HUMAN RESOURCE ALLOCATION
IN MULTIPLE PROJECT
ENVIRONMENT IN MALAYSIA

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DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

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APPROVAL FOR SUBMISSION

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Specially dedicated to

my family

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HUMAN RESOURCE ALLOCATION IN MULTIPLE PROJECT ENVIRONMENT IN MALAYSIA

ABSTRACT

Human Resource (HR) is the key factor that determines the success or failure of projects. Multi-project environment is an environment where an organization runs multiple projects at the same time. Nowadays multiple-project environment is getting more common. In this research, the human resource allocation in multiple-project environment in Malaysia was studied. Although human resource management in multiple-project environment is quite similar to the generic human resource management, it is opened to different set of challenges. The research begins with the gathering of the information from the literatures. Subsequently, the research questionnaire was designed involving different types of companies in Malaysia. The collected data was analysed to find out: 1) Project Team Member Selection Criteria, 2) Project Team Member Selection Methods, 3) Human Resource Management Methods, and 4) Issues and Problems Found in Assigning Resource. The data gathered from the questionnaire went through three tests, namely: 1) Cronbach's Alpha Test, 2) Relative Importance Index, and 3) Kruskal-Wallis Test. Based on the result, the assignment of human resource practice in multiple-project environment adopted by Malaysia companies in the descending order of importance are: 1) Taking place before the project start, 2) Taking place after the project started, 3) Allowing employee to choose the project that they want to work on, and 4) Allowing employee

exchange during the project course of a project. The top three criteria for assigning resource in multiple-project environment are: 1) Lifelong Learning Skills, 2) Good Communication Skills, and 3) Good Problem Solving Skills. The top three criteria in the Kruskal-Wallis test show no significant difference among the various industries in Malaysia. The effective method gathered in the result is "Multiple Resources Allocation Algorithm Method". This method shows no significant different in the Kruskal-Wallis test. The result of the research may serve as a guideline for the management to handle project more effectively and efficiently which increases the project success rate. The research may further enhance the pre-existing theories in the area. The further study can be done to obtain deeper understanding in multiple-project environment.

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LIST OF SYMBOLS / ABBREVIATIONS

HR	Human resource
HRM	Human resource management
MHRM	Micro human resource management
SHRM	Strategic human resource management
IHRM	International human resource management
MPM	Multiple project management
IT	Information technology
SPM	Single project management
WBS	Work breakdown structure
BFR	Best fitted resource
TRS	Task required skills
SR	Skill relationships
RSS	Resources skill set
THRP	Team based human resource planning
NTF	Next time frame
R&D	Research and development
RII	Relative importance index

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CHAPTER 1

INTRODUCTION

1.1 Overview

This chapter described general information regarding human resource and thesis outline. There are total six sub topics. The first sub topic is background of human resource. In first sub topic will discuss the human resource and human resource management. The second sub topic is problem statement. In second sub topic is listed the problem statement on human resource for multiple-project environment. The third sub topic is aim and objectives for the project. In third sub topic will described the goal of the project. The fourth sub topic is scope of the research. In fourth sub topic is discusses the research methodology use in this research. The fifth sub topic is significance study of the project. In fifth sub topic is discusses the benefit of this research. The sixth sub topic is chapter of dissertation. In sixth sub topic is summarize the overall of this thesis.

1.2 Background

Human Resource (HR) is the key factors to determine the project success or failure (André et al. 2011; Huemann et al. 2007; Wright & McMahan 1999; So¨derlund & Bredin 2006; Belout & Clothilde 2004). Human Resources has been researched, analyzed, and applauded over the years (Gerald et al. 2007).

Human resource in the organization will change whenever a new project starts or old project finishes (Turner et al. 2008; Hobday 2000). A sudden change of human resource will create additional pressures to the employees (So¨derlund & Bredin 2006). The pressures include: 1) High work-loads make it difficult to achieve a work-life-balance (Turner et al. 2008), 2) Doubt about future assignments (nature of the assignment, its location and future work colleagues) (Turner et al. 2008), and 3) Matching assignments to career development objectives (Turner et al. 2008).

The lacking of proper human resource management methods (Otero et al. 2009; Acuña et al. 2006; Karn 2006; So¨derlund & Bredin 2006) cause the decision on assign resources based on subjective measures only (Otero et al. 2009).

Human Resource Management (HRM) is an ideological framework to effectively and efficiently manage worker (Marlow 2006; Huemann et al. 2007; Pfeffer 1998 So¨derlund & Bredin 2006). Human Resource Management practices help to shape the employee's experiences and the employment relationship (Winstanley & Woodall 2000; Guest 2002).

There are three subfields of human resource management which are (Mark et al. 2009): 1) Micro HRM (MHRM), 2) Strategic HRM (SHRM), and 3) International HRM (IHRM). MHRM contains the sub-functions of HR policy and practice. MHRM help to manage employee and employer of the organization (Mark et al. 2009; Boxall et al. 2007). SHRM is the HR strategies. SHRM help to measure the performance of the organization (Mark et al. 2009; Boxall et al. 2007). IHRM covers HRM in companies operating across national boundaries (Mark et al. 2009; Boxall et al. 2007).

Multi-project environment is an environment which an organization running few project at the same time (Patanakul & Milosevic 2009; Anavi & Golany 2003; Pennypacker & Dye 2002; Fricke & Shenhar 2000; De Maio et al. 1994). In a multi-project environment, each projects competes resources with others projects (Laslo et al. 2008; Anavi & Golany 2003). Temporary systems and multi-project contexts are common in contemporary business (Rugirok et al. 1999; Turner 2009; Whittington et al. 2003). Scheduling is very crucial in multi-project environment (Wiley et al. 1998; Kerzner 2009). Scheduling helps to organize the resource needed from different project.

Multiple project management (MPM) help organizations to improve the management and efficiency to control the multiple projects (Patanakul & Milosevic 2009; Ireland 1997; Hobday 2000). MPM also give the benefit of reduce project cycle time, and share technology between organization projects (Patanakul & Milosevic 2009; Mark et al. 2009). MPM can take different forms, such as portfolio management (Platje et al. 1994). On an operational-level, MPM can be seen as the organization managing several concurrent projects. Each project group is managed by a project manager also known as

multiple-project manager. The project manager doesn't have decisions making power in an organization and has interrelationships with organization functional units from the project team (Galbraith 1994). Thus, MPM is designed for overlay to an existing functional organization and is strong interest to others organizations industries (Patanakul & Milosevic 2009).

1.3 Problem Statement

The issue and problem associated with human resource allocation in multiple-project environments are:

1. Limited Resources (Lin & Mitsuo 2008; Engwalla & Jerbrantb 2003; Hendriks et al. 1999; Miia & Päivi 2009).

2. Failure to Assign the Correct Human Resource (Otero et al. 2009; Acuña et al. 2006; Karn 2006; André et al. 2011).

3. Failure to Schedule the Resource (Milan et al. 2004; Laslo et al. 2008; Ghomi et al. 2002; Wilderich 2012).

4. Project Conflict and Confusion (Baiden et al. 2006; Marjolein et al. 2012; Engwall & Jerbrant 2003; Zika-Viktorsson et al. 2006).

5. Recruitment Suitable Staff (Zottoli & Wanous 2000; Billsberry 2007; Braddy et al. 2008; Breaugh 2008; Moser 2005).

1.4 Aim and Objectives

Base on the problem statement, the aim of this research is to identify human resource allocation in multiple-project environment in Malaysia. The aim can be achieved with below objectives:

1. To identify the human resources practices adopted by the Malaysia companies.

2. To determine the criteria for assigning human resource in multiple project environment.

3. To identify the effective method to assign human resource in multiple project environment.

4. To identify the human resource management best practices for project that be adopted.

1.5 Scope of the Research

This research was designed to improve the project team member allocation in multiple-project environment in Malaysia industry. The research will begin with literature review. In literature review listed the finding gathered from previous studies of multiple projects. From literature review elaborated the problem statement.

The research methodology was using quantitative manner, which using questionnaire to gather the information from Malaysia industry. The targeted audience will be those who are currently working in Malaysia regardless of their industries and position. The questionnaire has rating scale questions, as

well as some objective multiple choice questions. Online survey tool was selected to ease up the data collection process, and a total of 120 questionnaire survey invitation will be sent out through e-mail.

The data analysis was performed on the data collected to describe the basic features of the data (Layton & Walton 2011; Field 2005). Cronbach's Alpha test, Relative Importance Index, and Kruskal-Wallis test have used to further analyze the data (Layton & Walton 2011; Field 2005). Cronbach's Alpha is to determine the reliability of the questionnaire. Relative Importance Index used to change the information into importance indices and rank it. While Kruskal-Wallis test used to compare the difference among the independent group.

After the result gathered from the analysis, the result will be discussed with compared the information gathered from previous studies. The final stage was concluding the finding of the research.

1.6 Significance of Study

The result of the research will help to enhance both working industry and academic. For working industry, the result of the research will created a guideline for the management to handle project more effectively and increases the rate of project success. Besides that, the research also enlightens what criteria needed for the employee been selected to handle the project.

In term of academic, the research will further enhance the pre-existing theories and materials collected that was pre-defined by the researcher. Other than that, it also adds new possible theories and explanation for future researcher and project management student.

1.7 Chapter of Dissertation

The first chapter of the thesis discussed the background information of human resource and the problem statements within the context of the research. The aim and objectives of the study will also define for the study to identify the works to be done in order to complete the research. In first chapter will define the scope of the study. The significance of study shows how this research contribute to the firms that doing project. Brief research method will be state in first chapter.

The second chapter is literature review. In literature review will discuss the studies which gather from different source. This chapter will provide a more in depth understanding of project management as well as the multiple-project environment. In literature review will further discuss the problem statement.

Chapter three is about research methodology. In third chapter mainly describe about the method to be implemented the research in detail. The method discussed here will provide a clearer understanding on how the research reaches a conclusion and provide a guideline during the implementation phase.

The fourth chapter is basically about the result of the research. In fourth chapter discuss about the data and the analysis result. Results from the analysis will be organized to allow the reader to easily interpret the outcome of the research. In this chapter will also discuss the finding on the research result by comparing the literature review. The findings from literature review will be re-assessed in relation with the results from this research.

The last chapter is about conclusion and recommendation. The last chapter is concluding the finding of the research. Limitation of the research was also pointed out and recommendation on what can be done in the future to further improve this research was also provided. The last chapter will provide a further study which can improve the human resource allocation in multiple project environment.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

This chapter discusses the topics which had been studied for the research. There are five sub topics in this chapter. The first sub topic is the definition for single project and multiple projects. In first sub topic will elaborate the differences of single project and multiple project. The second sub topic is types of project team available. In second sub topic listed how many types of project team available. The third sub topic listed the issues and problems arise in multiple project environments. In third sub topic have five common issues and problems. Forth sub topic will be discussing the criteria for assigning human resource in multiple project. In the fourth sub topic have eight criteria. The fifth sub topic will be discussing the Human Resource Management (HRM) methods. In the fifth sub topic listed five common HRM methods.

2.2 Definition of Single Project and Multiple Projects

Project defines as create a unique product or service (PMBOK Guide 2004). Projects are not dependent in terms of goals and objectives but rather grouped for effective and efficient management for the organization (Ireland 1997; Turner & Speiser 1992; Kaufman 2001). For example a product improvement project, the objective is to improvement the product, and the goal is to increase organization sales and stay competitive with others company.

Single project management (SPM) is a team which leads by project manager (Patanakul & Milosevic 2009). SPM is to create a competitive advantage for the company. In others word is company mission.

Multiple project management (MPM) is defined as an organization handle few project at the same time (Patanakul & Milosevic 2009; Anavi & Golany 2003; Pennypacker & Dye 2002; Fricke & Shenhar 2000; De Maio et al. 1994). MPM are to achieve the company goal, in others word is company vision.

The differences between the SPM and MPM are (Patanakul & Milosevic 2009; Anavi & Golany 2003):

1) Multiple-project manager role is monitoring multiple concurrent projects, while single-project manager monitor one project.

2) Multiple-project manager leads different project teams for different projects with different objectives. On the other hand, single-project manager leads only one team.

3) Multiple-project manager face the problem of switchover several times a day from one project to another project. The switching project does not exist in single project.

2.3 Project Team Member Selection Methods

Project team is the people who have assigned tasks and responsibility for completing the project (PMBOK Guide 2004). The role and responsible assigned to the team member should involved of project planning and decision-making.

The project team is form by the project manager. The project manager will choose the team member by selecting from a group of people (Turner 2009). After project manager chosen the team member, project manager will assign the job or task according to the team member.

The project environment has change in recent decade (Gareis 2005; Turner & Keegan 2001). The organizations need to use appropriate structures to respond customized nature of demand (Sydow et al. 2004), especially in the consulting industries and high tech sector.

Different features of working environment will create different and new HRM practices for better management to the organizations (Turner et al. 2008). The environment includes:

1) Temporary Work Processes (Turner et al. 2008).

2) Dynamic Work Environment (Turner et al. 2008).

3) Project portfolio Resource and Role Demands (Turner et al. 2008).

4) Specific Management Paradigm (Turner et al. 2008).

2.3.1 Temporary Work Processes

The temporary organizations is been chosen to perform work for project or program in project-oriented organizations (Turner et al. 2008). This is because each time a new project starts or an old one finishes, the human resource configuration of the parent organization will change.

When an old project finish, the project team will back to their original functional organization. On the other hand, project team will be select or form when a new project start.

Therefore a project-oriented organization requires HRM practices to develop the assigning personnel to projects.

2.3.2 Dynamic Work Environment

The temporary working environment creates work boundaries and contexts to the worker. This will influence the motivation and increase stress to the project team. The project managers need to develop strategies which reduce the stress for the project team (Ga¨llstedt 2003; Aitken & Crawford 2007).

Furthermore, the size and number of projects performed will constantly change. This will cause the predictions resource requirements for new project more difficult (Turner et al. 2008)

Therefore, this will cause the human resource for the project-oriented so critical which cause insufficient human resource to allocate to others project.

2.3.3 Project Portfolio Resource and Role Demands

The project-oriented company may hold a portfolio of different external and internal project types (Gareis 2005; Anell 2000). A same employee will assign different projects at the same time. The employee may also assign to different project roles (Gareis 2005).

This will create role conflict for the employee (Rau & Hyland 2002). This is because the same employee needs to handle more than one project with the tide schedule.

An organization needs HRM practices to properly assign several projects or programs to the employee. This wills help increase the demands between projects and programs.

By doing so it can increase the company profit, because the company able to complete more project at the same time.

2.3.4 Specific Management Paradigm

A suitable project-oriented organization need to clearly define the management culture which express in the empowerment of employees (Fakhredin 2011; Winstanley & Woodall 2000; Pastoriza et al. 2008; Greenwood 2002). This help discontinuous or continuous the organizational change which include customer-orientation (clients and suppliers) (Gareis 2005).

Specific skills and competences of employee needed to work together in projects. To do so, the organization needs to provide training and give

practices to develop the capable of working environment. Thus, adopting specific HRM practices help to match the management paradigm.

The organizations can adopt the HRM practices base on the ways of working (Pfeffer 1998; Huselid 1995; Pellegrinelli 1997). The HRM practices can align with (Lengnick-Hall & Lengnick-Hall 1999; Wood 1999; Huemann et al. 2007):

- Vertical way which is selects as project-oriented and adopts project-based ways.

- Horizontal way which the HRM practices can consistent and support temporary organizations.

- Horizontal way which HRM practices in programs and projects are consistent.

- Horizontal way using organizational context.

- Novel HRM practices which adopting within the temporary organizations that programs and projects consistent with project-based ways of working.

- Different HRM practices which consistent with supportive of project based ways of working.

2.4 Issues and Problems Arise From Multiple Project Environment

Most of the time new project is start up all of a sudden and with the fast changing of competitors. Allocating employee in multi project environment is difficult and often gives lots of problem (Anavi & Golany 2003). This is due to the resources in the company and other unforeseeable problems (Pennypacker & Dye 2002).

Assigning the correct human resource to a project is vital (Wright & McMahan 1999; So¨derlund & Bredin 2006). More projects received by the company, the more specific knowledge of employee are needed (Wright & McMahan 1999).

Below list the issue and problem arise from human resource management in multiple-project environments:

1. Limited Resources (Lin & Mitsuo 2008; Engwalla & Jerbrantb 2003; Hendriks et al. 1999; Miia & Päivi 2009).

2. Failure to Assign the Correct Human Resource (Otero et al. 2009; Acuña et al. 2006; Karn 2006; André et al. 2011).

3. Failure to Schedule the Resource (Milan et al. 2004; Laslo et al. 2008; Ghomi et al. 2002; Wilderich 2012).

4. Project Conflict and Confusion (Baiden et al. 2006; Marjolein et al. 2012; Engwall & Jerbrant 2003; Zika-Viktorsson et al. 2006).

5. Recruitment Suitable Staff (Zottoli & Wanous 2000; Billsberry 2007; Braddy et al. 2008; Breaugh 2008; Moser 2005).

2.4.1 Limited Resources

Multi-project environment is part of the organizational unit that carries out substantial share of its operations as projects (Engwalla & Jerbrantb 2003; Miia & Päivi 2009). In a multi-project environment is means running several projects concurrently. The resources will be sharing amount the organization common resource pool (Lin & Mitsuo 2008). These mean projects are integrated into the management control and common reporting system of resource (Payne 1995).

There are several resources will be share amount the project, such as human resource, materials, tools and equipments, and company budget (Engwalla & Jerbrantb 2003).

The resources may not distribute equally to each project (Hendriks et al. 1999). Thus, each project will not have significant resource to complete the project. When the resources are not unavailable in the project, the project will have to be on hold to wait for the resource to be available.

One of the reasons why the project is fail because the resources that needed is unavailable. The resource of the project is waited for too long until the organization unable to bear the losses of the project. Finally, the organization has to call off the project.

2.4.2 Failure to Assign the Correct Human Resource

Normally, employee is assigned into the project team base on experience, availability and skill requirements (André et al. 2011; Wright & McMahan 1992). However, the information needed is not systematically recorded. Thus, this makes the organization difficult to assign employee to the project team.

By forming a good project team is a complicated task and is hard to achieved (Wright & McMahan 1992; Greenwood 2002). This is because the major problem currently having are the demand for specialize individual skills in the workforce is increasing. The fast turnover rates and the fast pace for new technologies and techniques are being developed (Otero et al. 2009). Thus, candidates with exact skills needed for the tasks are not available. Due to lack of proper knowledge to assess personnel capabilities, the decision makers are forced to assign resources based on subjective measures only (Otero et al. 2009).

When organization failure to assign the correct people into the project team, it will cause the project failure (Turner 2009; Karn 2006; Pennypacker & Dye 2002). Thus, it is important to select the correct people to handle the project especially in multiple project environments, which have limited resources.

2.4.3 Failure to Schedule the Resource

The schedule of activities is important when handling a project (Milan et al. 2004; Laslo et al. 2008; Pennypacker & Dye 2002; Kerzner 2009). This is because the project schedule will determine the project lead time. The activity of the project is breakdown using the WBS (work breakdown structure) (Turner 2009). The recourse allocation is concurrently performed with the scheduling of applicable activities where the resources have pre-specified and assign responsibilities towards the activities. The activity requires certain number of resource to perform the task has to be scheduled (Milan et al. 2004).

The project schedule handling method is different between single project environment and multiple-project environment (Huemann et al. 2007; Turner et al. 2008; Wilderich 2012). This is because in multiple-project environment the resources are limited in the organization (Lin & Mitsuo 2008; Wilderich 2012). Therefore, the same resource will be assign with few different activities. The critical thing is each activity has different length of time. Thus, the scheduling of activity in multiple-project is complex and more difficult to be handled (Wiley et al. 1998; Kerzner 2009).

The scheduling method in single project environment is not suitable in multiple project environments (Lin & Mitsuo 2008; Wiley et al. 1998). This is due to the quantity of resource and lead time is different in multiple project environment compare with single project.

The failure to schedule the resource will cause the project to postpone. When the project is postponed mean the project going toward failure.

Therefore, the project scheduling in multiple project environment is critical and needed to be look into it (Milan et al. 2004; Laslo et al. 2008; Ghomi et al. 2002).

2.4.4 Project Conflict and Confusion

In multiple-project environment, the employee will be handling different projects with different goal, objective, scopes, and timelines (Pennypacker & Dye 2002). Different project timeline can cause resource conflicts (Maylor et al. 2006; Platje et al. 1994; Rau & Hyland 2002). This is because the same resource required in different project. Other than that, unsuitable resources often cause additional pressure toward the organization, which leads to poor quality of information and longer timeline of projects (Elonen & Artto 2003).

In interdependent project, the interaction between projects and independent project information cause overload and give specific challenges to the organization (Engwall & Jerbrant 2003; Zika-Viktorsson et al. 2006; Patanakul & Milosevic 2009). Employee will become exhausted and confuse toward the information that is available for decision making. With the large amount of information from different project, these will lose sight of relevant and useful information. Inaccurate or poor information quality will cause poor decision making (Blichfeldt & Eskerod 2008; Elonen & Artto 2003; Engwall & Jerbrant 2003).

The overload of project information will cause confusion with other project (Engwall & Jerbrant 2003; Zika-Viktorsson et al. 2006; Rau & Hyland

2002). This is because different project have different needs and wants. The employee may easily mess-up with other project information.

The information given by the project sponsor is important (Marjolein et al. 2012). This is because the information indicates the customer needs and wants. When inaccurate information received will cause poor decision made. When wrong decision made will mess-up the project and leads to project failure.

2.4.5 Recruitment of Suitable Staff

Recruitment is the process of searching, screening, and selecting the suitable candidates for employment (Zottoli & Wanous 2000). Recruitment methods is using newspaper, advertisement, recommend for people, and online.

During the project planning stage, organization needs to select the suitable person to handle the project (Braddy et al. 2008; Kerzner 2009). To do so, the organization needs to search for suitable employee by using recruitment process. Recruitment process helps to create a pool of knowledge and skilful employees for the organization. From the pool will do selection for the correct candidate for the right job (Zottoli & Wanous 2000; Billsberry 2007).

However, job recruitment has a major problem which is timing (Zottoli & Wanous 2000; Breaugh 2008). There are people who searching for job, but the organization need to screen through it before it can select the best person.

Another issue of job recruitment is the person working capability (Moser 2005; Kruglanski et al. 2007; Ram et al. 2001). The working capability

is unable to judge base on the interview section. The performance of the person only can be judge after he/she enters to the company.

Conclusion, find a person to refill the position is easy. However, finding a suitable person to handle the job is difficult. Especially in multiple project environment.

2.5 Criteria for Assigning Human Resource in Multiple Projects

The successful rate and completion time of the project is improved when organization selected the correct employees which have the knowledge and skill (Margaret & Madeline 2009).

The requirement has undergone significant changes over the past years because the industry is demanding high skilled people (Ayiesah et al. 2010). The industry is requires the graduates which possess knowledge and skill (Ayiesah et al. 2010). Below list the criteria or skills need to be equipped by the industry:

1) Problem Solving and Analysis Skills (Ayiesah et al. 2010; Wei Liu et al. 2003; Julia & James 2013).

2) Decision Making Skills (Ayiesah et al. 2010; Kevin & Glen 2005).

3) Organization and Time Management Skills (Ayiesah et al. 2010; Hatice et al. 2012; Fakhredin 2011).

4) Communication Ability Skills (Oral, Written and Listening) (Ayiesah et al. 2010; Fakhredin 2011).

5) Interpersonal Skills (Ayiesah et al. 2010; Flora & Segrin 1999; Chris & Melissa 2007).

6) Leadership Skills (Ayiesah et al. 2010; Sonia 2011; Troy et al. 2007).

7) Creativity and Innovation Skills (Ayiesah et al. 2010; Ailing et al. 2013).

8) Lifelong Learning Skills (Ayiesah et al. 2010; OECD 2007; Yelkin & Melek 2010).

2.5.1 Problem Solving and Analysis Skills

Problem solving means finding solutions to solve the problems (John et al. 2007). The situation needed to be identified and analysis before the problem can be solved (Boxall et al. 2007). Without understanding the situation, the problem will not solve properly (John et al. 2007).

Rational problem-solving skills helps to identify the problems occur and solve it accordingly (John et al. 2007). The steps of the method listed below:

1. Try to identify the problem (John et al. 2007; D'Zurilla & Nezu 1999).

2. List the problem (John et al. 2007; D'Zurilla & Nezu 1999).

3. Analysis the problem (John et al. 2007; D'Zurilla & Nezu 1999).

4. Set the level of success for the problem (John et al. 2007; D'Zurilla & Nezu 1999).

5. List the alternative solutions (John et al. 2007; D'Zurilla & Nezu 1999).

6. Analysis and choose the suitable solution (John et al. 2007; D'Zurilla & Nezu 1999).

Problem solving and analysis skill is important (Ayiesah et al. 2010; Wei Liu et al. 2003; Julia & James 2013). This is because it helps to minimize the problem occurred in the project and make the project successful built.

2.5.2 Decision Making Skills

Decision making is a process of identifying the situation and make the best alternative selection from the feasible set (Jibin et al. 2013). Fast decision making help to reduce unnecessary delay time.

Below list the steps to select the effective decision:

1. Listing the objectives that achievable and specify the requirements of a successful choice outcomes (Kevin & Glen 2005).

2. Search for relevant information which helps to determine the quality of the choices (Kevin & Glen 2005).

3. Evaluate all alternatives pros and cons (Kevin & Glen 2005).

4. Execute the decision by plans the implementation (Kevin & Glen 2005).

5. Monitor the results, and react in the event that known risks become a reality (Kevin & Glen 2005).

Effective decision making helps to achieve intended outcomes. However, bad decision making could lead to unsuccessful outcomes (Kevin & Glen 2005). A fast thinker will increase company competency (Ayiesah et al. 2010; Kevin & Glen 2005).

2.5.3 Organization and Time Management Skills

Time management mean planning the time needed to achieve the goal (Hatice et al. 2012). Organization is a social group of people with different background, thinking, and different style of work which work within the same place to achieve common goal (Fakhredin 2011; Winstanley & Woodall 2000). Organization and time management mean manage different group of people to achieve common goal within the time given.

Effective time management can be achieved by two steps which involved the company organization:

1) How to arrive from the present point to the target point (Hatice et al. 2012; Eldeleklioglu 2008; Waterworth 2003).

2) How to achieve a goal within the shortest time (Hatice et al. 2012; Eldeleklioglu 2008; Waterworth 2003).

Organization management and time management is not easy to achieve (Kerzner 2009). Different company have different culture, it need deep experience to achieve the balance of organization and time management (Hatice et al. 2012; Fakhredin 2011; Winstanley & Woodall 2000; Greenwood 2002).

Good organization management and time management can increase company efficiency and project scheduling.

2.5.4 Communication Ability Skills

Communication is a medium which sending and receiving message through oral or written (Threats & Worrall 2004; Kate et al. 2013). Communication can be start through speech, written word, communication pictures and speech generating devices (Kate et al. 2013). Effective communication is one of the important key to successfully complete the task (Fakhredin 2011).

The challenge of communication are 'encoding' and 'decoding' (Linda 2004). Encoding mean the transmitter pass or deliver the message to the receiver. Decoding mean understanding the messages deliver by the transmitter. To successful achieve good communication, both sender and receiver have a common medium to encode and decode the message.

Communication is an important factor because different culture have different communication medium (Fakhredin 2011; Winstanley & Woodall 2000; Pastoriza et al. 2008; Greenwood 2002). Without a common medium to communicate, the communication will not successful done.

2.5.5 Interpersonal Skills

Interpersonal is a skill which the communication is made between the people (Jeffrey 2013). Leader need to give directives and discipline to the project team. Without guideline the project team feels confused, unappreciated, unmotivated, and frustrated (Chris & Melissa 2007; Jeffrey 2013).

There are four key component of interpersonal communication:

1) Listening (Jeffrey 2013).

2) Body language (Jeffrey 2013).

3) Verbal language (Jeffrey 2013).

4) Conduct (Jeffrey 2013).

Positive interpersonal skills help to increase the social skill (Flora & Segrin 1999; Chris & Melissa 2007). In other word, good interpersonal communication will reduce unwanted miscommunication.

2.5.6 Leadership Skills

Leadership means a person persuades and guides the team member towards the goal and objectives (Sonia 2011; Greenburg & Baron 1997). Team leader is important because if the team without a team leader, the team is soulless.

Leadership requirements skills listed below:

1) Interpersonal skills (Troy et al. 2007; Sonia 2011).

2) Strategic skills (Troy et al. 2007; Sonia 2011).

3) Technical skills (Troy et al. 2007; Sonia 2011).

4) Conceptual skills (Troy et al. 2007; Sonia 2011).

5) Emotional Intelligence (Troy et al. 2007; Sonia 2011).

6) Social Intelligence (Troy et al. 2007; Sonia 2011).

Leadership skills have an impact on the effectiveness and efficiency of the team member (Sonia 2011). This is because a poor leader will have poor persuades and guides. This will cause unhealthy to the team member.

2.5.7 Creativity and Innovation Skills

Creativity defines as generating ideas or solution and produces the novel (Ailing et al. 2013; Mona et al. 2012; Plucker et al. 2004; Amabile 1997). Innovation is defines as successful implementation of creative ideas to reality (Amabile 1997; Mona et al. 2012). Creativity is an activity and innovation is a team effort (Mona et al. 2012). The differences between creativity and innovation are social interactions and the degree of novelty (Mona et al. 2012).

Creativity is divided into three parts:

1) Professional knowledge (Ailing et al. 2013).

2) Innovative thinking skills (Ailing et al. 2013).

3) Motivation (Ailing et al. 2013).

The creativity technique is allowed to generating hypotheses, fast thinking ability and linking ideas (Ailing et al. 2013). With this skill will help to enhance the speed of development.

2.5.8 Lifelong Learning Skills

Lifelong learning means self motivation which keep learning new thing to enhance the person knowledge (Yelkin & Melek 2010). Lifelong learning can take place in any stage (Maruyama 2009; Marjan 2011). Lifelong learning can be in any time and form (Yelkin & Melek 2010; Marjan 2011; Nobeoka 1995).

Lifelong learning divided into 3 forms:

1) Formal learning.

- The learning occurs in an organized or structured (Tissot 2004; Marjan & Peyman 2012). This learning normally is in the education or during training.

2) Non-formal Learning.

- The learning embedded in activity planning which are not explicitly designated as learning (Tissot 2004; Marjan & Peyman 2012). This type of learning contain the element of vocational skills which available during workplace.

3) Informal learning.

- Informal learning which occur during daily life activities. This learning related to family, work or leisure.

Lifelong learning is important because it help to keep learning or updating the new thing which adequate by the company (OECD 2007; Yelkin & Melek 2010; Nobeoka 1995). Without the learning passion, the person and the company will be remained stationary and going no way.

2.6 Human Resource Management Methods

In multiple-project environment, few projects will be running at the same time within an organization (Miia & Päivi 2009). Project portfolio defines as a group of projects which share and compete for the same resources and carried out under the management or sponsorship of an organization (Ghasemzadeh & Archer 2000; Cooper et al. 1999; Dye & Pennypacker 1999). Project portfolio management consider as dynamic decision process because the ongoing project list is constantly revised and updated (Cooper et al. 1998).

In portfolio management principles, organizational resources are allocated to projects base on strategy (Hansen et al. 1999; Cooper & Edgett 2003; Englund & Graham 1999; William 1997; Mazzarol 2003). Portfolio management development processes, organization should look into the existence of project for different requirement (Cooper 2001; Loch 2000). Moreover, portfolio management need to share components, resources or platforms across multitude of projects when project implementation (Engwall & Jerbrant 2003).

Below list the method that commonly uses in multiple project environment:

1) Best-Fitted Resource (BFR) Methodology (Otero et al. 2009).

2) Team-based Human Resource Planning (THRP) Methodology (Cheng et al. 2006).

3) Delphi Methodology (André et al. 2011).

4) Rough-cut-project-and-portfolio-planning Methodology (Hendriks et al. 1999).

5) Multiple Resources Allocation Algorithm Methodology (Chen & Seyed 2009).

2.6.1 Best-Fitted Resource (BFR) Methodology

The BFR methodology was form from skill-relationship tables. This method describes how previous knowledge from various related skills help to learn the needed skills (Otero et al. 2009; Acuña et al. 2006). This approach require worker skills, integrates task complexities, and capabilities of resources.

BFR methodology has four steps. Each step has its objective which is to develop tabular information. The information use to establish a process for selects the most qualified resources for tasks.

The four process steps to develop the BFR listed below (Otero et al. 2009):

1. Task Required Skills (TRS)

    This process is to list the levels of skills needed for the task. Every skill level is specified in terms of its expected use.

2. Skill Relationships (SR)

This step is to form a measure to indicate how different skills help shorten the learning cycle to become proficient in other skills. If the organization resources do not gain the experience for the skill needed, maybe they are skillful in other skills that are related to the needed skills which can speed up the learning process.

3. Resources' Skill Set (RSS)

The RSS step is to prepare a table which represents the skills and knowledge available in the organization resources using discrete values.

4. Best-Fitted Resource (BFR)

The final step is to form BFR table to assign the suitable of available resources which has the skills needed for the task. The suitable resource will help reduce the learning cycle for the organization.

2.6.2 Team-Based Human Resource Planning (THRP) Methodology

The THRP method is form using organization processes which simulation the system (Salem et al. 2003; Yan & Levitt 1996). The simulation system divided into four phases which shown in Figure 1.1 (Cheng et al. 2006).
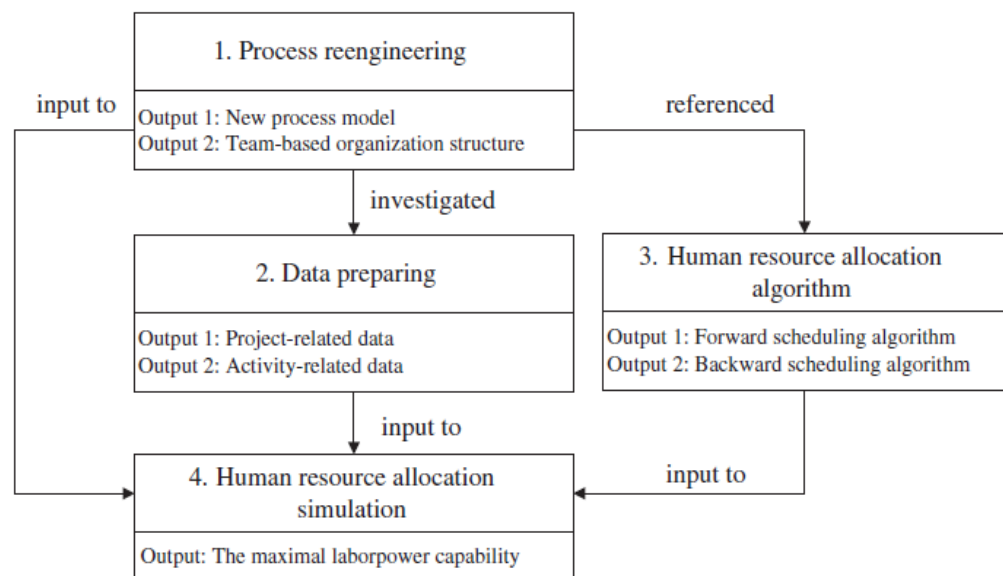
Figure 1.1: The THPR Model (Cheng et al. 2006).

The first step of the system is to create new processes model (Cheng et al. 2006; Cheng & Tsai 2003). The processes model includes team-based organization structure that designed during the reengineering phase (Cheng & Tsai 2003). After the process model is created, the data go through the pre-processing methods and use simulation algorithms to analyze and developed (Cheng et al. 2006). Finally step, all previous three phase results will integrate to the simulation system (Cheng et al. 2006).

By using the simulation system, the maximum worker capability power in the team can be focused and the data able to use as references for future plan for human resource to build worker experience and team work (Cheng et al. 2006). With the reference, organization able to increases the productivity.

2.6.3 Delphi Methodology

The Delphi method is an expert consultation method (André et al. 2011; Okoli & Pawlowski 2004). The core of the method is to organize various dialogues throughout each of the experts that have been consulted using questionnaires.

The Delphi method was used to identify groups of data to form a formula model to assign resource (André et al. 2011; Gorla & Wah 2004). As Figure 1.2 show the stages available in this method. Each stage has its own purposes. First stage is to determine the criteria needed to select the experts (André et al. 2011; Tim & Holly 2007; Chan et al. 2004). The second stage is to determine the factors needed to be considering the model (André et al. 2011; Tim & Holly 2007; Chan et al. 2004). On third stage is to draft the proposal of competences requirement and the roles to tackle the projects (André et al. 2011; Tim & Holly 2007). Final stage the method will use to try an error to search for rules and check any room for improvement (André et al. 2011; Tim & Holly 2007).
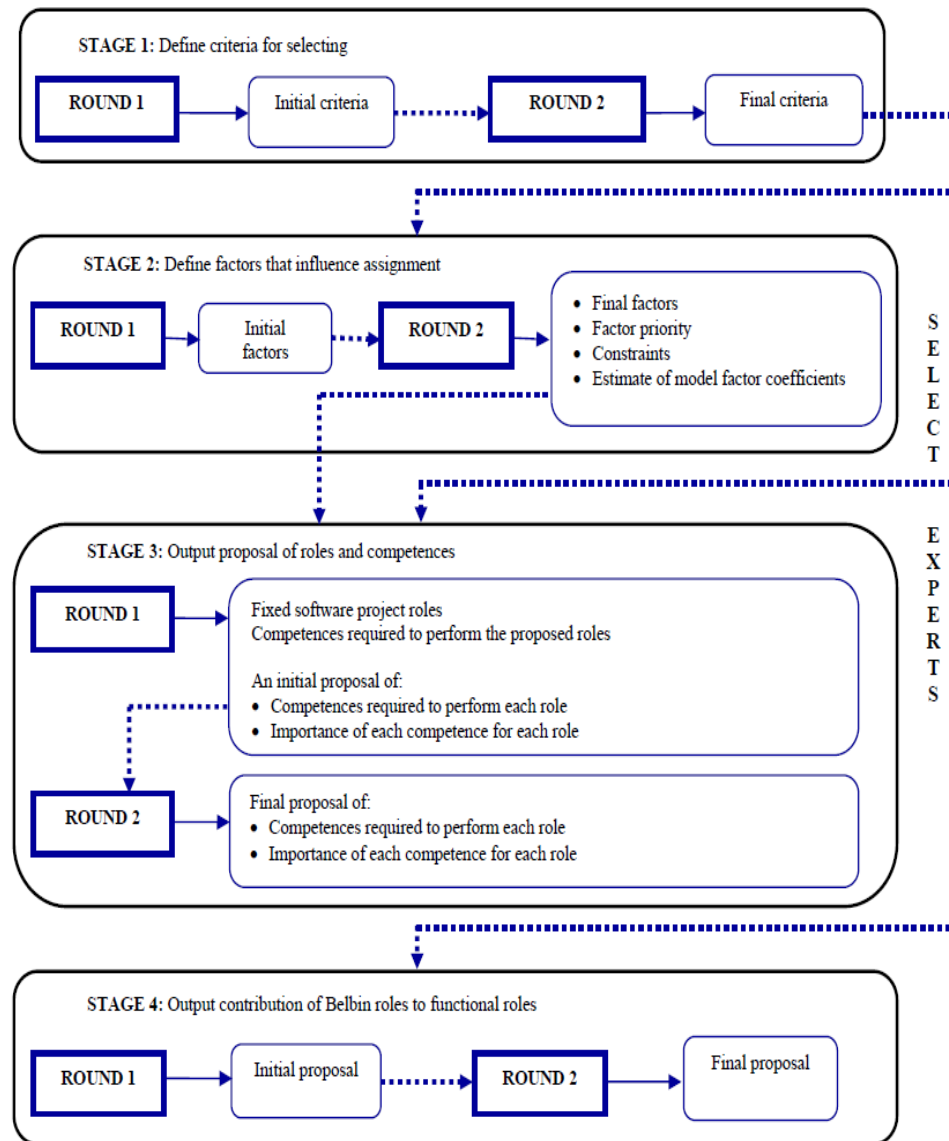
Figure 1.2: Application of the Delphi method (André et al. 2011).

2.6.4 Rough-Cut-Project-And-Portfolio-Planning Methodology

The core of this method is to plan and control the time cycles for projects (Platje et al. 1994). The model can be referred in Figure 1.3 (Hendriks et al. 1999).
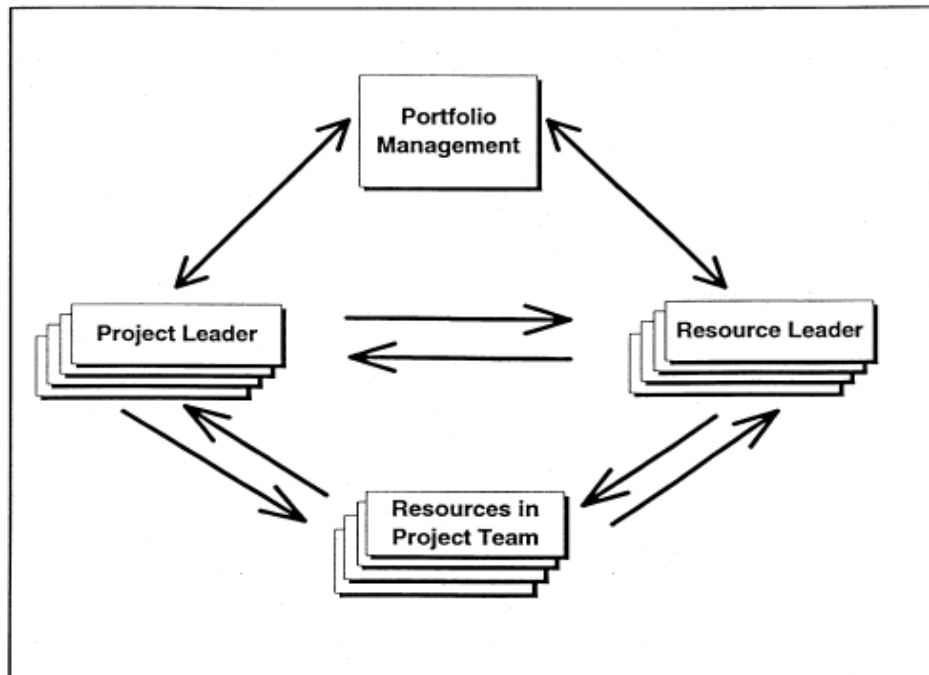
Figure 1.3: Portfolio planning process in multi-project organization (Hendriks et al. 1999).

The allocation method is designed in every quarter base on project portfolio with simple of 'Resource-Claim' and 'Resource-Offer' in the matrix organization (Hendriks et al. 1999; Zohar 2010). This method gives an overview of the requested project portfolio. The claim and offer will be done base on the percentage of workers requested for the next quarter (Hendriks et al. 1999). The group leader will have a discussion on the claims from project

leader. Management will be deciding on which project will selected in the portfolio and management will also assign the resource to the project.

There will be 5 elements which allocate human resource in multi-project situations. These 5 elements are (Hendriks et al. 1999):

- long-term-resource-allocation

- medium-term-resource-allocation

- short-term-resource-allocation

- links

- feedback

With the elements allocation method help organization to gain flexibility for daily planning and give clear business plan (Hendriks et al. 1999). In Figure 1.4 shows the relationship of each element.
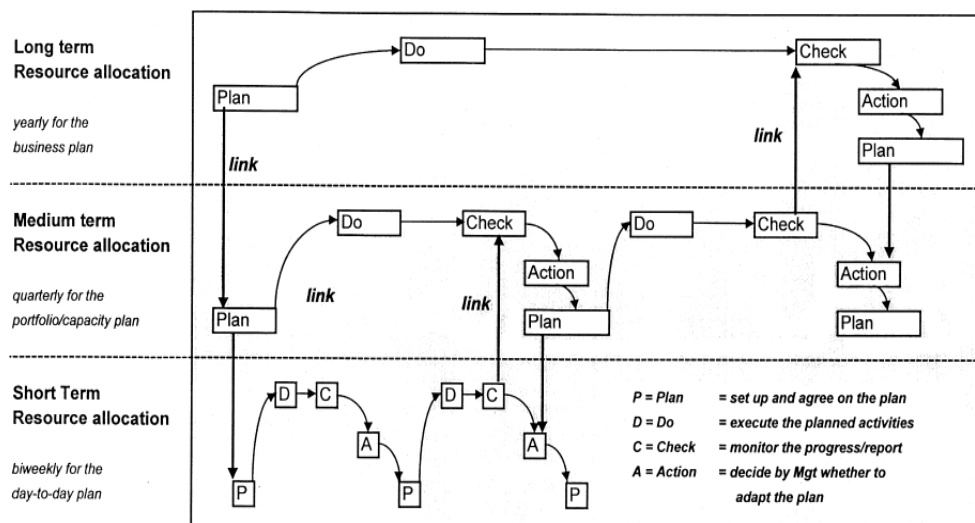
Figure 1.4: Relationships between the various resource allocation processes (Hendriks et al. 1999).

2.6.5 Multiple Resources Allocation Algorithm Methodology

This multiple resources allocation algorithm is more toward next time frame (NTF) method (Moselhi & Lorterapong 1993; Peerasit & Dragan 2006). This method gives minimum impact to the resource because the resource is assign base on active task. The resource allocation is base on time frames. Thus, the organization resource allocation remains constant.

This method uses the following assumptions to consider for the multiple resource assignation process (Chen & Seyed 2009; Kumanan et al. 2006):

1. Resources are positive integers.

2. Activities and task will not be separate.

3. The relationships on each activity will be defined.

4. The activities priority which will run concurrently will be define.

The flow of the method is shown in Figure 1.5. Any activity is able to enter into a group will be determine for resource assignation when all the predecessors are completed (Chen & Seyed 2009). The priority of activities is considered when multiple activities that run concurrently are competing for insufficient or limited resources (Chen & Seyed 2009; Lova et al. 2000).
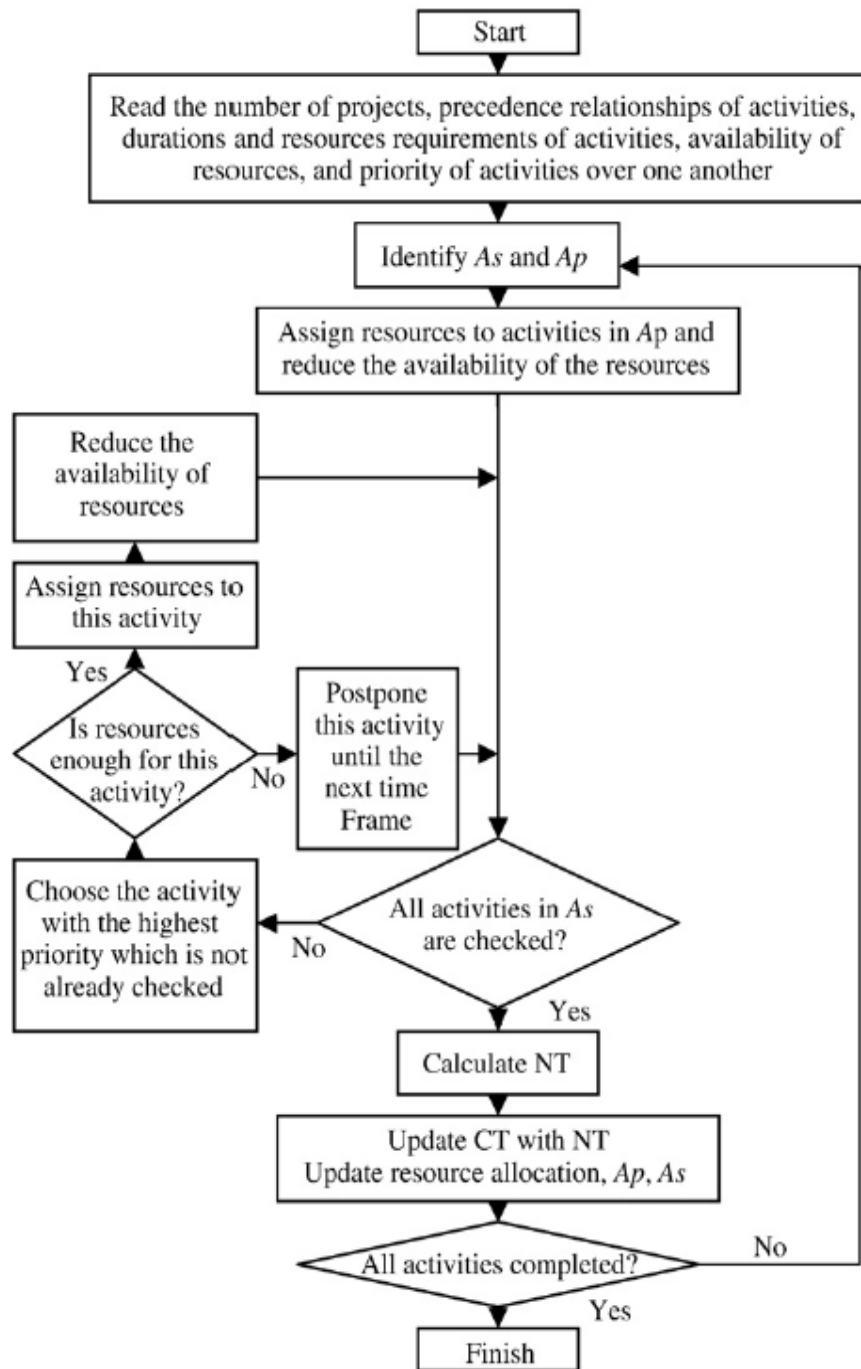
Figure 1.5: Flow of multiple resource allocation methodology (Chen & Seyed 2009).

CHAPTER 3

METHODOLOGY

3.1 Overview

This chapter will elaborate the methods use in the research. There will be six sub topics to be discussed. The first sub topic is the introduction. In first sub topic discuss the research steps and scope. The second sub topic is research methods. In second sub topic will discuss the method available. The third sub topic will be research questionnaire. In third sub topic will be discuss the questionnaire method that will completed the research. Fourth sub topic is the analysis of the data. In fourth sub topic will describe the step and method to analysis the data. The fifth sub topic is about the SPSS software. In fifth sub topic will discuss the SPSS software. The sixth sub topic will discuss the result summarization and discussion. In sixth sub topic discussed the steps that will summarize the result of the data.

3.2 Introduction

Research is formal work which systematically performs methodical study to gain answer or hypothesis (OECD 2007; Shuttleworth 2008).

Research need to follow series of steps and standard rules or protocols. The research must be in systematic algorithm which includes introduction, literature reviews, result and discussion. The research also needs to prepare series of questions to answer.

Hourglass model structure is a common research model. The hourglass model is begins with a table for research which list the focus of the needed information through the method of the project. Below list the important steps to conduct the research:

- Introduction on the research topic

- List the research problem

- Literature review

- Specify the purpose of research

- Determine the research hypotheses or questions

- Data collection

- Analyze and interpret the information gathered

- Research report with evaluate result

3.3 Research Methods

The aim of the research is to understand the research topic and issue in the research topic. This process takes three main forms (Rocco et al. 2011):

I.   Exploratory research

- It used to define and identify problem.

II. Constructive research

- It checks the theories and proposes solutions for the founding.

III. Empirical research

- It checks the feasibility of the solution using empirical evidence.

There are two common types of research design (Creswell 2008): 1) qualitative research and 2) quantitative research. The design of the research is choose according to the nature of the research.

3.3.1 Qualitative Research

The aim of qualitative research method is to understanding the human behavior (Michael 2006; Shmuel et al. 2007). This method is to ask wide question, and the data collected in the form of verbal, pictures, and/or video. The flexibility of this research method is the investigation of question. The question does not need to be quantifiably value or search for potential relationships in the variables. This method is expensive and time consuming

because it focused on a single set of research subjects (Michael 2006). This method is more toward to philosophical and theoretical stance of social constructionism (Shmuel et al. 2007; Creswell 2008).

Qualitative research method can collect data using interview (Gina 2007). Interviews allow one to one discussion with human subjects. Interviews allow to tape the conversation (accurate but time consuming), take notes (distracting), rely on interview memory (foolish) or provide answers for interviewee to choose (can lead to closed questioning for time's sake) (DiCicco et al. 2006). The questions are allowed to be closed ended question or open ended questions, or even mixture (Gina 2007). Closed ended questions encourage to be receives fixed facts such as personal details (name, sex, contact numbers, and others). The closed ended questions answers are easily to manage and allow quantifying the responses easier. On the other hand, open ended questions allow the interview gather variety idea and feelings from the person.

3.3.2 Quantitative Research

Quantitative method is a systematic approaches which gathering data of relationships and the phenomena. This method will ask narrow question to collect numerical data and analyze using the utilizing statistical. The quantitative research is designs to collect data from correlation, experiment and/or survey (or descriptive) (Creswell 2008). Statistics from the data able to derive from quantitative research which allow to be used for check the relationships between variables. This method is toward the theoretical stance of positivism and philosophical (Michael 2006). The data collection method is

relying on various sampling, and the structured data is collected and fit into predetermined response categories (Pekrun & Stephens 2010). The results from quantitative methods are easily to categorize, compare and summarize (Michael 2006). The core of quantitative research is testing hypotheses gather from estimation of the phenomenon and/or various theory. The participants allow to be randomly assigned to give different treatments. These will help to characteristics it statistically which control for the external variable or influence.

Quantitative research method are using questionnaire to collect data (Gina 2007). The questionnaire collecting data is faster compare with interview. This is because interview only can be done in a single time. On the other hand, few questionnaire forms can be done at the same time. The challenge of questionnaire is the layout of the question. Poor arrangement of the questionnaire will cause poor information gather from respondents. The respondent may answer the questionnaire with repeat or random ticking the answering boxes which in various patterns or same pattern. The question from the questionnaire must be clear, easy to understand, and have good ways to collect the information which allows to easily to be analyzed.

3.4 Quantitative Method - Questionnaire

This research is using questionnaire to collect data. The reason questionnaires is been choose because it can eliminate the bias from the interviewer (Chauncey 2013). This method is a convenient and flexible mean for the respondent to fill up the questionnaires, this help to increase the response rate and convenient for the data analysis.

The questionnaire will distribute out using online survey website and e-mail to respondent. The reason questionnaire is send through e-mail and upload to internet is because it gives flexibility and convenient to the responder.

The online survey will reduce the research time. This is because the responder able to give feedback as soon as the respondent completes the questionnaire (Evans & Mathur 2005). Hard copy questionnaire will take longer time to get the answer from the respondent. This is because the reply from responder is gradually depended on the post officer. Using online e-mail will also reduce the risk that the questionnaire gets lost.

The questionnaire mainly targeted for four different industries. The industries are Construction, Oil and Gas, Information Technology (IT), and Manufacturing. They are selected because this industry is practicing multiple-project environment. The target of questionnaire get from respondent is hundred sets. The questionnaire is divided into five sections.

The section A is company and respondent profile. This section contains ten questions. In this section is asking the respondent company background and respondent position.

In the section B are project team member selection criteria. There will be ten questions of project team member selection criteria to be rate. A scale of 1-5 to be selected; where 1 stands for unimportant, 2 stands for of little importance, 3 stands for moderately important, 4 stands for important, 5 stand for very important.

Section C is about the project team member selection methods. This section contains four questions to be rate. A scale of 1-6 to be selected; where 1 stands for never, 2 stands for rarely, 3 stands for sometimes, 4 stands for often, 5 stands for usually, 6 stands for always.

The section D is to human resource management methods. There will be five methods to be rate. A scale of 1-5 to be selected; where 1 stands for not useful, 2 stands for little useful, 3 stands for moderately useful, 4 stands for useful, 5 stands for very useful.

In section E is to rate the issues and problems found in assigning resources. There are five common issue and problem to be rate. A scale of 1-2 to be selected; where 1 stands for Yes, and 2 stands for No.

3.5 Analysis of the Data

After the data is gathered, the next stage is to analysis the data. There are three stages to analysis the data. The first stage is to test the reliability or the consistency of the questionnaire. Cronbach's Alpha will be used to test the reliability of the questionnaire. After the Cronbach's Alpha test, the next test is to rank the data. The data will be converted into indices and ranked using Relative Importance Index. The final test is to determine differences between several independent groups. This test can be done using Kruskal-Wallis.

3.5.1 Cronbach's Alpha

The analysis will begin with a reliability test using Cronbach's Alpha. Cronbach's Alpha is to ensure the reliability of the data collected. The analysis was carried out using SPSS software.

Cronbach's Alpha formula shows below:

$$\alpha = \frac{K\bar{c}}{(\bar{v} + (K-1)\bar{c})}$$

Where,

$\quad K \quad = \quad$ K-items or testlets

$\quad \bar{v} \quad = \quad$ average variance of each component (item)

$\quad \bar{c} \quad = \quad$ average of all covariance between the components

When the Cronbach's Alpha value is above 0.7 will be considered as a reliable questionnaire. On the other hand, while anything below that will indicate that the questionnaire is unreliable (Field 2005).

Below shows the table of the overview of Cronbach's Alpha value indication (Gliem & Gliem 2003):

Table 1: Croanbach alpha value (Gliem & Gliem 2003):

Cronbach's alpha	Internal Consistency
α ≥ 0.9	Excellent
0.9 > α ≥ 0.8	Good
0.8 > α ≥ 0.7	Acceptable
0.7 > α ≥ 0.6	Questionable
0.6 > α ≥ 0.5	Poor
0.5 > α	Unacceptable

3.5.2 Relative Importance Index (RII)

The data is non-parametric or non-normally distributed. In order to test the relative ranking, the result provided by the respondents was change to importance indices which based on the relative importance index.

The analysis was carried out using SPSS software. Relative Importance Index (RII) was formula shows below (Aibinu & Jagboro 2002):

$$RII = \frac{\sum w}{AN}$$

Where,

RII = relative importance index

w = weight given to each skill and method by the respondents, ranging from 1 to 5

A = highest weight (i.e. 5 in this study)

$$N \quad = \quad \text{total number of respondents}$$

3.5.3 Kruskal-Wallis

Kruskal-Wallis is used to find the differences between several groups (Field 2005). The test is based on non-normally distributed data or non-parametric data only (Field 2005). The test is done by ranks the data, and comparing responses among groups of recipients using samples of non-normally distributed response data (Walker 2002). The result of the significant value will also indicate the level of confidence and only values of less than 0.05 is considered as significant (Field 2005).

The analysis was carried out using SPSS software. In this research, Kruskal-Wallis test was used to compare various industries/organization with others information. Below lists the groups that will be compare:

1) Type of organization and project team member selection criteria

2) Type of organization and project team member selection methods

3) Type of organization and human resource management methods

4) Type of organization and issues and problems found in assigning resources

3.6 Statistic - SPSS

Statistics is a method of collection, analysis, organization, interpretation and presentation of data (Dodge 2006). The data collection can be done by doing surveys or experiments (Dodge 2006).

After the data has collected, the data will be analysis using SPSS software. SPSS software is a software package to analysis statistic (Levesque 2007; Field 2005). SPSS software is one of the powerful software which can generate the statistic result by saving all the data into the software. SPSS software can accept non-normally distributed data or non-parametric (Field 2005).

These research statistics results will be generated using SPSS software are:

1) Cronbach's Alpha

2) Relative Importance Index (RII)

3) Kruskal-Wallis

3.7 Result Summarization and Discussion

After the data is analysed, the result will be discussed and summarised it. The result of data will be put into table form or graph form. The summarization will be categorized into four main parts.

The first result will be the project team member selection criteria. By understanding the criteria will help to increase the efficiency to build the project team and reduce the problem found in the literature review part.

The second result is the project team member selection methods. With the understanding of project team member selection methods will help organization to properly assign human resource.

The third result is the HRM methods used in Malaysia industry. By understanding the methods will reduce the time needed to form the project team.

The final result is about the issue and problem arises in multiple projects. The result will give clearer picture of what is happening in multiple-project environment.

After summarize the result, the next section is comparing the result with the literature review. By comparing the literature review and result will help to understand the need and want of the real world. In the discussion will suggest the method of assigning human resource base on the questionnaire result.

CHAPTER 4

RESULT AND DISCUSSION

4.1 Overview

This chapter will present the result of the collected data and the discussion on the analysis. There will be four sub topics in this chapter. The first sub topic is the introduction. In first sub topic is to summarize the overall result. The second sub topic is Cronbach's Alpha test which will test the reliability of the questionnaire survey result. The third sub topic is the summary of the questionnaire result. In third sub topic will elaborate in detail on the questionnaire result and analysis the data with Relative Importance Index. The fourth sub topic is Kruskal-Wallis test. In fourth sub topic will be compare the difference independent group.

4.2 Introduction

The questionnaires were distributed to 120 persons, the respond rate is 107 persons (89.17%) and there was no response from 13 persons (10.83%). From the respondent, there are 17 from Construction (15.89%), 31 from Oil and Gas (28.97%), 13 from Information Technology (12.15%), 25 from Research and Development (23.36%), 11 from Manufacturing (10.28%), and 10 from others (9.35 %).

In the survey questionnaire, the questions were divided into five (5) parts as below:

Section A : Company and Respondent Profile

Section B : Project Team Member Selection Criteria

Section C : Project Team Member Selection Methods

Section D : Human Resource Management Methods

Section E : Issues and Problems Found In Assigning Resource

The data was tested using Cronbach's Alpha to determine the reliability of the data collected. Next, the result will be analyzed base on the questionnaire section. The data will be analysed using Relative Importance Index (RII). Finally the data will be compared with Kruskal-Wallis test. The result will put into Table form.

4.3 Cronbach's Alpha Test

The data collected from the questionnaire survey are tested with Cronbach's Alpha to measure the reliability of the data.

The Croanbach Alpha test result shows in Table 2.1 is reliability test of Project Team Member Selection Criteria. Croanbach Alpha test in Table 2.1 value is 0.996 which shown this study had the high internal consistency.

Table 2.1: Reliability Test of Project Team Member Selection Criteria

Cronbach's Alpha	N of Items
0.996	10

The Croanbach Alpha test result shows in Table 2.2 is reliability test of Project Team Member Selection Methods. Croanbach Alpha test in Table 2.2 value is 0.975 which shown this study had the high internal consistency.

Table 2.2: Reliability Test of Project Team Member Selection Methods

Cronbach's Alpha	N of Items
0.975	4

The Croanbach Alpha test result shows in Table 2.3 is reliability test of Human Resource Management Methods. Croanbach Alpha test in Table 2.3 value is 0.992 which shown this study had the high internal consistency.

Table 2.3: Reliability Test of Human Resource Management Methods

Cronbach's Alpha	N of Items
0.992	5

The Croanbach Alpha test result shows in Table 2.4 is reliability test of Issues and Problems Found In Assigning Resource. Croanbach Alpha test in Table 2.4 value is 0.934 which shown this study had the high internal consistency.

Table 2.4: Reliability Test of Issues and Problems Found In Assigning Resource

Cronbach's Alpha	N of Items
0.934	5

4.4 Summary of the Questionnaire Result

The result will be divided into five sections which same as the questionnaire section. In first section is company and respondent profile. For second section will be project team member selection criteria. Third section is project team member selection methods. In fourth section is human resource management methods. The fifth section is issue or problem found in assigning resource.

In first section there are ten tables. The table include the quantity and percentage column. From second section to fifth section will be using Relative

Importance Index (RII) to analysis the data. RII use to determine the ranking of the data.

4.4.1 Company and Respondent Profile

This section is to summarize the result for the company and respondent profile. These sections give the overall information of the respondent and the company information.

This section will divide into ten sections. The sections include:

1) Age

2) Gender

3) Education

4) Type of organization

5) Position

6) Nature of business

7) Number of years working experience

8) Average contract sum

9) Largest project involved based on contract sum

10) Are you handling more than one project concurrently

1. **Age**

Age	Quantity	Percentage
Less than 20	5	4.67
20-29	32	29.91
30-39	39	36.45
40-49	24	22.43
50 and above	7	6.54

2. **Gender**

Gender	Quantity	Percentage
Male	89	73.83
Female	18	20.30

3. **Education**

Education	Quantity	Percentage
Certificate	9	8.41
Diploma	33	30.84
Degree	50	46.73
Master	11	10.28
PhD	4	3.74

4. **Type of organization**

Type of organization	Quantity	Percentage
Clients (government or developer)	81	75.70
Consultants	9	8.41
Contractors	13	12.15
Others	4	3.74

5. **Position**

Position	Quantity	Percentage
Managing Director	6	5.61
Manager	47	43.93
Technician	13	12.15
Engineer	31	28.97
Human Resource	7	6.54
Others	3	2.80

6. **Nature of business**

Nature of business	Quantity	Percentage
Construction	17	15.89
Oil and Gas	31	28.97
Information Technology (IT)	13	12.15

Research and Development (R&D)	25	23.36
Manufacturing	11	10.28
Others	10	9.35

7. Number of years working experience

Number of years working experience	Quantity	Percentage
Less than 2 years	20	18.69
2-5 years	35	32.71
6-10 years	41	38.32
More than 10 years	11	10.28

8. Average contract sum

Average contract sum	Quantity	Percentage
Less than RM 10 million	60	56.07
RM 10 million – RM 50 million	30	28.04
More than RM 50 million	17	15.89

9. Largest project involved based on contract sum

Largest project involved based on contract sum	Quantity	Percentage
Less than RM 10 million	3	2.80
RM 10 million – RM 50 million	65	60.75
More than RM 50 million	39	36.45

10. Are you handling more than one project concurrently

Are you handling more than one project concurrently	Quantity	Percentage
1	35	32.71
2 – 3	67	62.62
4 – 5	5	4.67

In the summary of the result, majority of the respondent holding executive and management level which work for client. Most importantly, about half of the respondents have six years and above of working experience. With this information, it can increase the reliability of the survey result. This

is because they have vast experience and have better knowledge on Human Resource Management in the industry for many years.

There are one more important information is majority of the respondent is handling few project at the same time. This information is important because the research is about Human Resource Allocation in Multiple Project Environment. This research cannot be continues if the respondent does not practice multiple project environment.

4.4.2 Project Team Member Selection Criteria

This section is to summarize the result for the project team member selection criteria. These sections give the guideline for project team member selection criteria.

Table 3: Project Team Member Selection Criteria

No	Project Team Member Selection Criteria	RII	Ranking
1.	Lifelong Learning Skill	0.740	1
2.	Good Communication Skill (Oral, Written and Listening)	0.735	2
3.	Good Problem Solving Skill	0.708	3
4.	Good Analytical Skill	0.701	4
5.	Good Time Management Skill	0.695	5
6.	Decision Making Skill	0.680	6
7.	Good Leadership Skill	0.675	7
8.	Good Interpersonal Skill	0.662	8
9.	Good Innovation Skill	0.652	9

10.	Good Creativity Skill	0.634	10

From Table 3, the highest criteria ranking is lifelong learning skill. On the other hand, the lowest ranking is good creativity skill. The project team member selection criteria result has high rating on the answer selection. The lowest ranking has 0.634 RII values. When the value of RII is above 0.6 indicates most of the respondent answer the criteria listed in Table 3 is important. Thus, this indicates the criteria listed in Table 3 are important to all industry.

Comparing the journal written by Ayiesah et al. 2010, the criteria have swapped their rank. For example good problem solving skill have swapped place with good analytical skill. Most important, the highest ranking is remains unchanged which is lifelong learning skills. On the other hand, the lowest criteria remain unchanged is good creativity skill. Base on the comparison between the research result and the journal, the criteria ranking has swapped it place. These indicate when the time change the criteria required for the industry also changes.

Lifelong learning skill remained the top ranking compare the research result and journal is because this skill mean keep updating the knowledge and polish the skills (OECD 2007; Yelkin & Melek 2010; Nobeoka 1995). Organization is searching for the person with higher knowledge to help the company to solve problem. Summary, the lifelong learning skill is remains top of the main criteria.

The second criteria place is good communication skill, however in the journal the good communication skill is at third place. Good communication

skill means a medium which sending and receiving message through oral or written (Threats & Worrall 2004; Kate et al. 2013). Good communication skill has rank on the second place because effective communication is one of the important key to successfully complete the task (Fakhredin 2011). Communication is an important factor because different culture have different communication medium (Fakhredin 2011; Winstanley & Woodall 2000; Pastoriza et al. 2008; Greenwood 2002). The miscommunication will keep the project delay because the team member does not receive the proper information. Summary, good communication skill is needed because it can reduce miscommunication between team members.

The good problem solving skill is in third rank on the project team member selection criteria, comparing the journal is at fifth place. Good problem solving skills is important because problem solving helps finding the solutions and solves the problems (John et al. 2007). This will help the company minimize the problem occurred in the project and make the project successful built. Summary, good problem solving skill is important because it help company to solve problem occur.

Comparing the journal and result, the lowest criteria ranking remained unchanged which is good creativity skill. Creativity skill means generating ideas or solution and production of novel (Ailing et al. 2013; Mona et al. 2012; Plucker et al. 2004; Amabile 1997). The creativity skill remains lowest ranking because not many organization need to generating hypotheses, or fast thinking ability, or linking ideas (Ailing et al. 2013). Majority industry need worker which able to solve the problem occur on the project.

Base on the result above, education line should equip the graduate with the need and want for the industry or working environment (Ayiesah et al. 2010). With the ability that has gathered during university time, this will help the graduate to perform better during real working life.

When the graduate equipped with the knowledge and skills needed, it help the industry to perform better, especially in multiple-project environment. This is because in multiple-project environment, the team member required to handle few different tasks at the same time.

In multiple-project environment, the worker must have different background of knowledge and skills to help them to complete the task or job. In multiple-project environment, the worker will not work in the same task or job, the project team member will expose to multi direction of task or job.

Summary, the project team member selection criteria listed in Table 3 is the common criteria need on the industry. Therefore, the graduate or worker has to play their roles which initiative increases their skills to meet the industry expectation.

4.4.3 Project Team Member Selection Methods

This section is to summarize the result for the project team member selection methods. These sections give the guideline on how to select project team member.

Table 4: Project Team Member Selection Methods

No	Project Team Member Selection Methods	RII	Ranking
1.	Take place before the project start	0.726	1
2.	Take place after the project started	0.609	2
3.	Allow employee to choose the project that they want to work on	0.545	3
4.	Allow employee exchange during the project course of a project	0.500	4

From Table 4, the highest project team member selection methods ranking is take place before the project start. The lowest ranking is the allow employee exchange during the project course of a project.

The result indicates the project team member selection method is selected before the project start. This indicate large amount of industry select project team before the project start. This assignation increases the effectiveness of the project because each member knows their duty and can make early preparation (Kerzner 2009; Sydow et al. 2004; Gareis 2005). This project team member selection method normally founds in industry such as

Oil and Gas, Research and Development, Construction, Information Technology, academic and other similar industry.

The result also shows project team member methods will select after the project is started. This project team member selection methods normally used for add additional team member to the project team (Turner et al. 2008; Ga¨llstedt 2003; Aitken & Crawford 2007). This project team member selection method founds in industry such as Oil and Gas, Construction, Information Technology, and other similar industry.

The lowest ranking is the employee able to exchange project team during the project is started. This project team member selection method is low ranking because when employee exchange project it will reduce the resource form the project. Thus, the management does not allow worker to change project team. There is one condition which allow employee to exchange project team when the employee found to have medical problem. The industry which practicing this project team member selection method are Construction, Oil and Gas, Manufacturing, and other similar industry. This is because the jobs function is daily routine and requires physical power. The worker can change their job if they suffer any physical problem.

Summary, from Table 4 result shows the management has the highest authority which will form the project team member before or after the project is start. Thus, workers need to well prepare for the upcoming task and job.

4.4.4 Human Resource Management Methods

This section is to summarize the result for the human resource management methods. These sections give the guideline on how industry selects resources to the project.

Table 5: Human Resource Management Methods

No	Human Resource Management Methods	RII	Ranking
1.	Multiple Resources Allocation Algorithm Method (Assign based on project time/scheduling)	0.755	1
2.	Delphi Method (Assign based on series of discussion from expert)	0.718	2
3.	Best Fit Resource Method (Assign based on experience, skills or etc.)	0.714	3
4.	Team-Based Human Resource Planning Method (Assign based on mapping company processes)	0.705	4
5.	Rough-Cut-Project-And-Portfolio-Planning Method (Assign based on organization portfolio)	0.654	5

From Table 5, the highest human resource management method is multiple resources allocation algorithm method. The lowest ranking human resources management method is rough-cut-project-and-portfolio-planning (RCPAPP) method.

The human resource management method result has high rating on the answer selection. The lowest ranking has 0.654 RII values. When the value of

RII is above 0.6 which indicates most of the respondent answer the human resource method is applicable and normally use in their industry. This also indicate above human resource management method is widely used in the industry.

The multiple resource allocation algorithm method is the top ranking amount others method because the resource is assigned base on project schedule. Project is a temporary team member which forms to complete the project (Turner 2009). Thus, the management will assign the team member base on the schedule. For example if the task has a tide schedule, the task need a bigger team to complete the task. On the other way, if the project schedule has long timing, the management will assign fewer workers to the team member. This method is suitable for the industry which different scheduling time such as Oil and Gas, Construction, Information Technology and others similar industry.

Delphi method is one of the high ranking method is because the project team member is form from series of feedback from expertise (André et al. 2011). With this method the project team member will become more sustainable and better performance. This is because the expertise which is project manager knowing the need and want of the project which give advantages to the project team to perform better. This method is suitable for the industry which always keeps update such as Oil and Gas, Research and Development, Information Technology, Manufacturing and other similar industry.

The rough-cut-project-and-portfolio-planning method has low ranking from other methods. This can be understandable because this method has less

flexibility and longer time to form a project team. This is because the project team will form every year base on organization portfolio. This method is suitable for the industry which does not require add new member to project team often such as Research and Development, Manufacturing, academic and other similar industry.

Summary, the HRM method listed in Table 5 is common method which widely used in the industry. There may be others method which does not list in Table 5 is using by the industry. The HRM method listed in Table 5 is for reference and guidance which help to improve the assignation of human resources.

4.4.5 Issues and Problems Found in Assigning Resources

This section is to summarize the result for the issues and problems found in assigning resources. These sections help to analysis the current problem occur in the Malaysia industry.

Table 6: Issues and Problems Found In Assigning Resources

No	Issues and Problems Found In Assigning Resources	RII	Ranking
1.	Insufficient Expertise	0.935	1
2.	Recruitment Suitable Staff	0.921	2
3.	Fail To Schedule The Resource	0.916	3
4.	Conflict With Resources Availability	0.897	4
5.	Insufficient Budget	0.827	5

From Table 6, the highest issues and problems found in assigning resources is insufficient expertise. The lowest issues and problems found in assigning resources are insufficient budget.

The result has high rating on the answer which the lowest ranking has 0.827 RII values. When the value of RII is above 0.6 indicates most of the respondent answer yes on the issues and problems which suffer in their company. Thus, these indicate most of the industries have the same issues or problems listed in the Table 6.

The top ranking issues or problems found in assigning resource is insufficient expertise. The insufficient expertise is one of the common problem occur in any industry. The insufficient problem is occurs in two condition. First condition is there are new technologies occur (Zottoli & Wanous 2000; Billsberry 2007; Braddy et al. 2008; Patanakul & Milosevic 2009; Mark et al. 2009). The company need to adopt or use the new technology (Patanakul & Milosevic 2009; Mark et al. 2009), but there is limited person have the new knowledge to use or operate it (Bonache 2004). The second condition is the worker of the company resigned (Pennypacker & Dye 2002; Kerzner 2009). This will reduce the expertise on the company and will cause problem on the ongoing project. The insufficient expertise normally occurs in Oil and Gas, Research and Development, Information Technology and others similar industry.

The lowest ranking for the issues and problems found in assigning resource is the insufficient budget. Overall, insufficient budget is lowest ranking amount others issue and problem because not all industry has the same problem. Generally only few industry suffer insufficient budget. The

industries which suffer the insufficient budget are Research and Development, Construction and others similar project which need to invest first before can gain back.

Summary, base on Table 6, the issues and problems found in assigning resource is general issues found in most of the industry. The issues and problems listed in Table 6 is a reference for guidance. Different industry may have different issues and problems occur in their company.

4.5 Kruskal-Wallis Test

Kruskal-Wallis is used to find the differences between several groups (Field 2005). The test is based on non-normally distributed data or non-parametric data only (Field 2005). The test is done by ranks the data, and comparing responses among groups of recipients using samples of non-normally distributed response data (Walker 2002).

The result of the significant value will indicate the level of confidence. The values of less than 0.05 are considered as significant (Field 2005). The Kruskal-Wallis test will be used to test as below:

1) Type of organization and project team member selection criteria

2) Type of organization and project team member selection methods

3) Type of organization and human resource management methods

4) Type of organization and issues and problems found in assigning resources

4.5.1 Type of Organization and Project Team Member Selection Criteria

This section is test the organization and project team member selection criteria. The test will find any significant difference between the types of organization with project team member selection criteria.

Table 7: Relationship between type of organization and project team member selection criteria

	Type of organization	
Selection Criteria	Chi Square	p value
Good Problem Solving Skill	4.253	0.514
Good Analytical Skill	3.865	0.569
Decision Making Skill	1.622	0.899
Good Time Management Skill	1.761	0.881
Good Communication Skill	4.167	0.526
Good Interpersonal Skill	2.133	0.830
Good Leadership Skill	12.150	0.033
Good Creativity Skill	6.407	0.269
Good Innovation Skill	4.032	0.545
Lifelong Learning Skill	9.027	0.108

The *p* value less than 0.05 is considered as significant difference (Field 2005). On the other hand, *p* value more than 0.05 is considered no significant difference (Field 2005).

The result of the test indicated there are nine project team member selection criteria which does not have significant difference in the way project team member selection criteria is selected amongst the different types of organization ($p>0.05$), except good leadership skill ($p=0.033$). The significant difference means different organization give different weight to this criterion.

Base on the result, the project team member selection criteria listed in Table 3 are important for project success. Base on Table 3, the top three ranking project team member selection criteria are:

Table 3: Project Team Member Selection Criteria

No	Project Team Member Selection Criteria	RII	Ranking
1.	Lifelong Learning Skill	0.740	1
2.	Good Communication Skill (Oral, Written and Listening)	0.735	2
3.	Good Problem Solving Skill	0.708	3
4.	Good Analytical Skill	0.701	4
5.	Good Time Management Skill	0.695	5
6.	Decision Making Skill	0.680	6
7.	Good Leadership Skill	0.675	7
8.	Good Interpersonal Skill	0.662	8
9.	Good Innovation Skill	0.652	9
10.	Good Creativity Skill	0.634	10

Lifelong learning skill is the top choice for all industrial. This is because lifelong learning help to keep learning and updating the new thing which adequate by the company (OECD 2007; Yelkin & Melek 2010; Nobeoka 1995). Lifelong learning means self motivation on keep learning new thing which enhance the person knowledge (Yelkin & Melek 2010). Lifelong learning can take place in any stage (Maruyama 2009; Marjan 2011). Lifelong learning can be in any time and form (Yelkin & Melek 2010; Marjan 2011; Nobeoka 1995).

Any industries need to keep updating their knowledge in every angle (Field 2001; Aspin & Chapman 2000; Griffin 1999). This is because with the updated information, the company able to enhance their productivity time. For example Research and Development needs new information to build new product out. Without the spirit of keep learning new thing, the company may not able to adequate new technology to product new product.

The second place is good communication skill. Good communication skill means a medium which sending and receiving message through oral or written (Threats & Worrall 2004; Kate et al. 2013). Effective communication is one of the important key to successfully complete the task (Fakhredin 2011). The miscommunication will always keep the project delay because the team member does not receive the proper information. Thus, good communication is needed between the team members to reduce miscommunication.

The good problem solving skill is in third ranking on the project team member selection criteria. Problem solving means finding the solutions to

solve the problems (John et al. 2007). Good problem solving skills is important because this will help the company minimize the problem occurred in the project and make the project successful built.

Summary, based on the Table 7 project team member selection criteria listed in Table 3 is important to all industrial. The top three ranking criteria are must have criteria in any industry. Thus, each individual must have initiative to upgrade themselves to meet the social standard.

4.5.2 Type of Organization and Project Team Member Selection Methods

This section is test the organization and project team member selection methods. The test will find any significant difference between the types of organization with project team member selection methods.

Table 8: Relationship between type of organization and project team member selection methods

Team Member Selection Methods	Type of organization	
	Chi Square	p value
Take place before the project start	6.035	0.303
Take place after the project started	2.878	0.719
Allow employee to choose the project that they want to work on	6.861	0.231
Allow employee exchange during the project course of a project	3.389	0.640

The *p* value less than 0.05 is considered as significant difference (Field 2005). On the other hand, *p* value more than 0.05 is considered no significant difference (Field 2005).

The result of the test indicated that there is no significant difference in the way project team member selection method is selected amongst the different types of organization (*p*>0.05). This shows the project team member selection method take place before project start is use widely in all industry.

Base on the result, the project team member selection method listed in Table 4 are important for project success. Base on Table 4, the ranking in the descending order of importance for project team member selection method are:

Table 4: Project Team Member Selection Methods

No	Project Team Member Selection Methods	RII	Ranking
1.	Take place before the project start	0.726	1
2.	Take place after the project started	0.609	2
3.	Allow employee to choose the project that they want to work on	0.545	3
4.	Allow employee exchange during the project course of a project	0.500	4

Project team is the people who have been assigned tasks and responsibility for completing the project (PMBOK Guide 2004). The project team is formed by the project manager. The project manager will choose the team member by selecting from a group of people (Turner 2009). After project manager chosen the team member, project manager will assign the task according to the team member.

The team members selected usually form before the project start (Turner 2009). Normally project manager know the upcoming project. Thus, project manager will form the team member base on the job scope. Project manager will assign task base on the work breakdown structure (WBS).

The early team member selection will help to get to know the people who handling the particular project. With this, the team member can communicate amount each other. Therefore, the team member have better acknowledgement amount each other.

Summary, base on the Table 8 the project team member selection methods listed in Table 4 is normally used in all industrial. Base on Table 4, all industry normally form team member before the project start. Therefore, the worker must prepare themselves to receive new task from the management.

4.5.3 Type of Organization and Human Resource Management Methods

This section is test the organization and human resource management (HRM) methods. The test will find any significant difference between the types of organization with HRM methods.

Table 9: Relationship between type of organization and HRM methods

	Type of organization	
	Chi	p
HRM Methods	Square	value
Best Fit Resource Method	9.717	0.084
Delphi Method	4.067	0.540
Team-Based Human Resource Planning Method	5.428	0.366
Rough-Cut-Project-And-Portfolio-Planning Method	3.899	0.564
Multiple Resources Allocation Algorithm Method	6.143	0.293

The p value less than 0.05 is considered as significant difference (Field 2005). On the other hand, p value more than 0.05 is considered no significant difference (Field 2005).

The result of the test indicated that there is no significant difference in the way HRM method is selected amongst the different types of organization ($p>0.05$). The method listed in Table 5 is commonly use in all industry. Base on Table 5, the top three ranking HRM method are:

Table 5: Human Resource Management Methods

No	Human Resource Management Methods	RII	Ranking
1.	Multiple Resources Allocation Algorithm Method (Assign based on project time/scheduling)	0.755	1
2.	Delphi Method (Assign based on series of discussion from expert)	0.718	2
3.	Best Fit Resource Method (Assign based on experience, skills or etc.)	0.714	3
4.	Team-Based Human Resource Planning Method (Assign based on mapping company processes)	0.705	4
5.	Rough-Cut-Project-And-Portfolio-Planning Method (Assign based on organization portfolio)	0.654	5

In multiple-project environment, the project will be running at the same time within an organization (Miia & Päivi 2009). Project portfolio defines as a group of projects which share and compete for the same resources and carried out under the management or sponsorship of an organization (Ghasemzadeh & Archer 2000; Cooper et al. 1999; Dye & Pennypacker 1999).

The multiple resources allocation algorithm is the top HRM method because this algorithm is similar to next time frame (NTF) method (Moselhi & Lorterapong 1993). This method gives minimum impact to the resource because the resource is assign base on active task. The resource allocation is base on time frames. Thus, the organization resource allocation remains constant.

Summary, base on the Table 9 all HRM method listed in Table 5 is normally used in all industrial. Base on Table 5, the RII value is high, this indicate the industry does not have a fix HRM method. This can be understood because different project has different need and want. Thus, there is no fix HRM method for all industry.

4.5.4 Type of Organization and Issues and Problem Found in Assigning Resources

This section is test the organization and issues and problems found in assigning resources. The test will find any significant difference between the types of organization with issues and problems found in assigning resources.

Table 10: Relationship between type of organization and issues and problems found in assigning resources

Issues and Problems Found in Assigning Resources	Type of organization	
	Chi Square	p value
Insufficient Expertise	1.910	0.861
Insufficient Budget	5.486	0.359
Fail To Schedule The Resource	7.085	0.214
Conflict With Resources Availability	8.553	0.128
Recruitment Suitable Staff	3.906	0.563

The *p* value less than 0.05 is considered as significant difference (Field 2005). On the other hand, *p* value more than 0.05 is considered no significant difference (Field 2005).

The result of the test indicated that there is no significant difference in the way issues and problems found in assigning resources amongst the different types of organization ($p>0.05$). Base on Table 6, the top three issues and problems found in assigning resources are:

Table 6: Issues and Problems Found In Assigning Resources

No	Issues and Problems Found In Assigning Resources	RII	Ranking
1.	Insufficient Expertise	0.935	1
2.	Recruitment Suitable Staff	0.921	2
3.	Fail To Schedule The Resource	0.916	3
4.	Conflict With Resources Availability	0.897	4
5.	Insufficient Budget	0.827	5

Most of the time new project is start up all of a sudden and with the fast changing of competitors. Allocating employee in multi project environment is difficult and often gives lots of problem. This is due to limited resources in the company and other unforeseeable problems.

Assigning the correct human resource to a project is vital. The more projects received by the company, the more specific knowledge of employee is needed. This is because with the correct worker can help to minimize the problem and handle more task (Kerzner 2009). Specific knowledge worker cause problem on the human resource allocation progress, this is because specific knowledge worker is difficult to fine.

Summary, base on the Table 10 all issues and problems found in assigning resources facing by all industrial. In Table 6 shows the top three ranking issues and problems found in assigning resources are normally found in any industry.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Overview

This chapter draw the conclusions for the research. There are three sub topics. The first sub topic is conclusion. In first sub topic will conclude the findings of the research. The second sub topic will be limitation of the research. In second sub topic describes the limitation which found in this research. The third sub topic is future research. In third sub topic discuss the further research that can be done.

5.2 Conclusion

The aim of this research is to identify human resource allocation in multiple-project environment in Malaysia. The research will help to enhance both industry and academic. With the result of the research will created a guideline for the academic and company which can handle project more effectively and increases the rate of project success.

In this research, there are four objectives. Base on the result gathered on the research, all four objectives has achieved. Thus, the aim of the research has achieved too.

The first objective is to identify the human resources practices adopted by the Malaysia companies. The first objective was achieved based on the result of project team member selection methods. In the result shows the project team member selection methods in the descending order of importance are: 1) Take place before the project start, 2) Take place after the project started, 3) Allow employee to choose the project that they want to work on, and 4) Allow employee exchange during the project course of a project. In the Kruskal-Wallis test shows there is no significant difference in the way project team member selection methods amongst the different types of organization. The project team member selection methods take place before project start is use widely in all industry because before the project start, all team members will know who is handling the particular project. With this, the team member can communicate amount each other. Therefore, the team member have better acknowledgement amount each other.

The second objective is to determine the criteria for assigning human resource in multiple project environment. The second objective was achieved base on the result of project team member selection criteria. Base on the result, the project team member selection criteria in the descending order of importance are: 1) Lifelong Learning Skills, 2) Good Communication Skills, 3) Good Problem Solving Skills, 4) Good Analytical Skills, 5) Good Time Management Skills, 6) Decision Making Skills, 7) Good Leadership Skills, 8) Good Interpersonal Skills, 9) Good Innovation Skills, and 10) Good Creativity

Skills. The top three criteria show no signification different between the type of organization and project team member selection criteria in the Kruskal-Wallis test. Lifelong learning skill is the top criteria for all industrial because lifelong learning help to keep learning and updating the new thing which adequate by the company. The second important criterion is good communication skill because miscommunication will always keep the project delay because the team member does not receive the proper information. The third criterion is good problem solving skill because it help to minimize the problem occurred in the project. Knowing the project team member selection criteria help enhance the pre-existing theories and materials collected by previous researcher. This also helps to gain better knowledge on the requirement on the industry.

The third objective is to identify the effective method to assign human resource in multiple-project environment. The third objective was achieved based on the result at Human Resources Management (HRM) Methods. Based on the result, the HRM methods in the descending order of importance used in Malaysia Industry are: 1) Multiple Resources Allocation Algorithm Method, 2) Delphi Method, 3) Best Fit Resource Method, 4) Team-Based Human resource Planning Method, and 5) Rough-Cut-Project-And-Portfolio-Planning Method. The result indicated multiple resources allocation algorithm is the top HRM methods because it gives minimum impact to the resource because the resource is assign base on active task. The result gives a guideline on how industry assigns human resources. Conclusion, Multiple Resources Allocation Algorithm Method is the common HRM method generally used in the Malaysia industry.

The fourth objective is to identify the human resource management best practices for project that be adopted. The fourth objective was achieved based on the Kruskal-Wallis test. In Kruskal-Wallis test shows most of the independent group has no significant different except good leadership skill. The significant difference means different organization may give different weight to this criterion. The first human resource management best practices for project that be adopted was obtained from the result type of organization and project team member selection criteria. Based on the result, project team member selection criteria in the descending order of importance are: 1) Lifelong Learning Skills, 2) Good Communication Skills, 3) Good Problem Solving Skills, 4) Good Analytical Skills, 5) Good Time Management Skills, 6) Decision Making Skills, 7) Good Leadership Skills, 8) Good Interpersonal Skills, 9) Good Innovation Skills, and 10) Good Creativity Skills. Base on the project team member selection criteria, the important criteria is lifelong learning skills for the Malaysia industry. This is because lifelong learning mean keep learning and updating new thing which adequate by the company. Without learn new thing, the company unable to stay competitive. Thus, human resource management best practices for project that be adopted is by keep learning new thing. The second human resource management best practices for project that be adopted was obtained from the result type of organization and project team member selection methods. In the result shows the project team member selection methods in the descending order of importance are: 1) Take place before the project start, 2) Take place after the project started, 3) Allow employee to choose the project that they want to

work on, and 4) Allow employee exchange during the project course of a project. Base on the project team member selection methods in the descending order of importance, the project team member selection method take place before the project start. The early team member selection will help to get to know the people who handling the particular project. With this, the team member can communicate amount each other. Therefore, the team member have better acknowledgement amount each other. The third human resource management best practices for project that be adopted was obtained from the result type of organization and human resource management methods. In the result shows the human resource management methods in the descending order of importance are: 1) Multiple Resources Allocation Algorithm Method, 2) Delphi Method, 3) Best Fit Resource Method, 4) Team-Based Human Resource Planning Method, and 5) Rough-Cut-Project-And-Portfolio-Planning Method. Base on the human resource management methods in the descending order of importance, the multiple resources allocation algorithm method is the top because the HRM method gives minimum impact to the resource because the resource is assign base on active task. Conclusion, the human resource management best practices for project that be adopted with the lifelong learning criteria, and assign team member before project start and lastly using the Multiple Resources Allocation Algorithm Method.

5.3 Limitations of the Research

Each research has it owns limitation (Ionnidis 2007). This research also has it owns limitation. This research has two limitations. The first limitation is the inconsistency sample size. The second limitation is the answer provide by the participant.

The first limitation of this research is the sample size for the survey. The sample size is not focus enough. The industry groups are too many categories which caused the result to be inconsistent with the work of other researchers. In the result, there are some industries that have more participants. With different sample size will cause inconsistent to the result.

Other limitation of the research is the attitude of answering the question. The participants of the recipients were found simply filling in the survey. This problem maybe the participant does not fully understand the questionnaire. Thus, there are some participant does not fully answer the entire questionnaire.

Conclusion, the first problem can be eliminated by equally distribute the questionnaire to the industry that needs to do survey. The second problem is the questionnaire is not complete answer. The second problem can be reduces by inserting some indicator. For example picture, a picture worth a thousand words (Arthur 1911).

5.4 Future Research

Base on the research, there are two areas can be further study. The first area is the multiple resources allocation algorithm method. The second area is the lifelong learning in multiple-project environment.

The first area can be further studied as the topic on multiple resources allocation algorithm in Malaysia industry. The multiple resources allocation algorithm in Malaysia industry needs to be study more detail which will improve the Malaysia industry HRM.

The second area can be further studied as the topic on lifelong learning criteria in multiple-project environment. With the understanding the learning curve in multiple-project environment, it gain the speed to learn thing in the multiple-project environment.

Conclusion, both areas needs deep study which will improve the industry and the worker.

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APPENDICES

APPENDIX A: Survey Questionnaire

SURVEY: Human Resource Allocation In Multiple Project Environment

This questionnaire consists of Five (5) sections:-

Section A : Company and Respondent's Profile

Section B : Project Team Member Selection Criteria

Section C : Project Team Member Selection Methods

Section D : Human Resource Management Methods

Section E : Issues and Problems Found In Assigning Resources

Dear Sir/Madam,

You are invited to take part in a research study about Human Resource Allocation In Multiple Project Environment. Please be assured that your answers will be treated with confidentiality. Your frank and honest opinions in this questionnaire are sought and the information obtained will be strictly used for academic purposes and statistical analysis only. The identity of respondents will not be revealed.

I would be grateful if you could take a few minutes of your time to fill in this questionnaire.

Your cooperation is very much appreciated.

Thank you.

Yap Kim Cheong
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SECTION A

COMPANY AND RESPONDENT's PROFILE

Please tick (√) the correlated answers and fill in the blanks accordingly. You may tick more than one answer if needed. Thank you.

Name   :
                ………………………………………………………....
Company   :
                ….……………………………...............................
Address   :
                ……………………………………….............................

1. **Age**
   Less than 20 ☐
   20-29 ☐
   30-39 ☐
   40-49 ☐
   50 and above ☐

2. **Gender**
   Male ☐
   Female ☐

3. **Education**
   Certificate ☐
   Diploma ☐
   Degree ☐
   Master ☐
   PhD ☐
   Others; please specify ☐
   …………………………………………………

4. **Type of organization**
   Clients (government or developer) ☐
   Consultants ☐
   Contractors ☐

Others; please specify ☐

……………………………………………

5. **Position**
Managing Director ☐
Manager ☐
Technician ☐
Engineer ☐
Human Resource ☐
Others; please specify ☐

……………………………………………

6. **Nature of business**
Construction ☐
Oil and Gas ☐
Information Technology (IT) ☐
Research and Development (R&D) ☐
Manufacturing ☐
Others; please specify ☐

……………………………………………

7. **Number of years of working experience**
Less than 2 years ☐
2-5 years ☐
6-10 years ☐
More than 10 years ☐

8. **Average contract sum**
Less than RM 10 million ☐
RM 10 million – RM 50 million ☐
More than RM 50 million ☐
Others; please specify ☐

……………………………………………

9. **Largest project involved based on contract sum**
Less than RM 10 million ☐
RM 10 million – RM 50 million ☐
More than RM 50 million ☐

10. **Are you handling more than one project concurrently**
Yes ☐
How many?

....

No ☐

SECTION B

PROJECT TEAM MEMBER SELECTION CRITERIA

Please rate the criteria for assigning people to work on a project in your organization on a scale of 1 to 5.

(5) = Very Important   (2) = Of Little Importance
(4) = Important   (1) = Unimportant
(3) = Moderately Important

No	Project Team Member Selection Criteria	5	4	3	2	1
1.	Good Problem Solving Skill					
2.	Good Analytical Skill					
3.	Decision Making Skill					
4.	Good Time Management Skill					
5.	Good Communication Skill (Oral, Written and Listening)					
6.	Good Interpersonal Skill					
7.	Good Leadership Skill					
8.	Good Creativity Skill					
9.	Good Innovation Skill					
10.	Lifelong Learning Skill					

SECTION C

PROJECT TEAM MEMBER SELECTION METHODS

Please indicate how project team member are assigned in your organization on a scale of 0 to 5.

(6) = Always	(3) = Sometimes
(5) = Usually	(2) = Rarely
(4) = Often	(1) = Never

No	Project Team Member Selection Methods	6	5	4	3	2	1
1.	Take place before the project start						
2.	Take place after the project started						
3.	Allow employee to choose the project that they want to work on						
4.	Allow employee exchange during the project course of a project						

SECTION D

HUMAN RESOURCE MANAGEMENT METHODS

Listed below are human resource management methods. Please choose your answer according to the scale of 1 to 5

(5) = Very Useful   (2) = Little Useful
(4) = Useful   (1) = Not Useful
(3) = Moderately Useful

No	Human Resource Management Methods	5	4	3	2	1
1.	Best Fit Resource Method (Assign based on experience, skills or etc.)					
2.	Delphi Method (Assign based on series of discussion from expert)					
3.	Team-Based Human Resource Planning Method (Assign based on mapping company processes)					
4.	Rough-Cut-Project-And-Portfolio-Planning Method (Assign based on organization portfolio)					
5.	Multiple Resources Allocation Algorithm Method (Assign based on project time/scheduling)					

SECTION E

ISSUES AND PROBLEMS FOUND IN ASSIGNING RESOURCES

Listed below issues and problems found in assigning resources. Please choose your answer according to the scale of 1 to 2

(2) = Yes   (1) = No

No	Issues And Problems Found In Assigning Resources	2	1
1.	Insufficient Expertise		
2.	Insufficient Budget		
3.	Fail To Schedule The Resource		
4.	Conflict With Resources Availability		
5.	Recruitment Suitable Staff		