PROJECT COMMUNICATION AND PROJECT PERFORMANCE:
CASE OF SOFTWARE DEVELOPMENT IN MANUFACTURING ENVIRONMENT

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PROJECT COMMUNICATION AND PROJECT PERFORMANCE:
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by

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TABLE OF CONTENTS

CHAPTER 1 - INTRODUCTION

CHAPTER 2 – LITERATURE REVIEW

CHAPTER 3 - RESEARCH METHODOLOGY

CHAPTER 4 - RESULTS

CHAPTER 6 - CONCLUSION AND RECOMMENDATION

LIST OF TABLES

LIST OF FIGURE

ABBREVIATION

PMI	Project Management Institute
PMBOK	Project Management Body of Knowledge
ASD	Agile Software Development
SPSS	Statistical Package for the Social Sciences
PWC	PricewaterhouseCoppers LLC
PM	Project Management
SF	Success Factor
MBTI	Myers-Briggs Type Indicator
FIRO-B	Fundamental Interpersonal Relations Orientation-Behavior
PF	Personality Factor
MNC	Multi Nation Company
MBA	Master in Business Administration
IT	Information Technology
KMO	Kaiser-Meyer-Olkin
PC	Performance Criterion
IP	Internet Protocal
GDP	Gross Domestic Product
FDI	Foreign Direct Investment
MIDA	Malaysian Investment Development Authority

KOMUNIKASI PROJEK DAN PRESTASI PROJEK:

KES PEMBANGUNAN PERISIAN DALAM PERSEKITARAN PEMBUATAN

ABSTRAK

Komunikasi adalah satu kemahiran hidup yang penting yang membolehkan ahli pasukan mempunyai pemahaman yang lebih baik dan menghubungkan pasukan. Peranan pengurus projek adalah untuk memastikan bahawa semua orang yang terlibat dalam projek itu mempunyai jangkaan yang sama tentang apa yang akan dihasilkan, bila dan pada tahap kos tertentu. Oleh kerana komunikasi yang tidak betul di kalangan pasukan atau pengguna, ia menyebabkan peratusan yang tinggi dalam kegagalan projek. Dengan itu, tujuan kajian ini adalah untuk mengkaji faktor-faktor kejayaan utama dalam komunikasi untuk projek pembangunan perisian. Di samping itu, kajian kesan faktor kejayaan dalam komunikasi prestasi projek perisian telah dijalankan. Kaedah kuantitatif telah dijalankan dalam kajian ini dengan mengumpul 384 borang soal selidik dari responden dalam bidang pembuatan di Bayan Lepas, Pulau Pinang. Data yang diperolehi dianalisis dengan menggunakan min untuk kegunaan faktor kejayaan dan regresi untuk menganalisis bagaimana faktor kejayaan memberi kesan ke atas kejayaan projek pembangunan perisian dalam persekitaran pembuatan. Keputusan telah membuktikan bahawa faktor kejayaan utama dalam komunikasi adalah ciri-ciri ahli pasukan. Ini merupakan ilmu baru yang dicadangkan oleh penyelidikan dengan sokongan lima pengurus kanan berpengalaman dan pengurus projek yang mempunyai lebih daripada sepuluh tahun pengalaman bekerja. Selain itu, faktor-faktor kejayaan pengurusan komunikasi telah memberi kesan ketara kepada kos, bajet, kualiti, kepuasan pengguna dan pasukan kepuasan prestasi projek. Komunikasi memainkan peranan penting dalam menentukan prestasi projek. Walau

bagainmanapun, ia adalah penting bagi pengurus projek untuk memahami kepentingan

pengurusan komunikasi yang akan memberi kesan kepada prestasi projek dan akhirnya

meningkatkan kadar kejayaan projek dalam industry.

PROJECT COMMUNICATION AND PROJECT PERFORMANCE: CASE OF SOFTWARE DEVELOPMENT IN MANUFACTURING ENVIRONMENT

ABSTRACT

Communication is an important life skill that allow team members to have better understanding and to connect team. The role of project manager is to ensure that everyone associated with the project has a common set of expectation of what is to be delivered, when and at what cost. Due to ineffective communication among team members or within user, it leads to high percentage of project failure. Hence, the purpose of this research is to investigate the key success factors in communication for software development project. In addition, the study of the impact of success factor in communication on software project performance had been investigated. The quantitative method had been carried out in this research by collecting 384 survey questionnaires from the necessary participants in manufacturing field at Bayan Lepas, Penang. The collected data was analyzed by using means for ranking of success factors and regression; for study on how the success factors impact the project success of software development in manufacturing environment. The results have proved that the key success factor in communication is team members characteristics. This new knowledge spurred this research with the support of five experienced senior managers and project managers who have more than five years of working experience. Moreover, the success factors of communication management have significantly impact the project performance based on cost, budget, quality, user satisfaction and team satisfaction. Communication management play an important role in determining the project success. In summary, it is crucial for project managers to understand the

importance of communication management that will affect the project performance and eventually increase the success rate of software development project in the industry.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Manufacturing is important to long-term economic well-being. It also target regional development policies which have focused on innovation and learning as the main factors to increase corporate productivity. Innovation is seen as a facilitator to economic growth, it aims ultimately to improve the capacity of firms, networks, industries, and national economies to innovate and to improve respective competitive positons. If individual firms can improve their competitive position through innovation, then this will improve the economic performance of the region. (Catherine, 2004) With that, the involvement of technology are required to improve the innovation in manufacturing and it would directly increase the economics of the certain area.

Based on the definition from National Academy Council (1995), manufacturing business is committed to the production of physical objects that are in high quality and competitive in cost, the performance has to meet customers' expectation, and are delivered in a timely manner. In a manufacturing environment, the changing is more rapidly now, competing successfully will require that manufacturing increasingly provide customers with shorter times between order and delivery and between product conceptualization and realization, higher product quality and performance, while meeting more strict environmental constraints. To accomplish those goals, it will require major changes in current manufacturing processes, huge

usage of information to reduce waste and defects and more flexible manufacturing styles.

Besides huge amount of information is generated and used from design to manufacture, customer's requirements are part of the important information and must be saved and analyzed in a correct manner. By using information technology, there will be substantial improvement in the operation, organization, and effectiveness of information-intensive manufacturing processes and activities. Figure 1.1 shows the integration of various basic manufacturing activities by using information technology.
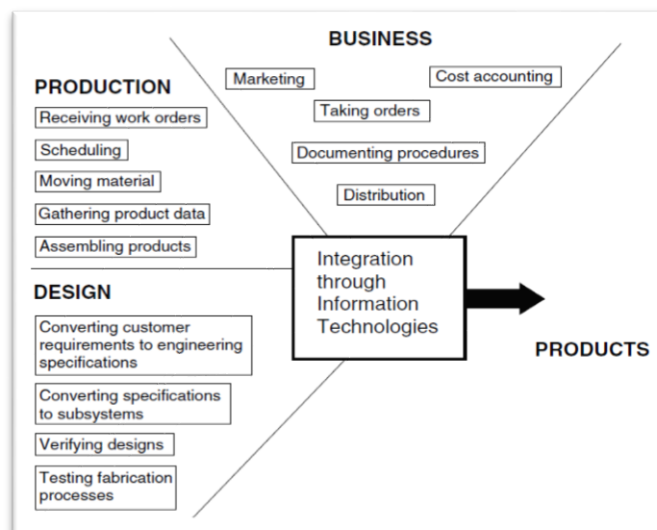
Figure 1.1: Integration of basic manufacturing activities

Source: National Academic Council (1995)

As defined by National Academic Council (1995), in order to assist enterprise achieve goals, information technology can be used to:

i.   Enable the migration of production from one product or process to another spontaneously.

ii.   Implementation of new framework or concepts.

iii. Delivery of the products to customer in time.

iv.   More collaboration and interactions with customers.

v.   Fully utilize resources and capital.

vi.   Restructuring of operations to focus on necessary business desires.

vii.   Eliminate redundant or unnecessary activities.

All the tools can be written in computer programming, documenting, testing and bugs fixing generally known as software development. From the research by National Academic Council (1995), it shows that software development in manufacturing is getting more and more important. Manufacturing depends on the software development to ensure that the products have specified qualities, in time to market and within cost. Those factories that succeed in meeting the challenge will remain in market or else will disappear from the manufacturing business.

With the importance of software development in manufacturing business, we have to ensure the software development is delivered successfully. However, most of the risks in today's software development process are due to project management. Based on the research carried out by Lyytines and Robey (1999), software development are in the critical environment.

Standish Group Incorporated is an independent international Information Technology (IT) research advisory firm founded in 1985. It reports about information systems implementation projects in the public and private sector. This firm focuses on mission-critical software applications, especially on failures and possible improvements in IT projects. Research done by Standish Group Incorporated, from year 1994 - 2009, has found that the success rate of software development has yet to increase. With the increasing level of complexity in software developments, the associated risks have increased and will impact towards the decrease of projects success rate. Figure 1.2 shows the IT project performance from year 1994 to year 2009.

Year	Successful (%)	Challenged (%)	Failed (%)
1994	16	53	31
1996	27	33	40
1998	26	46	28
2000	28	49	23
2004	29	53	18
2006	35	46	19
2009	32	44	24

Figure 1.2: IT Project Performance

Source: Standish Group Incorporated (2009)

Between 1994 to 2009, the percentage of successful projects is between 16% to 32%. However, the projects failed and challenged fell between 18% to 53%. This results show that IT project performance are in jeopardized situation. Standish (2009) has identified the project failure due to three critical elements. They are cost, schedule and performance. On the other hand, those projects that are challenged are behind schedule, over budget or less functionality than original's objectives.

According to Viktorsson et al (2003), more collaboration and communication are required in software development projects. Multiple studies consider communication critical towards project success. Based on Visamaki (2012), projects are all about communication and it can either save or ruin project.

Exchange of information and efficient co-operation does not just happen. Well organized, efficient and effective communication can be found in most of the skillful company. The communication can be managed and plan into communication management plan. With the presence of communication management plan, it highlights the involvement of all participants with the significance of planning.

Hence, this research studies the relationship between project communication management and success rate of software development project. Research teams

continuously investigate the importance of factor in project communication management on software development in manufacturing environment. Last but not least, the impact of project communication management on software development projects performance in manufacturing company will be researched.

1.2 Research Problem

Communication is prerequisite in any business. Without it, there will be neither productions nor projects. The role of communication is irreplaceable. With the good strategy in communication, it can makes the complex work getting more easier and integrates with all elements flawlessly. (Visamaki, 2012).

The more people involved in the project, the greater the risk of information loss. This can lead to failure to meet customer's expectation, project running out of time or inability of fellow project members to co-operate (Griffin, 1992).

Based on study from PMI's 2013 Pulse of the Profession report show for every USD$1 billion spent on a project, USD$135 million is at risk. This research has further investigated the importance of effective communications. The results show that USD$75 million out of USD$135 million, equal to 55.6% at risk is due to ineffective communications. Figure 1.3 shows the amount at risk for every USD1 billion spent on a project.
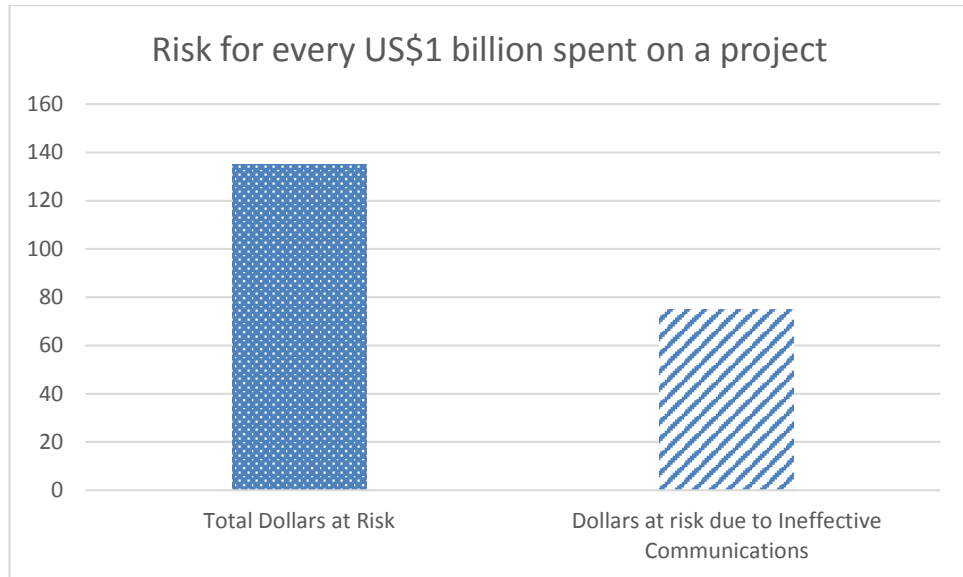
Figure 1.3: The amount at risk for every US$1 billion spent on a project

Source: PMI's 2013 Pulse of the Profession report

Due to 56% of high risk in ineffective communication, many organizations declare that they are not placing importance on effectively communicating critical project information. The finding from the PMI's Pulse proved that effective communication leads to more successful projects. According to the survey, effective communication is associated with 17 % increase in finishing project within budget, 34% increase in finishing project on time and 80% met the original goal. Figure 1.4 shows organizations that communicate more effectively have increase the success rate of the project.
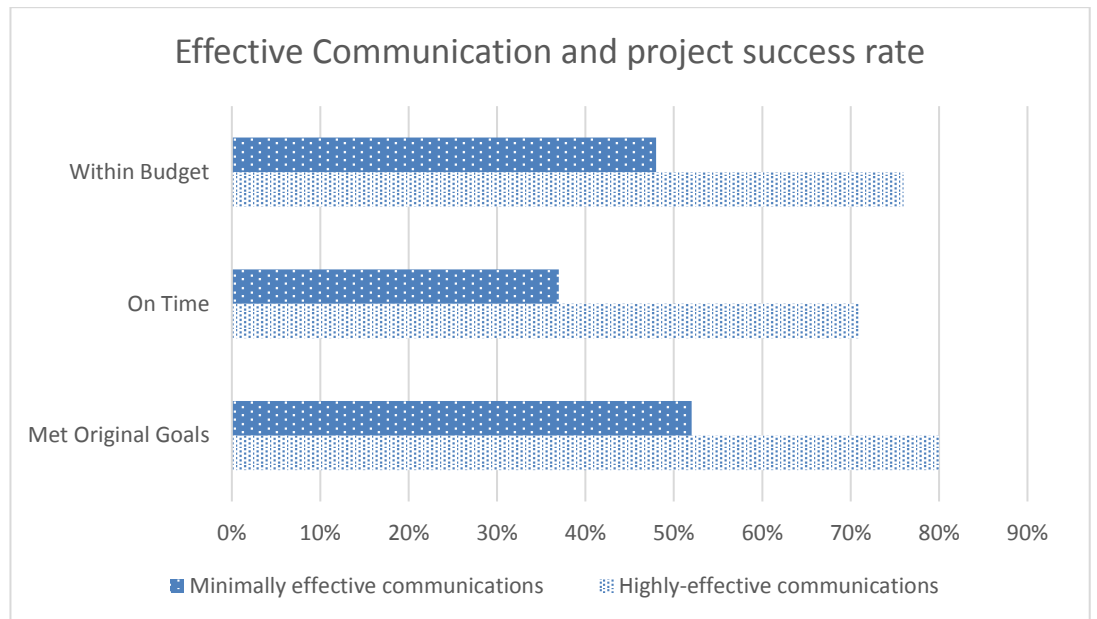
Figure 1.4: Effective communication and project success rate

Source: Source: PMI's 2013 Pulse of the Profession report

Another research from PM Solution (2011) found that out of USD200 million, USD74 million of projects are at the risk of failing each year. The research has defined the top 5 causes of concerned projects as:

i.   Imprecise requirement, lack of settlement, lack of urgency, ambiguous and Imprecise instructions.

ii.   Lack of resource, resource conflicts, turnover of key resource, poor planning.

iii.   Too tight and unrealistic schedules

iv.   Insufficient data

v.   Unidentified risks.

This summarized that the top five reasons of project letdown are due to miscommunication. Miscommunication between software developer and user caused the unclear requirement or lack of agreement. Lack of resources can be due to

miscommunication among software developers or management. Lack of commitment by software developers or unclear project's objectives could be causing the schedules to be unrealistic or too tight. As for the insufficient data and unidentified risks were due to software developers and user communicating based on their own point of view and by using their own language.

1.3 Research Gap

Ksenija (2010) mentioned that communication is value added to organizations and eventually it will increase the project performance in the organization. However, understanding team members' characteristic in communication during execution of software projects is yet to be identified by past research. Hence, this new success factor in communication management is study. Nevertheless, there is no empirical study examining the impact of software project performance based on the success factors in communication management, especially in manufacturing environment in Penang.

As a conclusion, there are several researchers who have carried out their studies abroad but may not be fully related in Malaysia. With that in mind, this research would like to study the new success factor in communication that suggested and further the study on the impact of project performance based on success factors in communication of manufacturing environment in Penang.

1.4 Research Questions

The survey from PMI (2013), PricewaterhouseCoopers LLC (PwC) (2013) and PM Solution (2011) have shown that the main causes of project failure are project communications. Hence, this research is focused on the following questions:

Question 1: What are the success factors in project communication?

Question 2: What are the key success factors in project communication for software development?

Question 3: How do the success factors impact the project success of software development in manufacturing environment?

1.5 Research Objectives

This research is focused on the following objectives:

i.   To identify success factor in project communication management.

ii.   To identify the key success factors in communication management for software development project.

iii.   To investigate the impact of success factor in communication on software project performance.

1.6 Research Scope

The focus of this research is to analyse of the relationship between project communication and project performance in software development in manufacturing environment. Based on the searching engine from Business List website (2014), there

are 148 factories in manufacturing environment located in Bayan Lepas, Penang. However, not all the factories are involved in software development. Some of them are outsourcing the software development to software house and these factories will be eliminated from this research. Hence, the scope for this research is to focus on the factories which are involved in software development.

The research data is limited to a sample population of 384 respondents from manufacturing factories that are involved in software development in Bayan Lepas area, Penang.

1.7 Significance of the Study

Based on the findings from problem statements, researcher can conclude that communication will be one of the huge impact to determine the project success rate. The software project will fall into jeopardize situation without proper communication with user on requirement's gathering or team member not having clear and efficient information. Hence, proper communication is a must within team members to improve the project success rate.

This research will be a study on the past research papers and define the key success factor in communication management. The findings will be useful for project manager as a guideline on which type of success factors in communication management can be applied during project execution. Besides, the recommendation of attending Myers-Briggs Type Indicator (MBTI) training can improve the softskill of project manager to understand the character of each team member and it can be applied when handling conflict.

Lastly, the study on impact of success factor in communication will help project managers have a better way on monitoring the overall project results. Project managers can consider to improve on selected success factors in communication if they foresee the project is exceeding budget, running behind schedule, unacceptable quality, cannot meet customer's requirements or project team members' satisfaction with the progress.

1.8 Definition of Key Term

The following are definitions to explain the key terms used in this research.

Project Management Body of Knowledge (PMBOK) is an globally recognized standard that deals with the application of knowledge, skills, tools and techniques to meet project requirements (Project Management Institute, 2013).

Myers-Briggs Type Indicator (MBTI) refer to a psychometric test designed to indicate psychological preferences in manner of people preceive the world around them and make conclusions (CPP's Professional Consulting Services, 2005).

Gross Domestic Product (GDP) is a measure of the market value of all final goods and services produced in a period of time (MIDA, 2017).

Foreign Direct Investment (FDI) is an investment in the form of controlling ownership in a buisness in one country by an entity based in another country (MIDA, 2017).

Project Communication management is the understanding area that consumes the necessary processes to confirm appropriate generation, gathering, spreading, storage, retrieval and disposition of project information (PMBOK, 2000).

Software Project Performance is fundamental quality attribute of software system (Paola, 2006).

Software Development is the process of computer programming, documenting, testing and bug fixing involved in creating and maintaining application and frameworks resulting in a software product (Tatjana, 2012).

Manufacturing environment is an industrial operational facility to fabricate products (National Research Council, 1995).

1.9 Thesis Organization

Chapter 1 discusses on the background of the study, problem statement, research objectives, research questions, scope of study, significant of study and definition of key terms. Chapter 2 discusses on literature reviews that are related to this study, in particular, the communication theory, project management, project communication management, software development methodologies, success factors in communication, propose on the new success factors in communication, study on the psychometric test which is the new success factor proposed, software project performance, developed theoretical framework and defined literature gap. Chapter 3 focuses on the design of the study and methodology procedures. Chapter 4 discussed the results from the data analysed based on research objectives. Chapter 5 focuses on the discussion based on the results from previous chapters. Chapter 6 presents the research achievements and the contribution of the study for the managerial and theoretical perspectives and also propose suggestion for future study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter, focus on literature review on project management, project communication management, communication theory, critical success factor, success factors in communication and examine on new success factor in communication. Software development frameworks and software project performance investigate. Next, the study of psychometric test to describe on personal's characteristic is conduct. Last but not least, the theoretical framework is established.

2.2 Project Management

Project management involves planning, scheduling and controlling all the project activities to achieve the objectives. It is the application of knowledge, skills, tools and techniques to project tasks to meet the requirements of project. Based on PMBOK (2008), the description of project management as following:

i. Every project is unique. Hence, clear identifications and analysis of requirements are needed.

ii. The objectives of the project must be established and communicated to all project team members. In order to allow team members to carry out the project efficiently, the objectives should be achievable and clearly defined.

iii. It has a definite beginning and end date and not a continuous process.

iv. All projects are carried out under certain constraints; commonly use the "triple constraints". Each constraint form a mutual relationship, the rest of the constraints will be affected if there is any change in one of them.

Project management processes fall into five groups, which are initiating, planning, executing, monitoring and closing. To initiate process group is the first step of opening a new project. This is the formal authorization process to launch a project. In this step, documentation will take place those includes to describe project scope, deliverables, duration and forecast of resources. Multiple phases will be created from the large complex project and it will reviewed when every new phase starts. The decision of the project is either to be revised, stopped, delayed or continued after reviewed. Customers and stakeholders are most often involve during this phase to improve the satisfaction and deliverables acceptance. The output of the initiating process are project scope, objectives and authorization to start the project or phases.

The second process is planning, which will be focusing on identifying, defining and maturing the project scope, project cost and scheduling all tasks that may carry throughout the project. As the changes can be occurred during any time in the project, hence, the changes and approvals on changing should be updated. This is to ensure to provide effective and accurate information. The stakeholders may impact on the project, they need to be informed and involved appropriately.

Next process is executing and it is define as assigning process. This process would bring resources and people together, executes and integrates the plan activities and identify specific subsequence projects. Due to various

changes may occur during this process, the project baseline have become dramatically changed.

The process of monitoring every progress of the project is define as monitoring and controlling process. It is a repetitive process, use to identify the gap between the process and the original plan. Last but not least, it determine corrective actions to achieve the objectives. This process is helping to update stakeholders and team members on how well the project has been achieve and what may need revising and reviewing. It monitor entire project and provide feedback between project phases.

Last but not least, closing process is to conclude the project's output, provide the services or products to the end user and close the project. During this process, all the contracts with supplier or buyers have to be completed and settled.

Project management process groups are linked to one another through the purposes. The inputs for the next project management process groups is come from the output that achieved by one process group. As a summary, the different of project based on its purpose, organizations and characteristics. Hence, project management process groups are functioned based on their characteristics (Ngoc Se, 2010).

2.3 Project Communication Management

Based on PMBOK, 2008, project management knowledge draws on nine areas which are integration, scope, time, cost, quality, procurement, human resources, communications and risk management. The researcher are focus on project

communication management, hence the details of this area will be further investigate. Project communication is to establish understanding between sender and receiver and exchange of project specific information. The information must be provided by project team to all stakeholders in time and accurately. It will be prepared in a various ways to meet the needs of project stakeholders. Project communication management is the understanding area that consumes the necessary processes to confirm appropriate generation, gathering, spreading, storage, retrieval and disposition of project information.

The responsible of project manager is to prepare the project communication management plan. The important of project communication management plan is to provide information and people that are essential for fruitful communication.

The project communication management can be used to:

i. Prepare a communication plan for the specific projects.

ii. Effectively distribute the information via proper methods that can be reached by customers.

iii. Storage of data in systematic and proper location.

iv. Archive records

The first step in preparing the communication planning is to understand the communication process. Project Communications Management procedures which include the following:

i. Identify stakeholders – The process of recognizing people or organizations involve in the project by the project. The contribution, benefits and impact on project success need to document. Stakeholder can be customer management, project team members, external stakeholders and project management staff.

ii.   Plan communications – The process of defining a communication approach and determining the project stakeholder information needs. For instance, who needs the information, when the information needed by stakeholders, how it can be delivered to stakeholder and by whom.

iii.   Distribute information – The process of confirm applicable information accessible to project stakeholders as planned.

iv.   Manage stakeholder expectations – The process of communication and dealing with stakeholders to notify matters as they occur and meet their requirements.

v.   Report performance – The process of allocating and gathering performance information, including status reports, progress measurements, and forecasts.

Source: PMBOK, 2008

2.3.1 Develop the communication plan

The presence of communication plan can helps the project team to identify internal and external stakeholders and at the same time improve communication between parties involved in the project. Project manager is responsible to lead the project development team to prepare the communication plan. This is to ensure that an effective communication strategy is built into project delivery process. The plan is a framework and can be revised when appropriate. Figure 2.1 shown the communication plan flowchart (Project Communication Handbook Second Edition, 2007).
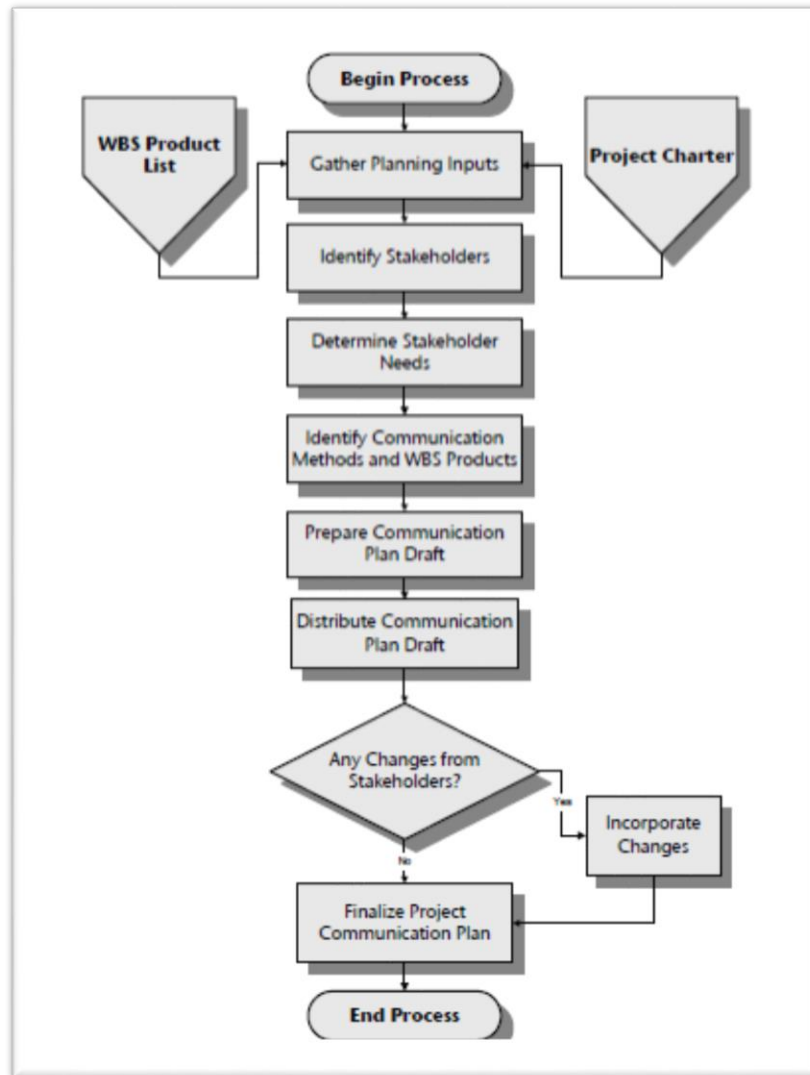
Figure 2.1: Communication plan flowchart

In the gather planning inputs stage, the communication plan had been developed by project manager by asking the following questions:

    i.   Who needs what information?

    ii.   When do they need the information?

    iii.   Who delivers the information?

    iv.   How should the information be delivered?

There are two type of inputs needed to prepare the communication plan. These are:

i. Work Breakdown Structure list: A list of potential project task and it is based on workplan that includes all the action items.

ii. Project Charter: The agreement between sponsor and the project manager on the key elements of the project.

The second stage of preparing communication plan is to identify the stakeholders and determine what are their needs as well as expectations. With the guidance by project manager, team members will have a brainstorming session to list the entire stakeholders. A stakeholder analysis matrix can be used to identify stakeholders as shown in appendix A.

There are different communication methods that can be used through the implementation of the project. The purpose of using those methods, who is the responsible to use the specific method, frequency of those methods to be used and which group of audience can be involved in the methods.

When drafting the communication plan, the following items will be included:

i. A list of all stakeholders.

ii. Method of communication to be used by every stakeholder.

iii. Method to gather and distribute the progress of the project.

iv. Stakeholder analysis to identify stakeholder's expectation, preferred method of communication and preferred method for recognizing performance.

v. Communication matrix to track the project performance by each task of the project

Information must be distributed to project stakeholders in a timely manner by using proper methods. With the communication plan, project team members are attentive of their accountabilities to have a close conversation with external

stakeholders. If team members can communicate with the project deliverable or progress on agreed timeline by both parties, this will eliminate conflicts, changes, or complaints from stakeholders. This can directly impact the project's performance. For instance, project will run out of budget, schedule or cannot meet stakeholder's expectation.

The project communication plan can be revised from time to time to meet the requirement or expectation of stakeholders. The following guidelines can be referred to improve the project communication plan.

i.   Awareness: An appropriate manner of communication had been shared and relay the information based on stakeholder's needs.

ii.   Content: Generate an atmosphere for project team member and the rest of stakeholder to have a two-way, open and honest communication. Encourage them to exchange ideas and knowledge constructively.

iii.   Context: Communication is always in two-way, it have to be listen and deliver the message.

iv.   Flow of Communication: Organize communication with project milestone.

v.   Effectiveness: Conduct regular assessment of the communication process and plan.

vi.   Format and media: Use variety of methods to share the information as requested by stakeholders.

2.4 Communication Theory

After the project communication management and method of develop the communication plan had been investigated. Research continue the study of communication theory. Conrad & Poole (2005) define communication that involve people acting together to create or sustain meanings by using of verbal or nonverbal signs with a particular perspective. However, it differs depending on the context. Communication is a process where the signs formed by human are received, interpreted and responded to by other human (Galanes et al,2004). From the research, it focus that communication occurs between people and which includes personal interpretation of messages sent by one to another.

The main role of communication is to get people to collaborate and cooperate on the common task. It acts by transfer a meaning over different broadcasting, either verbal or nonverbal, physical means, for instance, body language, eye contact, sign language or in writing (Gaurav, 2008). Effective communication is vital to the success of projects, program and portfolio. To meet expectations of all parties, the right information has to be transmitted in an accurate and consistent manner (Ksenija, 2010).

In the earlier stage, research define communication theory as transmitting information from one party to the other. More researches were conducted and researchers began to realize that collaboration and cooperation are important to ensure all parties are getting the same message either by using verbal or nonverbal methods. Effective communication comes into the picture to ensure correct information is transmitted in order to meet expectation for all parties.

2.4.1 Communication models

Communication is a transactional process that are elaborate that messages can be encoded and decoded simultaneously affect each other. (Wenburg & Wilmot, 1973). To produce meaning in the conversation, all parties that are involved in the dialogue have important roles in the communication. The basic model of communication is shown in Figure 2.2 (PMBOK Fourth Edition, 2008). It shows the information sending and receiving between two parties who are sender and receiver (Ksenija, 2010).

The key components of the communication model include:

    i.   Encode: It is use to interpret idea or thoughts into language that is understood by human.

    ii.   Message and feedback-message: The outcome of the encoding.

    iii.   Medium: The method used to translate the message.

    iv.   Noise: Anything that disturb the transmission of message to be understood.

    v.   Decode: To convey the message back into meaningful ideas that can be understood by human.
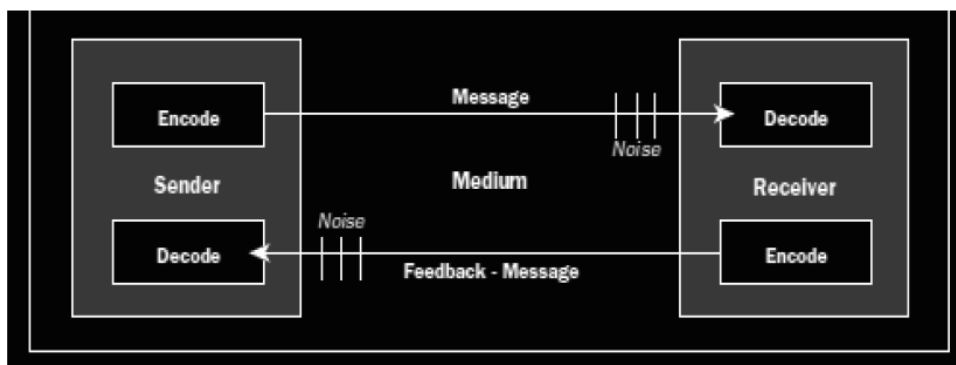

Figure 2.2: Basic communication model

When discussing project communication, the components in the communication model need to be discussed. In the communication process, the main responsibility of the communication is to ensure the information is clear and precise and to make sure the receiver can receive the message correctly. As for the role of the receiver is to make sure that the information received can be understood correctly. The presence of noise will cause the sender and the receiver to get different sets of information. This indirectly will cause miscommunication between both parties.

2.4.2 Communication methods

There are few communication methods used to share the information among project stakeholders. The communication method can be categorized as push, pull and interactive communication (Ksenija, 2010).

   i.   Interactive communication: This is the most competent method to confirm a mutual understanding by all parties on a respective topic.

   ii. Push communication: The information will be sent to definite recipients. The information will be distributed, however, it does not verify that it is reached or was understood by the audience.

   iii. Pull communication: The audience involved will be in a huge amount. It will request the recipients to access the communication content at their own preference.

Communication can also be categorized as formal and informal communication (Christian, 2011).

i. Formal communication: The communication is performing in a proper and manageable way. For instance, project group meetings on periodically basis to gather information. The information gathered will be documented and stored into a common area that are easily accesible by team members.

ii. Informal communication: The communication is held in a spontaneous manner. It can occur through e-mails, project portals and direct conversations.

2.5 Critical Success Factors

As this research is focus on success factors in communication, hence the definition of critical success factors have to be study before further investigate the success factor in communication. The definition of Critical Success Factors (CSFs) was introduced by Rochart in 1982, it describe as factors foreseeing achievement on projects (Rohaniyati, 2009). He also mentioned that the satisfaction of results will guarantee positive competitive performance for the organization. The efforts of organization will be less than preferred if results in these areas are not sufficient (Prapawadee & Wariya, 2009). Boynton and Zmud (1984) mentioned that Critical Success Factors are make sure the success of an organization in maintaining an extraordinary performance in operating activities for an organization (Prapawadee & Wariya, 2009). The concept of CSFs are the most key for general organization, mission, objectives and strategies (Freund, 1988).

The study of Jugdev and Muller's (2005) is concept of success factors indicates the following:

i. During 1960's – 1980's: Mainly limited to time, cost, factors, specification and client satisfaction are the literature on success factors.