For Chapter 4 is about analysis and result of the study. The analysis was done on the questionnaire which has been distributed to respondent. Then, all data has been collected will be analyse using the SPSS software are presented in tables and chart.

Then in Chapter 5, the discussion and recommendation was made based on the analysis and result. The discussion was focus on three (3) objectives which has been determined early.

Last but not least, Chapter 6 will be the conclusion for this study related with the aim and the objectives of this study including limitation of the study.

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