CREATING COLLABORATIVE PLATFORM FOR KNOWLEDGE TRANSFER BASED ON ACTOR-NETWORK THEORY

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UNIVERSITI UTARA MALAYSIA
2009

AMAL BINTI IBRAHIM	CREATING COLLABORATIVE PLATFORM BASED ON ANT	M.Sc. (IT) 2009

CREATING COLLABORATIVE PLATFORM FOR KNOWLEDGE TRANSFER BASED ON ACTOR-NETWORK THEORY

A thesis submitted to the Graduate School in partial fulfillment of the requirement for the degree Master of Science (Information Technology)
Universiti Utara Malaysia

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ABSTRAK

Pengurusan maklumat adalah satu cabang pengetahuan yang sangat berkembang dan telah diakui keberkesanannnya di dalam organisasi. Pengenalan kepada konsep ini telah bermula pada pertengahan tahun 50-an di mana konsep pengetahuan telah dikaji dan dikembangkan sehingga tercetusnya evolusi pengurusan maklumat seperti perpindahan dan kolaborasi maklumat. Kolaborasi maklumat telah diimplementasi dengan pelbagai cara bagi mempertingkatkan prestasi dan memantapkan pengetahuan staf. Kolaborasi maklumat menyentuh kepada ikatan perhubungan yang mantap antara aktor yang terlibat dan tidak dapat diasingkan. Perhubungan antara aktor ini akan diterjemahkan melalui teori sosiologi yang dinamakan sebagai Teori Actor-Network. Projek ini dilakukan bertujuan untuk mengkaji bagaimana teori sosiologi dapat digunakan sebagai alat terjemahan masalah dan penyelesaian di dalam masalah yang melibatkan sistem maklumat seperti pembangunan platform web untuk kolaborasi maklumat di kalangan kakitangan Teknologi Maklumat di Politeknik Malaysia. Kajian ini juga menunjukkan bagaimana Teori Actor-Network dapat dikaitkan dengan aktiviti-aktiviti di dalam pembangunan sistem seperti mengenalpasti keperluan, kajian sistem sedia ada dan peranan setiap aktor. Kajian ini juga menunjukkan kesesuaian teori ini digunakan di dalam persekitaran kolaborasi. Apabila semua aktor, peranan dan keperluan aktor dikenalpasti, satu rangkakerja ANT telah dibangunkan bagi menunjukkan struktur aktor yang berkait di dalam pembangunan platform web bagi kolaborasi maklumat. Gambarajah perhubungan antara aktor juga telah dihasilkan bagi menunjukkan kaitan perhubungan antara aktor. Kebelakangan ini, telah terdapat kajian yang menunjukkan bahawa teori sosialogi telah membantu menghasil dan menyelesaikan masalah di dalam pembangunan sistem. Walaupun secara ringkas, kajian ini sedikit sebanyak memberi gambaran bagaimana bidang pembangunan sistem dan teknologi maklumat dapat menggunakan teori tersebut di dalam bidangnya.

ABSTRACT

Knowledge management is a growth diciplines and has been widely used in organization to improve the effectiveness of the knowledge among the employee. The introduction of this concept has started in the midst of 50s where the concept of knowlege has been studied and has been enhanced to the new diciplines which are knowledge transfer and collaboration. Knowledge collaboration has been implemented in variety of ways to creates the knowledge sharing and individual knowledge, talents and information can be effectively used. Knowledge collaboration is all about relation and connection of involved actor and this cannot be separated. This relationship is translated through an Actor-Network Theory, which is a sociology theory. This project is to study how socialogy theory can be used as an intepreting and solution tool in information system field such as creating a collaborative web platform for IT Personnel in Polytechnic Malaysia. This project also shows how Actor-Network Theory can be related to system development activities such as identfying list of requirements, analyzing current system and identfying the actor's roles. Once the actors, roles and the list of requirements have been identified, the ANT Framework for collaborative web platform has been built to represent the actor's structure that relate. Actor-Network Diagram has been built to show the relationship among the actors. Lately, many researches has used this theory to produce and solve the problem. In briefly, the reseach has showed the implementation of socialogy theory in information system and technology field.

ACKNOWLEDGEMENTS

Praise to Allah S.W.T for giving me the strength, ability and made all things possible for me to complete this project. I would like to express my heartfelt gratitude and appreciation to whom that has supported me in completed this project paper.

Thousands of thanks and appreciation to my supervisor, En. Mohd. Adan bin Omar for his assistance, guidance and support during the project. His thoughts and experiences have helped me a lot from the preparations to the completions of this project. Without his support, I might not be able to complete this project successfully. Also, my sincere thanks to Mr. Azmi b. Md Saman for giving me ideas and comments in making this project right on track.

For all IT Personnel in Polytechnics who have participated in this project: Wan Mahani Mahmood, Noraini Omar, Nor Shakinah Nasir, Razatulshima Ghazali, Aina Md. Noor, Sheila Mahalingam, Jamilah Ahmad and also their subordinates. Participation and the cooperation that have been given are truly much appreciated. My superior, Assistant Director of Hospital Sultanah Bahiyah-En. Abd. Rahman bin Che Ahmad, for giving me chance and approval in completing this project.

For all my family members who are always be at my side, a warmth thank you to my beloved husband, Rushfuzi Fazari b. Rushdi for his love and tolerance, my father and step mother- Hj. Ibrahim Hj. Hussein and Pn. Sharifah Ismail, my in-laws- Hj. Rushdi b. Ghazali and Hjh. Fuziah bt. Abd. Rahman and my aunt- Pn. Natrah Kartini bt. Abdullah Nasution. Not to forget to my sister, Prof. Madya Dr. Huda Ibrahim for her assistance and guidance and also to all my brothers and sisters for the endless support and love. Last but not least, Al-Fatihah and deepest love to my dearest mother, Almarhumah Mariam Asiah Abdullah Nasution.

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LIST OF ABBREVIATIONS

ANT	:	Actor-Network Theory
CELM	:	Collaborative Engineering Life Cycle Methodology
HOD	:	Head Of Department
ICT	:	Information and Communication Technology
IS	:	Information System
IT	:	Information Technology
KM	:	Knowledge Management
KMS	:	Knowledge Management System
OPP	:	Obligatory Passage Point
RAD	:	Rapid Application Development
SDLC	:	System Development Life Cycle
STS	:	Social and Technology Studies

CHAPTER 1

BACKGROUND OF THE STUDY

This chapter presents the overview of knowledge sharing and knowledge collaboration. Problem statements, objectives, scope, significance of study are also discussed in this chapter.

1.0 Introduction

Knowledge becomes significantly a valuable entity since the increased use of computers in the second half of the 20th century. In this era, knowledge is treated as an important asset and something that very priceless either by individual or organizations. Thousand of money has been invested to enable the culture of knowledge management in organization. By using a technology, knowledge can be widely spread over the world. Earlier than this, people are use to transfer their knowledge in classic way from one person to another either by verbally or in written. Activities such as discussion forum, formal apprenticeship, training, mentoring, and on-the-job training are practical ways to transfer and share the knowledge. In those days, people will get the benefit of the knowledge transfer if more experienced members sharing the knowledge in an organization or group. For instance, knowledge transfer happens when the founder of the family business trains his sons and daughters to run the business. It also takes place when a student goes to college and learns from a professor and also when an apprentice chef trains under a master chef. Without the technology, knowledge only can be manually transferred and shared in certain boundary. Those people who are physically not in this group might not be able to participate.

These days, with the support of the technology, organization and companies have realized the importance of sharing and transferring knowledge especially among the employees. Many platforms using the computer

technology such as knowledge based, expert system, knowledge repositories, group decision support system and computer supported cooperative work have been introduced as an enhance tool to let the knowledge to be channeled to the employees without any physically boundaries. With these technologies, organization can shared and transfer much more knowledge than in the past. Hence form this; collaborative environment begins to take place. Kristensen and Kijl (2008) in their research has showed that a range of recent studies emphasize the importance of collaboration as a key driver of business performance. A study shows that workplace innovations account for 89% of multifactor productivity gains (Black & Lynch, 2001), while a survey of 946 decision makers in key positions (Gofus, et. al., 2006) concludes that collaboration positively impacts an organization's business performance, as collaboration constitutes twice the impact of a company's strategic orientation and more than five times the impact of market and technological turbulence influences.

Collaboration software has become a popular approach to environmental policy, planning, and management. More knowledge can be transferred and distributed using this platform. Collaborative software is designed to foster team project and group learning. The technology designed in team based and make heavy used of key features such as team folders, discussion topics areas, team membership lists and e-mail addresses making it easy to communicate with other team members, and security to form and maintain ad hoc team (Anna, Kjell & Robert, 2004). Collaborative software is the basis for computer supported cooperative work and certain tools and features for instance electronic calendar, project management system, workflow system, knowledge management system, social software system, online spreadsheet and application sharing. Knowledge can be collaborated to organize projects, generate new ideas, and make decision quickly and intelligently. This is knowledge management today.

1.1 Overview Of Polytechnics at Malaysia

Polytechnics education was first introduced in Malaysia through Colombo Plan in 1969. Politeknik Ungku Omar in Ipoh is the first polytechnic which was operated in year 1969. As year 2009, there are 27 polytechnics institution across Malaysia which offers engineering, information technology, design and communication visual, commerce and hospitality studies to Malaysian local student. Cabinet structure in year 2004 has moved this institution from Ministry of Education to Ministry of Higher Education as this institution provides higher level of education such as diploma and certificates.

The main player of this institution is academic personnel which the core business is mainly teaching and learning. In supporting management affairs, each polytechnic has their own administrative department and IT department is part of it. Basically, each IT department in polytechnic has 5 to 14 IT staff including computer technician.

1.2 Problem Background

Handling and managing branches of education institutions can be very challenging. In 2009, 27 polytechnics in Malaysia are fully operated and 3 more are going to be operated by year 2010. Each polytechnic has its own IT division which responsible to manage the IT affairs. As in the record, there are 215 IT Personnel at present managing these 27 polytechnics across the nation. Problem rise when a number of senior IT Personnel have been promoted to the higher level and they have being transferred to the other government agencies. This scenario has started in year 2006. Knowledge and information has not been passing down to the rest of this team. 70% are new hired staff. Moreover, when there are meetings, only the senior personnel are involved. Meeting is organized each time new project or task need to be completed. The meeting usually will be lead by one Assistant Manager which geographically located in Selangor. Usually, only senior IT Personnel will get involved and dealing with all information and project. When they left, somehow their knowledge cannot

be transferred to the new personnel in efficient way. There is lack of collaborative platform among this team to share and transfer their knowledge. Therefore, a collaborative platform is needed to create a professional and social network in a benefit oriented environment. This can be done using the web platform or portal.

This platform will act as a collaborative platform for them to capture knowledge, ideas and innovations. Best practices can be shared, problem can be solved quickly and most importantly, the new personnel can quickly learn and get involved with all projects. New personnel will not be left behind. This research will attempt to answer the following questions:

- What are the current practices of the knowledge transfer among the IT Personnel?
- How Actor-Network Theory (ANT) contributes to the development of the collaboration platform?
- How does an organization plan and manage knowledge transfer?
- How collaboration platform contributes to the knowledge transfer among the IT Personnel in polytechnics?

1.3 Problem Statement

There is lack of knowledge transferring platform among the IT Personnel in polytechnics at Malaysia.

1.4 Research Objectives

Specifically, the main objectives of this research are:

- To identify the practices of the knowledge transfer among the IT Personnel.
- To describe the problem and solution based on actor-network theory.
- To investigate organization plan and manage knowledge transfer.
- To determine the benefit of collaborative platform in improving the knowledge transfer.
- To develop and test the prototype collaborative platform.

1.5 Scope of the Study

The scope of this research is limited to these boundaries:

- The research material will be used to develop a prototype of the collaborative web platform.
- The prototype collaborative web platform is designed for the IT Personnel and the Assistant Manager in polytechnics at Malaysia.
- The use of actor-network theory as the interpretation and description tool in analyzing the requirement in developing the collaborative platform.

1.6 Significance Of Study

Over these years, sociological theories have been used in the field of information system research. Townson and Lewis (2004) stated that the motivation for this has been the errors of omission and commission that may arise when information system are regarded solely as technical artifacts composed of hardware and software rather than as social system enabled by technology. Understanding the problem and requirement of information system and technology from sociological theory's perspective can improve the understanding in interpreting and describing the problems. Actor-Network Theory (ANT) has been chosen as a requirement analysis tool in understanding the problem as above. This research is needed to study the useful of sociological theory in analyzing the information system research and the interaction of human and technology in developing the information system application.

Most of the organizations or institutions are more focusing on producing a product or service to the customer. However, one of the most significant keys to value-creation comes from placing emphasis on producing and sharing knowledge. In this case, knowledge sharing concept is focused on knowledge transfer among the IT Personnel in polytechnics. Besides producing the quality semi professional student, polytechnics may overlook to look into the knowledge management among the employees especially the IT Personnel. Knowledge management should be about exploiting and utilizing

knowledge of the employees and building a culture where knowledge sharing can thrive. Knowledge management is often about managing relationships within the institutions. Collaboration tools such as intranets, balance scorecards, data warehouse and customer relations management are used to establish these relationships. Transferring knowledge can be more systematic and proficient. This study is to prove that the knowledge transferring can be done in an efficient way using the collaborative platform.

CHAPTER 2

LITERATURE REVIEW

This chapter focuses on the definition and concept of knowledge management, knowledge transfer and knowledge collaboration. It also touches how information technology is used to manage the knowledge. Understand the issues related to these topics of discussion contribute to the successful of plan in implementing actor-network theory in collaborative environment.

2.0 Knowledge Management

The discipline of knowledge management (KM) has been established over 20 years old. Many organization and consulting firms especially in U.S., Europe and Japan has started local knowledge management programs and by 1990, several researchers mostly from those countries has initiated focused study and research in knowledge management. The development of knowledge disciplines has started a long time ago. The idea of Michael Polanyi about tacit and explicit knowledge has opened another dimension of knowledge as a priceless entity. The significant characteristic of the tacit knowledge approach is the basic belief that knowledge is essentially personal in nature and is therefore difficult to extract from the heads of individuals. This knowledge is not easily shared. Example of tacit knowledge is reading reaction of customer's face. In contrast with tacit knowledge approach, the explicit knowledge approach holds that knowledge is something that can be explained by individuals. It is easy to communicate even though some effort and even some forms of assistance may sometimes be required to help individuals articulate what they know. Example of explicit knowledge is teaching a programming language.

According to Hedlund (1994) with his N-form model of KM has summarized that knowledge management is a process of generate, storage,

transfer, transformation, application, embedding, and protection of organizational knowledge. This concept has been used frequently in knowledge management. Sveiby (1998) defines knowledge management is 'the art of creating value from an organization's intangible assets. Moreover, he also identifies two main tracks of knowledge management activities: one track focuses on knowledge management as the management of information and the other track as the management of people. Wiig (1994) defined that KM is the systematic, explicit and deliberate building, renewal, and application of knowledge maximize an enterprise's knowledge-related effectiveness and returns from its knowledge assets. KM is about applying the collective knowledge of the entire workforce to achieve specific organizational goals. It is about facilitating the process by which knowledge is created, shared and utilized.

The ideas and the concepts of KM are accepted by many researchers and practitioners. Using the same concept, Kuzca (2001) stated that KM is the overall task of managing the processes of knowledge creation, storage and sharing, as well as the related activities. It has to include the identification of the current state, the determination of needs, and the improvement of affected processes in order to address these needs. He also classified three aspects relates to KM. The first is the management of general conditions in an organisation (the cultural environment and the KM processes). The second is the provision of assistance for the direct, inter-human KM processes, i.e., communication. The third is the management of generation, distribution, access and use of knowledge coded into artifacts (documents, training, videos etc.), i.e., information management. Knowledge embedded into social entities, therefore, needs to be managed. Works that take into account the collection of resources and processes governing the creation, dissemination and leveraging of knowledge to fulfill group or organizational objectives can be classified as knowledge management (Nonaka, 2005). Lu and Liu (2008) emphasized that the essence of the knowledge management lies in innovating and sharing the knowledge. The core of knowledge management does not depend on how many knowledge be possessed. It lies in innovate the knowledge to create the

new value and making the knowledge to the person who needs the knowledge conveniently.

Technology-driven perspectives have traditionally been in a dominant position in the field of knowledge management, partly because new developments in computing and information technology have enabled increased retention and transfer information in organization on a larger scale than was once possible. Knowledge management initiatives rely on information technology as an important enabler as well as a medium to create and distribute the knowledge. Application of IT to knowledge management is concentrated on the coding to sharing the best practices, the creation of corporate knowledge directories as well as the creation of knowledge networks. According to Skyrme (2001), knowledge management is epitomized by several increasingly used practices. These includes sharing best practices, developing expertise directories, using intranets to improve access to knowledge repositories, and nurturing communities or practice. Systematic processes support these activities, also enabling replication of successes. All these are specific actions organizations take to manage their knowledge. Carayannis and Liebowitz (1999) present hypothetical linkages between knowledge management system (KMS) and artificial intelligence, information technology and managerial and organizational cognition dissects individual and group knowledge into components in order to create a linkage to information technology. It is important to state that knowledge management is not information technology fields. Information technology only acts as an enabler to the growth of knowledge management. Whealey (2001) claims that knowledge management is not about technology. People are dazzled by technical solutions as many problems have been solved by the technology solution. People share knowledge because they are in relationship.

Sveiby (1996) has stated before that the concept of knowledge management from how people use them. The first one is IT-Track KM = Management of Information. Researchers and practitioners in this field tend to have their education in computer and/or information science. They are

involved in construction of information management systems, AI, reengineering, group ware etc. To them Knowledge = Objects that can be identified and handled in information systems. This track is new and is growing very fast at the moment, assisted by new developments in IT. The other point of view is People-Track KM = Management of People. Researchers and practitioners in this field tend to have their education in philosophy, psychology, sociology or business/management. They are primarily involved in assessing, changing and improving human individual skills and/or behavior. To them Knowledge = Processes, a complex set of dynamic skills, know-how etc, that is constantly changing. They are traditionally involved in learning and in managing these competencies individually - like psychologists - or on an organizational level - like philosophers, sociologists or organizational theorists. This track is very old, and is not growing so fast.

2.1 Knowledge Transfer

By adapting Polanyi's concept, Nonaka (1991) highlights the important issues of knowledge creation and transfer in his article. Nickols (2000) has summarized those four such transfers or creations which are:

a) Tacit to tacit. Acquiring someone else's tacit knowledge through observation, imitation and practice. The example Nonaka uses is that of a product developer, Ikuro Tanaka, who apprentices herself to a hotel chef famous for the quality of his bread. She learns how to make bread his way, including an unusual kneading technique.
b) Explicit to explicit. Combining discrete pieces of explicit knowledge to form new explicit knowledge, for example, compiling data and preparing a report that analyzes and synthesizes these data. The report constitutes new explicit knowledge.
c) Tacit to explicit. Nonaka cites here the product developer's subsequent conversion of her acquired tacit knowledge into specifications for a bread-making machine. However, as defined by Polanyi, who invented the term, tacit knowledge cannot be articulated. Thus, although

Nonaka's product developer was clearly able to devise a set of product specifications based on what she learned while apprenticed to the chef in question, it seems doubtful that she actually articulated the chef's tacit knowledge or her own. It seems more likely that she articulated some rules or principles or descriptions of procedures, that is, she created some declarative knowledge that subsequently proved useful in the design and development of the bread-making machine.

d) Explicit to tacit. Internalizing explicit knowledge. Here, Nonaka indicates that the product development team acquired new tacit knowledge; specifically, they came to understand in an intuitive way, that products like the home bread-making machine can provide quality, that is, they can produce bread as good as that made by a professional baker. That Nonaka (or anyone else) knows of this suggests that whatever knowledge was acquired has been made explicit and that means it might have been implicit knowledge at one point but was never truly tacit knowledge because that cannot be articulated.

Knowledge transfer is a field of knowledge management that transferring knowledge from one set of individuals to another has been a key area of interest for knowledge management researchers. Transferring knowledge across global boundaries has become an important competitive advantage for organizations seeking success. While most research blames these failures on poor project management and/or lack of executive sponsorship (Reich, 2007), the fact that there is very little knowledge transfer and sharing between project teams has to play a key role in allowing these failures to occur. Since knowledge transfer is usually one of the first tasks of transitioning to an outsourced model, it is sometimes overlooked or under-planned, resulting in a shaky start to the outsourcing relationship (Warner and Brown, 2005).

Kogut and Zander (1992) claimed that the advantages of the internal organization over the market organization arise from the superior abilities in both crating and transfer the knowledge. The successful key in the organization or firm does not only rely on the quality product only but it

certainly on the employee's knowledge and skills. The central competitive dimension of what organizations and firms know how to do is to create and transfer knowledge efficiently within an organizational context. Organizations are viewed as social communities with shared language and norms, specializing and efficiency in the creation and transfer of knowledge. Knowledge is obtained, developed and transferred essentially through social interaction. As a large number of networked connections enable a given actor to be exposed to a wider variety of diverse knowledge, networks act as knowledge enabler. However, there is a main problem in creating a knowledge transfer environment. A common problem in most knowledge management is that individuals do not share their knowledge (Skyrme, 1999). But we willingly share what we know if we think it is important to the work, if we feel encouraged to learn, if we want to support a colleague. Some of the conditions that make people willing to learn and share their learning's are; people understand and support the work objective, people know and care about each other, people feel personally connected to their leaders, people feel respected and trusted. He also stated the best practices in making the knowledge management works. Those practices are creation of knowledge database, knowledge mapping, formation of knowledge teams, active management of knowledge processes, development of knowledge centers, knowledge webs, introduction of collaborative technologies and appointment of senior personnel to in-charge.

Sveiby (1996) empasized that knowledge is action oriented and is best transferred via tradition, in social interaction with people, because humans have a huge capacity to absorb signals unconsciously in face-to-face communication. However, tradition is slow and unconscious. It is particularly urgent in the rapid information processing industries due to the rapid development in information technology. It is ineffectively to transfer a valuable knowledge if we are physically apart from each other. In real world, multinational organizations are located across the globe. This is the point when technology will act as enabler in knowledge transfer. The capabilities of information technology in transferring and collaborate the knowledge

contributes to the rapid growth of knowledge management. In addition, he also quoted that Polanyi has identified three tacit psycho-social mechanisms for knowledge transfer which are imitation, identification and learning by doing. The essence of knowledge transfer is the process of identifying valuable knowledge, understanding, digesting new knowledge and utilizing, and creating new knowledge (Zhai, Xue & Dong, 2007). Knowledge transfer performance depends on the absorbability of knowledge accepter to a great extent. Davernport and Prusak (2005) claim that high-performing knowledge workers is the best performers are those who share knowledge frequently with their peers. When individuals view knowledge as something to share rather than to protect, it becomes the basis for new knowledge and learning. When knowledge is freely shared, social networks and knowledge-based "communities of practice" form and are strengthened, both within and across organizations. This leads to the cross-fertilization of ideas and, ultimately, to innovation.

In other point of view, Qin and Yang (2008) mentioned on knowledge activities on organization and claims that today's knowledge could not solve tomorrow's problems. Organizations must continually update and re-invention their knowledge. This is a process that transfer a shared knowledge and create new knowledge, which is called manage shared knowledge. Extending from knowledge transfer, shared knowledge involve several activities such as members of the team discuss the results and transfer the experience into knowledge the team received a shared knowledge, and on this basis, adjust their actions in the next round and choose a way of knowledge transfer, which makes the team a shared knowledge and uses it to re-group or individuals. Weber (2007) stated that knowledge management approaches may fail when they do not promote collaboration. According to Yulong (2007), firms are seeking to collaborate with their partners at greater extent in the areas such as knowledge management to exploit the potentials of an efficient and effective supply chain. Companies that learn to manage and leverage these networks effectively will likely be more agile, more efficient and more innovative than those that do not. Collaboration is an important means for learning and

sharing. Therefore, any KM approach that does not promote collaboration is likely to fail. Failure of organizing the knowledge management and knowledge transferring absolutely may impact the operational of organization. In our case, failure of understanding the knowledge is not limited to the IT employees only but continuously, it may affect the development of project especially in information technology and system. The IT Personnel plays an important role in establishing the organization. Therefore, the collaboration is very significance for the knowledge sharing and transferring. We can conclude that knowledge transferring is not enough in supporting the development of knowledge management. There is another activity that makes knowledge more valuable and growth. At this point, knowledge collaboration is taken place.

2.2 Knowledge Collaboration

Knowledge collaboration is an enhance activities than knowledge transferring. According to Cambridge University Press, knowledge is an understanding of or information about a subject which has been obtained by experience or study, and which is either in a person's mind or possessed by people generally. Meanwhile, collaboration is when two or more people work together to create or achieve the same thing. From this definition, we can understand that knowledge collaboration is a process to move the right information and knowledge to the right people at the right time through a structured platform in order to achieve the objective. Gill (2005) stated that the reuse of knowledge can assist an organization in not reinventing the wheel and ensuring the past mistakes are not repeated. However, where corporate knowledge is ineffectively managed during the project life cycle, valuable intellectual capital is lost, causing rework and lost opportunities.

Yu and Fan (2008) stated that knowledge used or created in knowledge collaboration procedure flows from one net node to another, so that knowledge is transported or shared. As related to knowledge collaboration, Zhou (2008) stated that knowledge management is the foundation for development of integrative application, resources sharing, effective adaptation

to new environments, and the enhancement of organizational learning. The increased focus on KM led government agencies to implement various KM technologies, like one-stop portals, repositories and collaborative systems. Collaborative system these days offers many features such as online discussion, shared documents, manage calendars and projects. Hustad (2004) stated that knowledge can be shared and transferred in multinational organizations, and how a network of different 'communities of knowing' can stimulate these knowledge processes through global collaboration supported by information and communication technology (ICT). Thagard (1997) stated that knowledge collaboration has at least four different kinds of collaboration, reflecting the different backgrounds and roles of the collaborators, but the objective is to promote the knowledge sharing. Knowledge collaboration is an organizational approach to create and manage the knowledge for the benefits of the organizations and also creates a culture that encourages sharing among the collaborators.

Sveiby and his colleague, Dr. Roland Simons have done a research on the ability and willingness of organization to collaborate and has introduced a concept of collaborative climate to promote the collaborative environment. In their research, they have found that among other things, the appreciation of collaborative climate depends on the vantage point of the person. Collaborative climate tends to improve with age, power position, seniority in the organization and level of education (Sveiby & Simons, 2002). According to them, collaborative climate defined by behaviors that people can observe and what people do around here. They have highlighted four components of collaborative climate in organization which are organization culture, immediate supervisor, employee attitude and workgroup support.

Suliman (2002) stated that one of the key technologies that is driving knowledge management is collaborative technology. Collaboration tools enable a company's professionals to work together and work virtually regardless of the geographical location. Web technology allows organizations to build web and knowledge portals that can handle substantial amount of

information and made it accessible to users anywhere anytime. Once again information technology acts a platform in collaborative environment. Hussain, Lucas & Ali (2004) have defined seven (7) steps in creating knowledge management methodology. One of the steps in the methodology is integrating existing information systems to contribute and capture knowledge in an appropriate format. It means that there is a need to have a appropriate and dedicated platform to collaborate the knowledge. Kock (2005) defined that the term e-collaboration is used as an umbrella term that comprises several other closely related fields, commonly known as computer-mediated communication, computer-supported cooperative work, groupware, group support system, collaboration technologies, or, more recently, the so-called field of knowledge management.

Two major approaches of knowledge collaboration are knowledge repository approach and the community-based approach (Ye, Yamamoto & Kishida, 2008). Deeply influenced by research in artificial intelligence, the knowledge repository approach believes that expertise or knowledge can be externalized and formalized with logics or rules for sharing. The research focus, therefore, is on extracting knowledge by interviewing experts; formalizing extracted knowledge; storing formalized knowledge in knowledge repositories; and developing retrieval mechanisms to locate from repositories the knowledge relevant to the task at hand. This knowledge repository approach completely overlooked the fact that a great amount of human knowledge is inherently tacit. Even if a knowledge repository can capture and store externalized knowledge, the tacit context is always lost. Due to the loss of the context, many users are unable to apply the knowledge that they located from the knowledge repository.

A community-based approach was proposed in the 90s when researchers have realized the difficulties in the knowledge repository approach. The new approach has been introduced in understanding and supporting knowledge transfer and collaboration. This approach is focuses on natural and informal human communications because it believes that learning

takes place naturally when people from a community of practice engage in practices together. In contrast with the knowledge repository approach in which knowledge is managed, this approach promotes informal communication in communities through the management of social network and the creation of expert lists. User in the community knows whom to ask when they have a problem.

2.3 Conclusion

Chapter 2 has covered the reviews of knowledge management and its sub discipline's literatures. The review shows the continuous development of knowledge management theory to the introducing of knowledge collaboration concept. Knowledge management is one big field. Although this field has growth fast, the aims is still to encourage the knowledge to be collaborated for organization and individual benefits. Many researchers has introduced the enhance concept of knowledge management. Knowledge transfer is another process that organization needs to look into it. Once the organization has realized the importance of implementing knowledge management, everybody started to share knowledge to enrich the value of organization. Sharing and transferring is not enough yet to improve the effectiveness of organization. Knowledge collaboration then came to take place and creates more space for employees to gain more knowledge. Due to the growth of technology, knowledge management significantly become popular and accepted by all organizations. We need to clear understand that information technology only acts as enabler or transporter for knowledge management to growth. This field used information technology as tool and these days, both of these elements are connected each other.

CHAPTER 3

ACTOR-NETWORK THEORY

3.0 Introduction

Actor network theory (ANT), also known as enrolment theory or the sociology of translation, emerged during the mid-1980s, primarily with the work of Bruno Latour, Michel Callon, and John Law. It is an effort to understand processes of technological innovation and scientific knowledge-creation. This theory's aim is to describe a society of human and non-humans as equal actors tied together into network built and maintained in order to achieve particular goal (Stadler, 1997).

For example, rather than saying Newton "founded" the theory of gravitation seemingly as though he were alone in a vacuum, Actor-Network Theory emphasizes and considers all surrounding factors; no one acts alone. Various other technical and non-technical elements would all be described and considered in his actor-network. Another example is the development of a product. To achieve this aim, the theory uses a somewhat specialized vocabulary. The key term actor, for instance, is not used as in conventional sociology where actors are usually defined as "discrete individual, corporate, or collective social units." (Wasserman & Faust, 1994). ANT does not typically attempt to describe why a network exists. It is more interested in the infrastructure of actor-networks, how they are formed, how they can fall apart.

ANT incorporates what is known as *a* principle of generalized concepts on what are human and non-human (e.g. artifacts, organization structures) should be integrated into the same conceptual framework and assigned equal amounts of agency. In this way, one gains a detailed description of the concrete mechanisms at work that hold the network together, while allowing an impartial treatment of the actors. The kind of

analysis that ANT promotes seeks to open the black box - that is, the Web as a singular object - in order to examine the network of the many actors that constitute it. ANT invites us to see the Web not as a computer network, but as a socio-technical network that assembles human and non-human actors: computer developers, hardware, technical standards, and protocols, as well as institutional bodies that regulate the architecture of the Web, software, and software developers, users, and so on (Langlois, 2005).

3.1 Key Elements of ANT

3.1.1 Actor

Actors, actants and entities are major elements of the actor-network. Any element which bends space around itself makes other elements dependent upon itself and translate their will into the language of its own (Callon and Latour, 1981). Common examples of actors include humans, collectivities of humans, texts, graphical representations, and technical artifacts. Actors, all of which have interests, try to convince other actors so as to create an alignment of the other actors' interests with their own interests. An actor makes changes in the set of elements and concepts habitually used to describe the social and the natural worlds. By stating what belongs to the past, and of what the future consists by defining what comes before and what comes after, by building up balance sheets, by drawing up chronologies, it imposes its own space and time. It defines space and its organization, sizes and their measures, values and standards (Callon and Latour, 1981). Actor is not just a point object, but it is an association of heterogeneous elements. It is like a black-box, when the lid is opened, one can see a whole network of others that constitutes the actor. Any changes affecting the actor will also affecting the network it simplifies (Ibrahim, 2006).

3.1.2 Actor-Network

Actor-network is a heterogeneous network of aligned interests working towards the achievement of a common goal. The alignment of interest within an actor-network is form through the enrolment of a body of allies either both human and non-human through a process of translating their interests to be matching with those of the network. Examples of actor-network are people, process, environment, organization and technology. The concept of actor-network in ANT's name expresses the idea that the actor does not act on its own. Actor works under the influence of a complex network of material and semiotic influence (Garson, 2008).

3.1.3 Translation

Translation is a process of the creation of an actor-network. In other word, translation is the process of converting entities, of making similar (such that one entity may be substituted for another) or simplifying (black-boxing or translating network elements into a single block) while retaining difference (translation is not simply transfer). This process consists of four major moments or stages which are problematization, interresement, enrolment and mobilization of allies. Through these processes, we can understand the current problem and come out with the big picture of actor-network. Besides seeing the output as a single entity, this theory with its translation concept offers a different point of view on how each actor connected to each other. Numerous actors within an organization may be involved in a different process of translation, each with its own unique characteristics and outcomes. For purposes of clarity, it is useful to focus on a single actor, from whose vantage point we wish to see the process of translation.

3.1.3.1 Problematization

The first moment of translation during which a focal actor defines identities and interests of other actors that are consistent with its own interests, and establishes itself as an Obligatory Passage Point (OPP), thus "rendering itself indispensable" (Callon, 1986). In other word, the enrolling actor defines a general problem that only can be resolved by the solution of a much more specific problem caused by the enrolling actors. For instance, a university needed an e-learning platform to support communication with students, the work submission, the file repository, the grades and the feedback to students.

3.1.3.2 Interessement

Interessement is the second moment of translation which involves a process of convincing other actors to accept definition of the focal actor. Interessement involve a group of actions by which an entity attempts to impose and stabilize the identity of the other actors it defines through its problematization. Different devices are used to implement these actions. To interest other actors is to build devices which can be placed between them and all other entities who want to define their identities otherwise (Callon, 1986).

3.1.3.3 Enrolment

Interessement moment is a phase to convince other actor while enrolment is a phase when other actor accepts the interests defined by the focal actor. Interessement achieves enrolment if it is successful. Enrolling actors in an actor-

network requires going through some participative activities where actors can discover and share their common interests.

3.1.3.4 Mobilization of Allies

The leader creates and empowers actants to communicate (via charts, diagrams, etc. – "immutable mobiles") progress being made toward their shared goals and actions, thus reinforcing commitments to the course of action. At this stage the leader has lined up a chain of distinctive links to perpetuate the network (Callon, 1986).

3.1.4 Obligatory Passage Point (OPP)

The obligatory passage point is referring to a situation that has to occur in order for all the actors to satisfy the interests that have been attributed to them by the focal actor. The focal actor defines the OPP through which the other actors must pass through and by which the focal actor becomes indispensable. An obligatory passage point is a node in the network that all the actants who have a stake (or a perception thereof) in the problem would have to go through (Ekbia, 2004).

3.2 ANT and Information System

Actor-network theory is an approach that can be considered very helpful when it comes to understand and improve the relationship between people and technology. The theory was introduced by Callon and Latour in the late of 1980s. There has been increasing interest by academics (but not practitioners) in the potential for using sociological theories in the field of information system research (Lewis et.al., 2004). Principally, the actor-network theory is focused on the elements of actor and network which are mutually constitutive. Researcher has found that the current information system approach is more concentrated on the hardware and software. According to Martin (1998), in his

research on Geographical Information System (GIS), the current theoretical framework for GIS is too focused on technical development to offer any critical contribution to social theory of technology society interactions. In exploring the social construction of GIS and the inherent difficulty in multi-participant GIS design, some researchers have turned to Actor Network Theory (ANT). This also been supported by Lewis and Townson (2004) statement which summarized that the use of the ideas of ANT may contribute to improved understanding and more explicit, more defensible basis for using engage method research. Research in the information systems field examines more than just the technological system or just the social system, or even the two systems side by side. In addition, it investigates the phenomena that emerge when the two interact.

Tatnall (2003) stated that an approach to information systems research, based on actor-network theory, offers a good means of allowing impartial treatment of the contributions of both human and non-human actors, and of handling the complexities involved. Chen et. al., (2009) believed that ANT can provide added explanatory power in three primary ways. The third way is when ANT assumes that society is inhabited by actors pursuing interests. Interests can be translated into technical or social arrangement, for instance an information systems or organizational routines. Wujie and Tingjie (2008) stated that actor-network theory belongs to the sociotechnological school, which addresses the issue of technology development by looking at actors, who possess enough power to change the direction of technology development. Goncalves & Figueiredo (2008) supported the idea of ANT by stated that In Actor-Network Theory terms, technology and its use is not separable. Society and technology cannot work in separate branches. It seems that sociological theory is become famous in information system research as the typical method or approach in information system turns to fail in certain environment.

3.3 Conclusion

The concept of actor-network theory has been described in this chapter to provide briefly understanding of this theory. Analytically, ANT is interested in the ways in which networks overcome the conflict and strengthen each actor internally, gaining consistency and stabilizing. This theory also organizes in a flexible ways and convert the elements into a set of network that depending on each other. ANT provides a fresh perspective on the importance of relationships between human and physical actors. It also focuses attention on the socio-technical networks that leaders create to accomplish their goals, emphasizing that no one acts alone as there are important roles played by resources of all kinds, including equipment, data, money, publicity, and power.

CHAPTER 4

METHODOLOGY

This chapter focus on the method used to accomplish this study. It is also cover on the description each activity in each phase in the methodology and how Actor-Network Theory is applied into this methodology.

4.0 Introduction

Collaboration consists of interaction and communication of user in certain particular network. In developing the collaboration platform for knowledge transfer in polytechnics, a specific methodology which is design for the development of the collaborative environment is chosen. Collaborative Engineering Life Methodology (CELM) is introduced as a framework for collaborative information system and collaborative software. It contains mechanisms to support three layers of user involvement: selected user representatives, user groups, and the broader user community (Nunamaker et. al., 1998). This methodology emphasized on the user involvement as collaborative information system and software may turns failed if users do not participate and involve in creating the collaborative environment. CELM comes with four main phases which are planning, requirement, design and implementation. Each phase has several activities which complete the main phases. The planning, requirement, design and implementation phase are ongoing phases that will keep circulate as if the requirements change (see Figure 1).

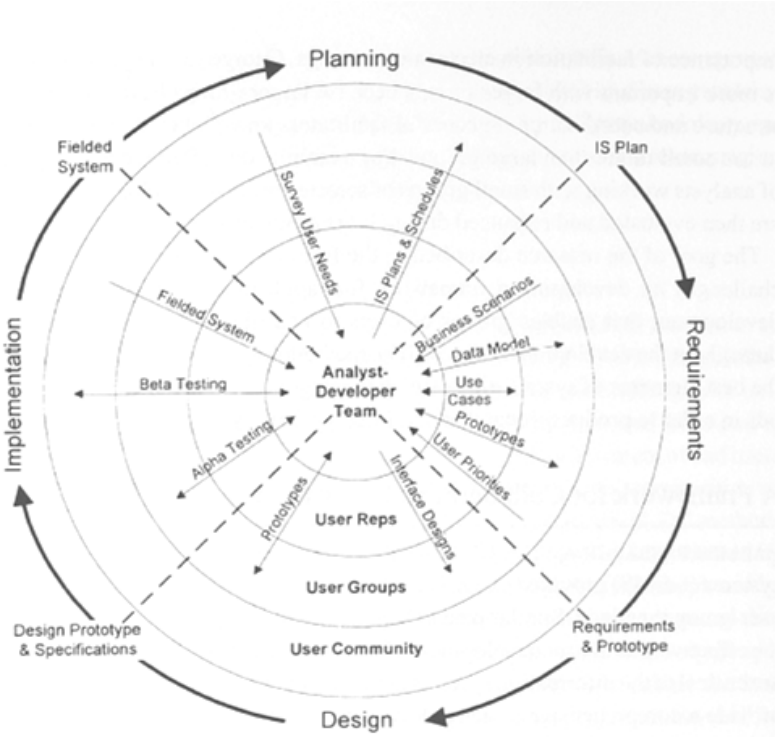

Figure 1 : The Collaborative Engineering Life Methodology (Nunamaker et. al., 1998)

However, this research is mainly focus on how knowledge collaboration can be applied in polytechnic's environment in improving the knowledge management among the IT Personnel in polytechnic. This research is also focus on how ANT can be used as a translating tool in understanding and interpreting the problem of knowledge transfer in polytechnic. As mentioned in Chapter 3, ANT consists of four moments: Problematization, Interresement, Enrolment and Mobilization of Allies. Therefore, the moments of ANT will be applied into CELM to fulfill the needs of this research (see Figure 2). By using the combination of CELM and ANT, this research can be related to the ANT which focuses the interaction and participation on actor and their relation. Though ANT consists of four phases or moments, the last phase which is Mobilization of Allies does not include in this methodology as this study is only focusing in developing the prototype of the system.

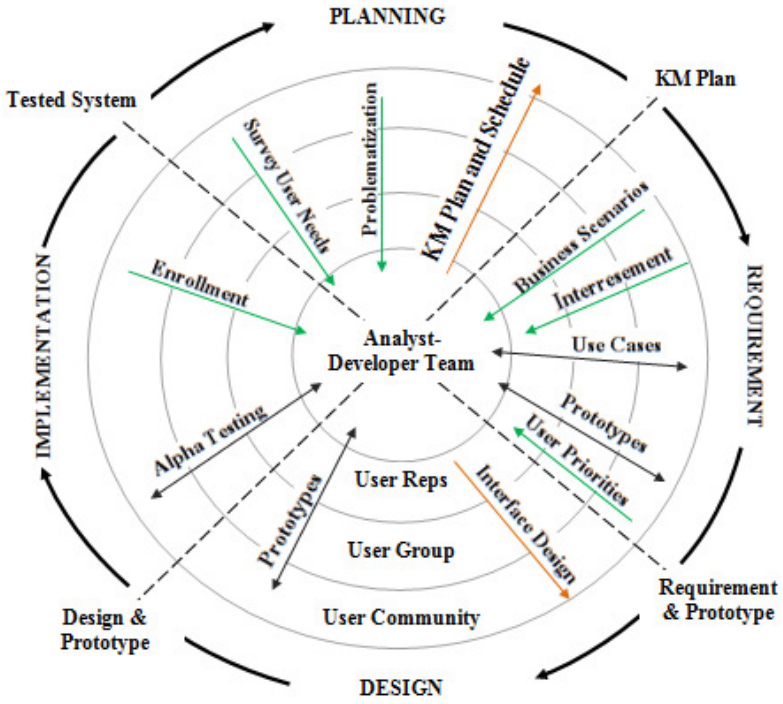

Figure 2 : ANT is applied in Collaborative Engineering Life Cycle

4.1 Planning Phase

This phase involve the analysis and understanding of problem background. Problem background is important to identify the problem statement in this research. In order to suite with the needs of this research, the output from Planning Phase is changed to Knowledge Management (KM) Plan instead of Information System (IS) Plan. Planning is especially critical in the CELM because it is designed to support incremental system development (although it is also applicable to other development).

4.1.1 Survey User's Needs

The initial task of this activity is to identify the problem background and current activity of knowledge collaboration process in polytechnic. From there, the needs of proposing a new system need to be justified. An interview has been conducted with the representative of IT Personnel in polytechnic in understanding the problem background and the needs in improving the knowledge management among the IT Personnel in polytechnic.

4.1.2 Problematization

Problematization which is the first moment in ANT is included in this phase as the activities of problematization moment are to identify the actors, roles and building the actor-network. Those activities are mainly related in identifying and understanding the current situation of the problem. Normal System Development Life Cycle (SDLC) defines the problem from the user's perspective. The way to discover the problem may be different from ANT's view. As we can see that CELM does not provide any specific activity in identifying the actor and the relationship among the actors. Therefore, problematization moment is embedded into this phase.

4.1.3 KM Plan and Schedule

The principle of this activity is identifying how polytechnic as an organization plan and manage knowledge transfer among the IT Personnel.

4.2 Requirement Phase

The ANT theory will be used to translate the business scenarios and needs to the collaborative platform requirement. Wrong interpretation and translation may produce weak user's requirements that may affect the development of the collaboration platform. This phase involves several activities such as Business Requirement Analysis, Interresement, Use-Case, User Prototype and Priorities. For the second time, an informal interview has been conducted with Assistant Manager, Head of IT Department and IT Executives from five different polytechnics to know exactly the requirements in developing the collaboration web platform. User must understand requirement so that they can prioritize the needs and justify the expenditures for any technical solution. The developer must understand the requirement so they can transform them to appropriate technical solution. Requirement was analyzed for accuracy, necessity, consistency, flexibility and feasibility.

4.2.1 Business Scenario

The first step in the requirement phase is the identification of business scenario. The purpose this phase is to interpret the analysis of business needs to the identification of systems requirements. This process increases the specificity of requirements. The scenarios and data requirements are subsequently translated into alternative system use cases that are implemented in a physical artifact which is the prototype (Nunamaker et. al., 1998). It is important to develop a comprehensive business activity or function model in designing the system. In this context, business scenarios are defined as narrative descriptions of human work processes that specifically identify an ordered sequence of actions taken to accomplish some business goal.

4.2.2 Interessement

Interresement is the second moment in ANT. The main activities in Interresement are identifying each actor's interest on the system and come out with the requirement to the collaborative platform. With this justification, Interresement is applied into Requirement Phase in CELM. The development and evaluation of system use cases and prototypes increase specificity of both the requirements and the artifact.

4.2.3 Use Case

Use case is a powerful concept for helping an analyst to understand how a system should behave. According to Bennet et.al (2002), use cases are descriptions of the functionality of the system from the user's perspective. Use case diagrams are used to show the system functionality and which user can communicate with that functionality. We used use case to document the scope of the system.

4.2.4 Evaluate Prototypes

To help identify and validate their requirements, a prototype based on the proposed system use cases is developed. As clearly demonstrated by the RAD approach, prototypes provide users with a physical artifact that enables them to evaluate both the requirements and their implementation. Survey is done to collect responses to closed-ended evaluation questions. The feedback is used to update the business scenarios, interessement, system use cases, and the prototype in an iterative development and evaluation process that increases the specificity of both the requirements.

4.2.5 User Priorities

The objective of this activity is to define a streamlined process for identifying user requirements. Unlike others requirements specification, which often takes so long to develop that it is outdated before it is even completed. The goal of this step, therefore, is to consolidate and prioritize requirements identified during user data collecting group sessions. Documentation of these requirements provides complete and useful requirements specification for the development team.

4.3 Design Phase

The design phase involves converting the requirements identified during the planning and requirement phases into unified design specifications that developers use during the development phase.

4.3.1 Interface Design

Interface design will be based on the requirement by the users. A simple interface design improves the effectiveness of the system develop. Also, a good interface design also encourages the user to use the system.

4.3.2 Prototypes

Prototyping can enhance an organization's ability to design, test, and establish controls. Fail to design may fail the system. Prototype of the collaboration platform is designed and should be reviewed and agreed by the user.

4.4 Implementation Phase

The implementation phase involves installing approved applications into production environments. As in this methodology, implementation will only involves alpha testing as this development only covers a prototype which involves five polytechnics.

4.4.1 Alpha Testing

Alpha testing is simulated or actual operational testing by potential users/customers or an independent test team at the developers' site. Alpha testing is often employed for off-the-shelf software as a form of internal acceptance testing, before the software goes to beta testing., beta testing and fielded system.

4.4.2 Enrolment

In this case, enrolment moment will consists of activities and elements that can be used to achieve the focal interest.

4.5 Conclusion

A methodology is a step by step which been used in order to accomplish this study. After the ANT concept is embedded into the methodology, the research has started by following the phases together with ANT moments. ANT is considered as a translating and analyzing tool that can be implemented in information system development life cycle. This is because ANT does not have much different as the result from ANT moments might be similarly same with output from information system development methodology. It also aims to identify the problem, solutions and implementation process. ANT needs to be studied in order to see how suites this theory can be used together in information system field.

CHAPTER 5

FINDINGS

This chapter will describe in detailed on how Actor-Network Theory is being used as a tool for understanding and interpreting the problem. This chapter also shows the relationship between the actors and the network in creating the collaboration platform in polytechnic.

5.1 Analyze Current Practices

33 participants from five polytechnics have been involved in a survey in analyzing the current practices and management plan in enhancing the knowledge collaboration environment in polytechnic. The main objective of this survey is to find out how IT Personnel get involved in collaborative environment. This survey also attempts to answer the question either this group actually apply the concept of knowledge collaboration or they only reside their knowledge individually in doing daily job.

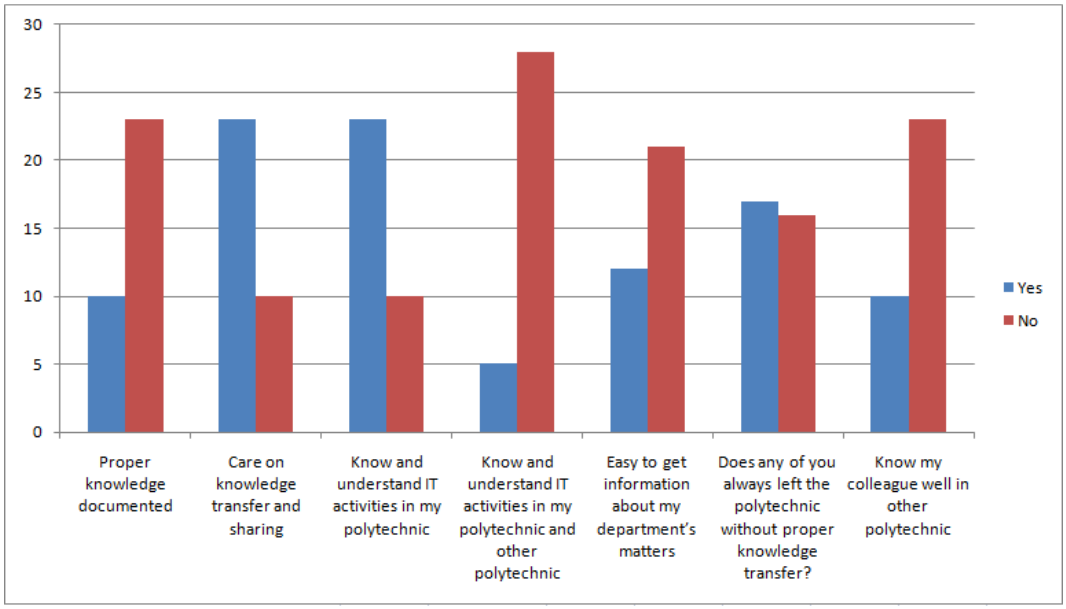

Figure 3 : The culture of knowledge collaboration in polytechnic

The questions are related in finding out the understanding of IT Personnel in knowledge sharing and transferring (Figure 3). In government organization, each staff is required to have a printed job's description individually. However, this document is only referring to basic guidelines. Knowledge and skill usually do not be documented properly. Only 30% of the respondents have documented properly their knowledge and skill as a reference and guideline to their colleague. Those are Head of IT Department and IT Executives. This group is aware of the needs in sharing and transferring the knowledge and skills as they involve in main task. In another point of view, most of them are cared about the needs of knowledge transfer and sharing. They realize that in theory, it is important to assist and extend their skill to others but practically they do not have initiative to make their knowledge and skill accessible to the rest of the team. Furthermore, the respondents also do not have strong social relationship among them. They only discuss among their colleague in each polytechnic. They randomly cross discussion with other colleague in other polytechnic. Only Head of IT Department get to know their colleague well since they always involved in meeting and training held by headquarter. 64% of them feel that it is difficult to get information and knowledge especially on technical skills

The respondents have shown that they are well known and understand all the activities and events regarding IT affair in their own polytechnic. This shown that each Head of IT Department has applied a good communication practice in sharing the information. However, this is only applied for current activities such as short term planning and strategies. When it comes to know about the long term IT plan and strategy for all polytechnics, 85% of the respondent has respond that this information does not be channeled to them.

Ineffective knowledge collaboration contributes to the failure of proper knowledge transferring among IT Personnel who has been transferred or promoted to other government agency. Almost half of the respondents agree that some of them left the polytechnic without a proper knowledge transfer process to the team. Hence, this creates difficulties to the team to get the

knowledge and experience especially to the new staff. Knowledge and skills are difficult to learn as these need years of working experience.

5.1.1 Identified Group of User

Using the Collaborative Engineering Life Cycle (CELM), I have identified the group of user as this methodology is stressed on the user as its core component. The analyst or the developer team is the core of the life-cycle. The developer will be surrounded by three different groups of user in creating the collaborative environment. These groups are Representative Group who represents the key person; User Group who represents the executive level and User Community who represents the entire user community. This layering of user participation is required because the collaborative software is designed to be scalable with lot of information and involve different type of user populations. In understanding the current environment, the groups of users have been identified according to the approach.

5.1.1.1 Representative Group

This group represents the key user. Key user is someone who can influence other members in the community and should be experts in their jobs areas. In this case, there are two groups of user who can act as representative group. As mentioned before, this community is lead by Assistant Manager in Selangor. He will be the representative group as his position is responsible in planning and developing the information technology (IT) infrastructure in polytechnic. The other user who can be categorized into this group is Head of IT Department in each polytechnic. Usually the senior IT Personnel will be pointed as Head of IT Department. These two users really have experienced and very experts in their business area and capable to influence other user to accept their objective or interest.

5.1.1.2 User Group

This group represents executive level. In our case, the IT Executive will act as a user group. This group is reporting directly to the Head of IT Department. Although these executives have different scope of job description, their main objective is to support the IT Department in offering the IT services to the end user.

5.1.1.3 User Community

User community group represents all IT Personnel in polytechnic including the Assistant Manager, HOD, IT Executive, Assistant IT Executive and Computer Technician. This group is mainly the community in the scope of IT Department.

5.2 ANT as a Translating Tool

This section presents the use of ANT in discussing about current practices of knowledge collaboration in polytechnic. The concept of Problematization, an element in ANT, is applied in explaining this situation.

5.2.1 Problematization Moment

a) Step: Identifying the Actors and Roles

In understanding the problem statement, the causes that had initiated the problem needs to be identified first. A survey has been done through interview session and questionnaires to investigate the real situation and current practice of knowledge transfer and collaboration in this case. In applying the ANT, the term ‘actor’ will be used to represent the element of the system. These are the central elements in the actor network. They have

been described as any element which makes other elements dependent upon itself. Actors can only do things in association with others and we can see actors as nodes and central points in a network (or networks). Actors can also be seen as entities that interact with other actors or serve as an intermediary between actors. The difference between ANT and other network theories is that in ANT actors and entities can be either human or non-human. Their properties are also being dependent on their relationships in a network. ANT treats all element of the system equally in understanding the relationship among the actors. The feedbacks from the survey have shown that there are different actors involves in contributing to the knowledge collaboration. Figure 4 shows the current elements together with their roles that can be enrolled as actors in building the actor-network. Each actor has different roles in supporting the operation in polytechnic.

No.	Group of Actors	Roles	Actors
1.	Human	▪ To manage IT affairs in polytechnic. ▪ To plan the direction and strategy for IT development. ▪ To recommend and make decision of IT project and task. ▪ To execute the project and task given in achieving the IT plan and strategy.	▪ User Representatives (Assistant Manager, Head of IT Department) ▪ User Groups (IT Executives) ▪ User Community (Assistant Manager, Head of IT Department, IT Executives, Assistant IT Executives, Computer Technicians)
2.	Documents	▪ To present information about IT development and IT project in polytechnic.	▪ Report, worksheet, diagram
3.	Technology	▪ To support the operation of teaching and learning in polytechnic. ▪ To provide the infrastructure for daily operation in polytechnic.	▪ Hardware, Software, Network
4.	Deliverable Method	▪ To provide a platform for communication among the IT Personnel in polytechnic.	▪ Meetings/ Discussions/ Forums, E-mail, Phone calls, Instant Messaging, Intranet and Website, Bulletin Board, Training, Workshop and Seminar.
5.	Organization	▪ To provide space for teaching and learning to student across Malaysia. ▪ To present each polytechnic individually.	▪ 27 polytechnics

Figure 4 : Current Actors and Roles Involve in Collaborative Network

Besides identifying the actors in this case, current practices of knowledge transferring also have been identified through the survey that has been conducted. Although this team has multiple of ways to collaborate and transfer the knowledge, yet they still do not have a dedicated platform to enable the knowledge collaboration environment. The process of knowledge transfer is being done in typical approaches such as meeting, discussion, forum, e-mail, phone call, instant messaging, brochure, intranet, website, bulletin board, training, workshop and seminar. Those approaches can be synchronous and asynchronous collaboration tools. All the approaches above seem to have very limited access. Only certain people might get involved especially in meeting and training.

It is agree that not all information need to be known by team members but at least, the rest of the team need to know clearly the direction of the organization. E-mail is an effective platform in communication but still has the limitation especially in collaborate the work and task. Many e-mails will be sent and received throughout the day. In most organization, it is very common situation when the sender and the recipient will keep sending and receiving emails with the same title of subject though the issue discussed in the email already out of the subject. This is a practice, using the same title of subject for replying or forwarding the email. This situation does not really help the team to manage the information and knowledge efficiently. It is tedious to search the information in bulk of emails.

Meetings are conducted by Assistant Manager to update and initiate a new project or task. Head of IT Department or appointed IT Executives usually attend the meetings. Sometimes, the meeting is called for revise new plans and

strategies of the polytechnic organization. If there is a need, the person who attended the meeting should extend and share the content of the meeting once they get back to their office. Unfortunately, some of them do not extend and spread the news. Therefore, the information and knowledge only reside within the scope of people who has attended the meetings.

b) Step: Identifying the Causes

Problematization is also about defining the possible causes that influence the problem. There is none of dedicated official platform to channel the information and knowledge among IT Personnel in polytechnic. Although information and knowledge are being transferred in multiple ways, still it limited to certain boundaries. Knowledge can be transferred if more experienced personnel join the group. For those who are not associated with the key actors, they might be left behind. The physical location is also contributed to the lack of knowledge collaboration among this team. Polytechnics are located across the Malaysia and this team is only has a chance to meet each other in formal meeting and training.

The second source of the problem is originated from lack of involvement among IT Personnel in handling task and project. In most of the project, usually only the HOD as a key person is involved meanwhile the other IT Personnel might not be involved and sometimes they even do not know exactly the IT direction and strategy in polytechnic. It is a culture to only involve the key person in handling the project and new task. This practice is not very efficient as the turnaround of IT Personnel in polytechnic is quite high. The feedback shows that most of the IT Personnel may be transferred or promoted to the other government agencies in three to four years times.

A third source influencing the problem is the lack of awareness among IT Personnel on the knowledge collaboration and transfer. From the observation, not all IT Personnel are aware on how importance of sharing, learning and collaborate each other. But why this is happening? In this situation, there are two groups of users; Group A is IT Personnel who agree that collaboration is important and Group B who do not really aware of the importance of collaboration environment. The Assistant Manager, Head of IT Department and a few key user drop belong to Group A. Their roles are focused and defined polytechnic's direction in IT. They realize that to perform their roles it is important to share the knowledge among them since they are decision maker and planner of IT affairs in polytechnic. While people in Group B, who have roles in executing the strategy and practitioner does not really aware since they do not involved in decision making, they are not a planner and even not a recommender in IT planning and strategies in polytechnic. Besides, Group B always depends on Group A in doing their job. Therefore, it is not easy for the Assistant Manager to manage the knowledge and to let other IT Personnel get involved in project or task. Several of them also do not have good competency and expertise in their daily task. In order to enable knowledge transfer in collaborative environment, a platform is needed which they can communicate, discussed, shared and collaborated their knowledge and expertise among them. A dedicated web platform that can be accessed by all IT Personnel in polytechnic is proposed as a solution to this problem.

c) Step: Building the Actor-Network

Actor-network diagram is important in understanding the relationship of actors in their own network. ANT diagrams are

an efficient tool that can reveal the interaction of actors in the scope of network. These basic diagrams are illuminating in that they begin to map out the available people, places, and things that participants may encounter in a given system. Doing this mapping first helps developers understand the available nouns that their users could leverage. To begin understanding the context in which participants use these systems, designers must first understand who and what are involved in these scenarios. Mapping out all of the possible actors in any given network is an important first step in designing these systems, because it helps designers catalog all of the active participants. Figure 5 shows the interaction of all actors involved in collaborative web platform. If one actor fail to interact or does not act according to its roles, definitely the system may turn to be unsuccessful. This is the ANT concept where it believes that all actors need to work together and to understand the relation among the actors.

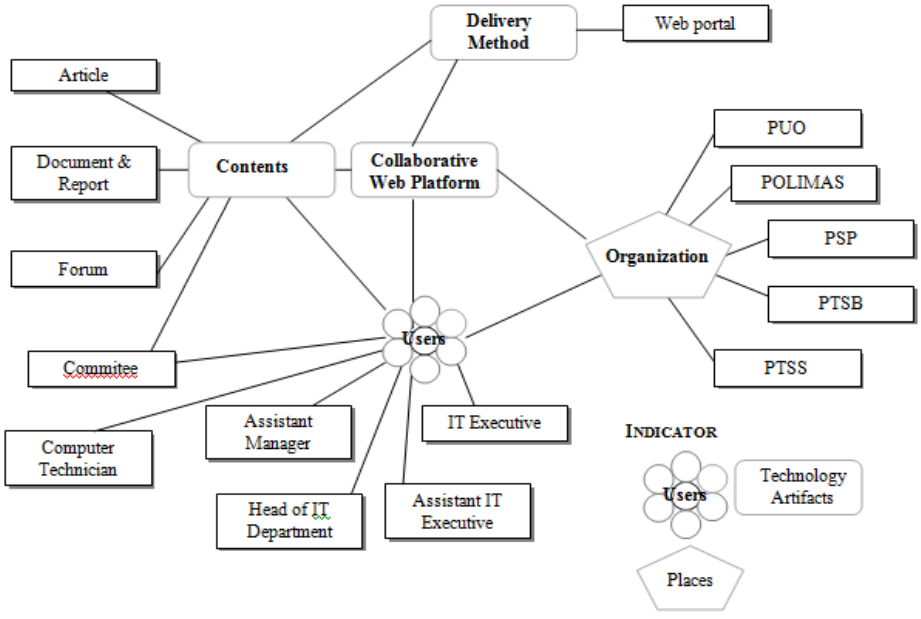

Figure 5 : The Collaborative Web Platform Network for IT Personnel in Polytechnic

5.3 User's Requirements

This section presents the use of ANT in discussing user's requirements. The concept of Interessment, an element in ANT, is applied in explaining this situation.

5.3.1 Interessement Moment

The combination of different actors with different roles contributes to different interest among them. Figure 6 shows the different actors with different interest in enabling knowledge collaboration environment through a dedicated collaborative web platform. One of the main ideas of ANT is that we should not only look at the human entity itself, but also non-human entities such as objects, organizations and technology should also be taken into consideration. Focal actor which is Assistant Manager needs to convince other actors the idea of dedicated collaborative web platform to address the problem in this case. The idea is to try and rationalize the collaborative environment in the group. Other actors must become aware of the problematization and contributing thought that lead to the creation of a collaborative environment.

No.	Actors	Interest
1.	Assistant Manager	▪ To improve the knowledge collaboration among the IT Personnel by monitoring the progress the project and task. ▪ To assist IT Personnel in understanding the IT strategy and planning in polytechnic.
2.	Developer and Administrator	▪ To have a simple collaborative web platform for easily maintain. ▪ To supervise, observe and update the content of the collaborative web platform.
3.	Head of IT Department	▪ To have a centralized information system on IT affairs in polytechnic. ▪ To develop knowledge and skills and has a platform to communicate with other IT Personnel in different polytechnic.
4.	IT personnel	▪ To develop knowledge and skills and has a platform to communicate with other IT Personnel in different polytechnic. ▪ To broad the social relationship among IT Personnel in polytechnic.
5.	Report and Article	▪ To be easily accessed and managed efficiently.

No.	Actors	Interest
		▪ To be accessed by authorized user only. ▪ To have the latest information.
6.	Delivery Method	▪ To be accessed by all IT Personnel in polytechnic with minimum configuration. ▪ To be accessed at anytime and anywhere via internet access.
7.	Organizations	▪ To be categorized by 27 polytechnics.

Figure 6 : Actors define Interest in Identifying the Requirement of Collaborative Web Platform

5.3.2 Identify the OPP

As mentioned before, the obligatory passage point is a stage that has to take place in order for all the actors to achieve the interest. As in this research, the OPP is referring to a question on the capacity and responsibility of IT Personnel to manage and implementation the knowledge collaboration platform.

5.3.3 Identify Obstacles and Enrolment

I have created and developed the appropriate collaborative web portal for them to fill with the necessary contents. We know that the physical location is a challenge factor to gather this team as one community. This team needs to clearly understand each role in contributing to the successful of knowledge collaboration. Realizing this issue, the Assistant Manager has created one committee to manage and maintain this platform. This committee is responsible in managing and maintaining the platform.

Another challenge that might be considered in implementing the collaborative web platform is the role of this web to act as a knowledge center for IT Personnel. The Assistant Manager has raised one issue that he thinks might be occurred during the implementation of the system. The collaborative web might turn failed if only a few IT Personnel are participated. In order to get all participate, the committee also responsible in promoting the platform. In order to get all involve, the committee needs to include a representative from each user groups.

A framework of ANT has to be illustrated to easy understanding of problem and case translations (see Figure 7). This framework captures the elements of ANT which element of problem has affected all actors in the system. Therefore, focal actor has identified the goal which is improving knowledge collaboration among the IT Personnel through the collaborative web platform. All actors then aligned their interest and roles in achieving the goal. However, those process need to come through a phase which is OPP before achieving the main goal. Obstacles have been identified and mechanism such as creating the committee for this platform is part of interessement mechanism in achieving the goal.

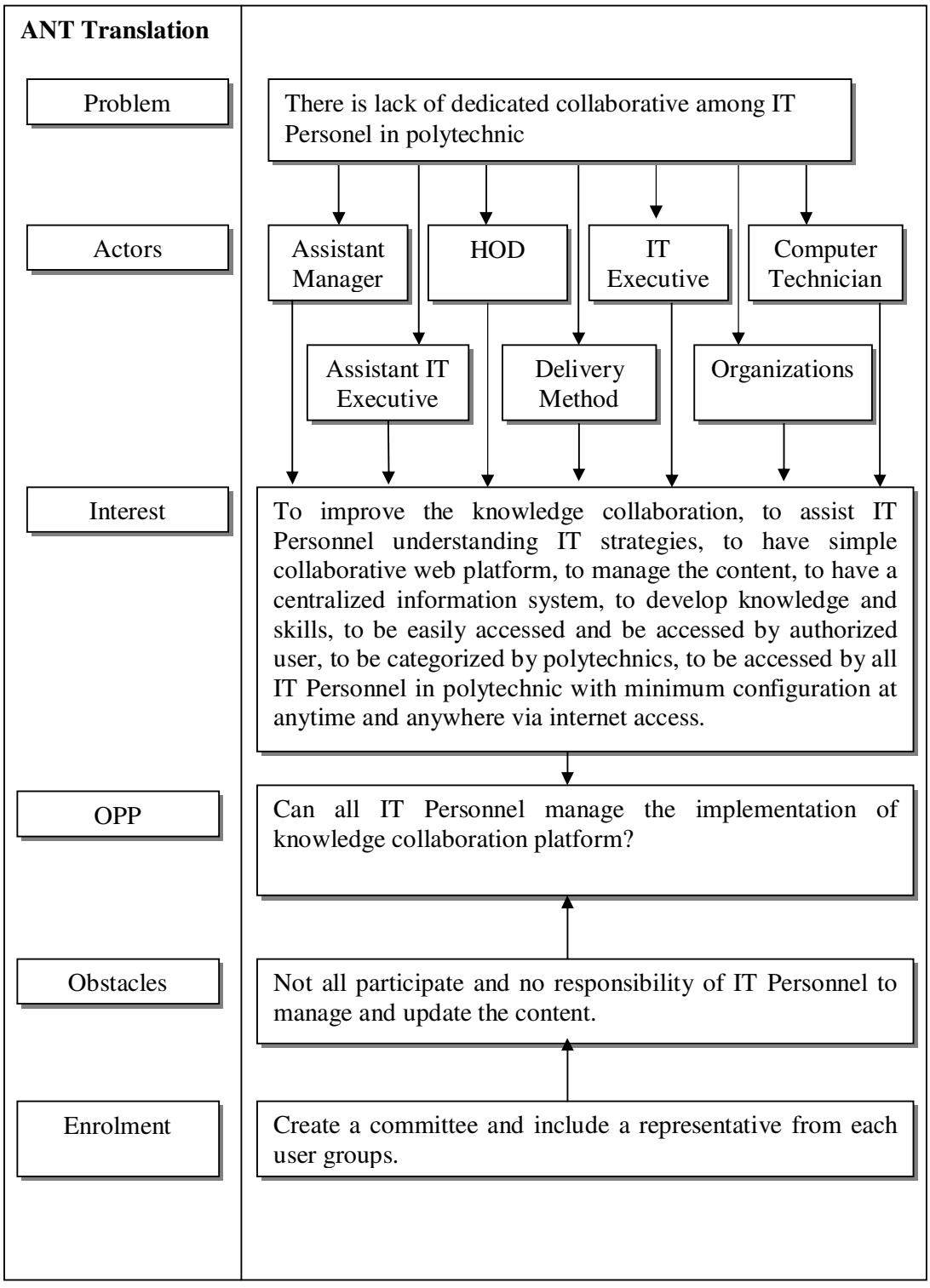

Figure 7 : ANT Framework for Collaborative Web Platform in Polytechnic

5.3.4 Activities of Collaborative Web Platform

The dedicated collaborative web platform should be able to serve the following activities required by the user (see Figure 8).

Actors	Group	List of Activities
Administrator	User Representative	▪ Add/update/delete member ▪ Add/update/delete roles ▪ Add/update/delete organization ▪ Assign and reassign member's roles
Assistant Manager	User Representative	▪ Add/view/update/publish/delete article and document ▪ Add and join forum ▪ Add/view/update/delete calendar ▪ Add/update/delete announcement and news ▪ Add/view/update/publish/delete confidential document
Head of IT Department	User Representative	▪ Add/view/update/publish/delete article and document ▪ Add and join forum ▪ Add/view/update/delete calendar ▪ Add/update/delete announcement and news ▪ Add/view/update/publish/delete confidential document

Actors	Group	List of Activities
IT Executives	User Group	▪ Add/view/update article and document ▪ Add and join forum ▪ Add/view/update calendar
Assistant IT Executives and Computer Technician	User Community	▪ Add/view/update article ▪ Add and join forum ▪ Add/view/update calendar

Figure 8 : Activities in Collaborative Web Platform

5.3.5 Use Case

The use case diagram for collaborative web platform has been categorized into five (5) different users (see Figure 9). The Administrator, Assistant Manager, Head of IT Department, IT Executive and Assistant IT Executive/ Computer Technician. These users have different authority level to access the system. The diagram below represents the collaborative web platform users. After categorized the group of users, a use case has been produced to capture a system's behavioral requirements by detailing scenario-driven threads through the functional requirements (see Figure 10).

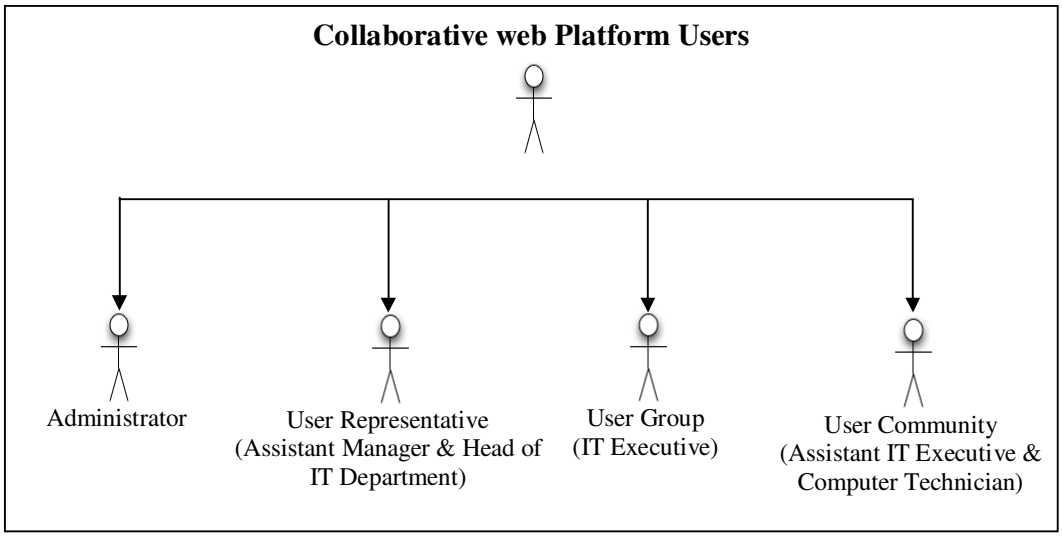

Figure 9 : Groups of Users

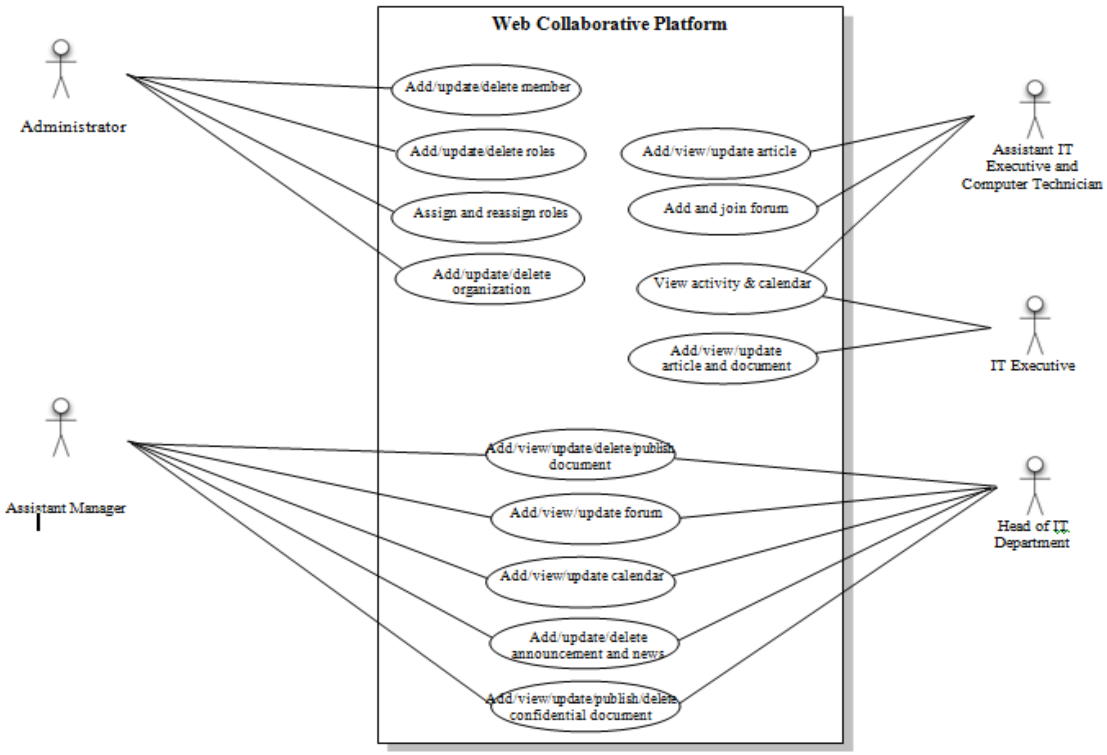

Figure 10 : Use Case for Collaborative Web Platform

5.4 Contents of Collaborative Web Platform – a Prototype

Based to the requirements that have been identified by the actors during the Interessement moment, the collaborative web platform prototype is developed with four major contents (see Figure 11): About Community, Announcement & News, Article & Document and Forum & Discussion. As per discussion with the User Representative (Assistant Manager and Head of IT Department), they have suggested that this web platform should be designed in simple and easy for maintenance. Cost of development is being considered too as not this will involved all IT Personnel in all polytechnics. This research used open source as the platform for the development of collaborative web platform. The main focus is designing the contents for collaborative web platform. There are different ways of designing the contents. Table shows the relation between the four contents, their users and the associated information to be provided.

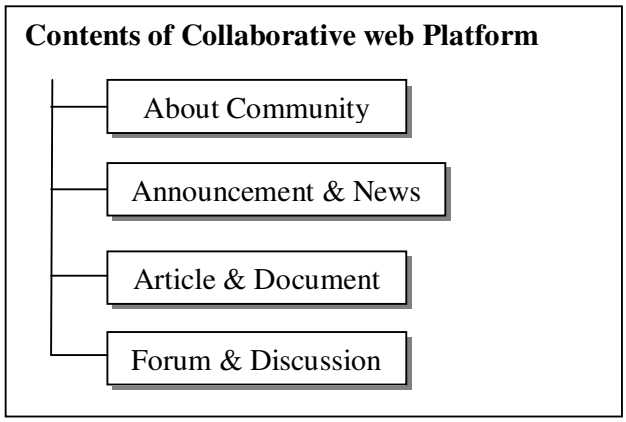

Figure 11: Collaborative Web Platform Contents

In categorized the content of this platform, it is necessary to identify the relationship between the actor, content and content's roles (see Figure 12). Understanding the content's roles help to design the collaborative web platform according to the user's need. It defined the level of users who can accessed the content and categorized the content to multiple sub-contents.

Content	Sub Content	Web User (or Actor)	Description
Komuniti Politeknik	▪ Join Komuniti ▪ Jawatankuasa Komuniti ▪ Fasiliti Komuniti ▪ Ahli Komuniti	▪ Assistant Manager ▪ Head of IT Department ▪ IT Executives ▪ Assistant IT Executive ▪ Computer Technician	▪ To store relevant information and description about collaborative web platform.
Pengumuman dan Aktiviti	▪ Pengumuman ▪ Kalendar ▪ Aktiviti	▪ Assistant Manager ▪ Head of IT Department ▪ IT Executives ▪ Assistant IT Executive ▪ Computer Technician	▪ To publish announcement, news and events to be accessed by all IT Personnel.
Artikel & Dokumen	▪ Perolehan ▪ Perkakasan ▪ Sistem & Aplikasi ▪ Harta Modal & Inventori ▪ Rangkaian & Server ▪ Pekeliling ▪ PTK ▪ Pautan	▪ Assistant Manager ▪ Head of IT Department ▪ IT Executives ▪ Assistant IT Executive ▪ Computer Technician	▪ Documents such as budgeting report and purchasing report are considered as confidential and should be access only for authorized user only.

Content	Sub Content	Web User (or Actor)	Description
	▪ Submit Artikel ▪ Submit Web Link		▪ Documents with information and knowledge based such as networking diagram, hardware allocation, systems installation, procedures and quality documents should be able to be access by all IT Personnel in polytechnic. ▪ To store related information such as regular entries of commentary, descriptions of events, or other material and maintain individually. ▪ Blog can be configured to be accessed by all IT

Content	Sub Content	Web User (or Actor)	Description
			Personnel. All unofficial information and knowledge can be stored in blog.
Forum Komuniti	▪ Forum	▪ Assistant Manager ▪ Head of IT Department ▪ IT Executives ▪ Assistant IT Executive ▪ Computer Technician	▪ To provide online discussion between IT Personnel and can build connection with each other and interest groups will easily form around a topic's discussion and subjects dealt.

Figure 12 : Content of Collaborative Web Platform

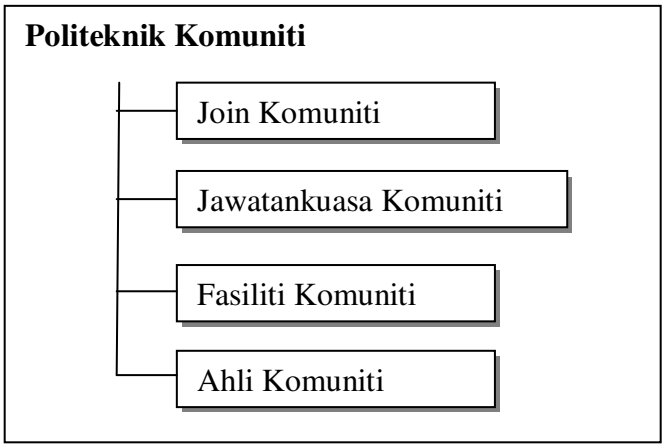

Figure 13 : Sub-contents of Politeknik Komuniti

As show in Figure 12, all the contents are accessible by all users except for the Administrator content. The Assistant Manager and all Head of IT Department have the more authority and roles in managing this platform. The objective of this platform is to allow all contents to be accessible by all users. However, this platform is only designed for polytechnic's IT Personnel; it means only registered user can have the facility to browse the contents. The first content is Politeknik Komuniti which is basically about the platform itself (see Figure 13). This is link to the sub-contents which are Join Komuniti, Jawatankuasa Komuniti, Fasiliti Komuniti and Ahli Komuniti. Join Komuniti contains of information on how to become a member of this community. This content also shows the role's description of each IT Personnel to all members of the community. The second sub content is Jawatankuasa Komuniti which contains of committee's information of this platform. It provides details of person in-charge in managing and maintaining this platform. This information is useful as guidance of reference on platform regards. The third sub-content is Fasiliti Komuniti which provides the information about the facilities that has to offer to the users. The user of this platform also can see all the community members in getting know each other and creating their social community. The list of community member is one of the features of collaborative software.

Figure 14 : Sub-contents for Pengumuman & Aktiviti

This web also provides information on announcements and news to community member (see Figure 14). Another problem that has been discovered in this organization is late notice of any events by Assistant Manager to all polytechnics. Email is being used to send the information in certain events such as meetings and training. Although they communicate through email platform, it is not really a practice. It is good to have a center of announcements and news platform. The Assistant Manager also finds it very convenient and suitable to publish incoming events and announcement through this collaborative web platform. This content does not limit to the Assistant Manager and Head of IT Department only, but it also allow other community members to share and broadcast their event. However, only Assistant Manager and the Head of IT Department can approve and publish the contents. Besides, Assistant Manager also can use this content to request any tasks or projects to the rest of the community. In polytechnic's environment, email addresses are based on each polytechnic's domain name. For instance, IT Personnel in Politeknik Sultan Abdul Halim Mu'adzam Shah used polimas.edu.my as their email domain and IT Personnel in Politeknik Port Dickson used polipd.edu.my as their email domain. They do not have a centralized email system. This condition contributes to the difficulties in broadcasting and channeling the information to all IT Personnel in polytechnics. With this content, everybody has the ability to broadcast news and announcement to the rest of the team without searching and figuring out others email addresses.

Figure 15 : Sub-contents for Artikel & Dokumen

This content provides a knowledge sharing and collaborating platform for the community. The sub-contents have been categorized based on each job description in IT Department (see Figure 15). In current environment, to get and retrieve the information and knowledge regarding the above sub-contents is depending on each IT Personnel's initiatives. For those who are really wanted to learn and share those information and knowledge get the benefits if they manage to know all details about that information. Meanwhile, for those who think the above items are not part of their work may be left behind. This situation may affect them during the assessment and competency test. Therefore, this collaborative web platform is designed to cater all related information and

knowledge on IT affair in polytechnic. This content and sub-contents give an opportunity to the community to share and transfer their knowledge to others. It is also a good platform for new comers to get the knowledge. All members are allowed to submit or post the article on each related sub-contents and only the Assistant Manager and Head of IT Department have the rights to approve and publish the article.

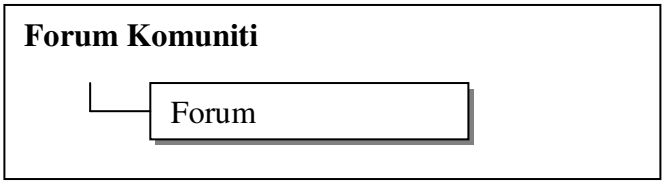

Figure 16 : Sub-content for Forum Komuniti

This content is a platform for community members to discuss and gives opinion on each article discussion area (see Figure 16). The forum will be categorized by title for easy searching. All community members are welcomed to use this forum platform to discuss any issues in their work scope. Instead of using the instant messaging, this content is also support the communication among them.

5.5 Conclusion

Using an actor network approach, the main actors were identified, and the relationships between them mapped. In this research, contents, documents, group of users, personal interviews, focus groups, and participant observations have been utilized. The results of the analysis indicate that, there are significant differences in the types of actors and the networks that they exist in. But what exactly ANT contributes to this research?

ANT highlights the relationship of actors which does not distinguish between human and non-human. A network should contain both of the elements.

When talking about a collaborative web in this case, we should see it as one heterogeneous network which binds all actors that needs each other and have to work together to make this network strong and establish. By looking at the relationships between actors, contents, delivery method, organizations, it identifies “actor networks” as the fundamental building blocks of technology. In this way, it allows the investigation of such questions as how technologies come into being and how users and other actors conform, ignore, modify, or usurp the original designers’ interests.

Normally, a failure of IS research or IS development is either depends from the user or the system factor. This failure usually emerges when a few aspects might be overlooking during the progress of the research or development. ANT does touch all single aspect of element by considering all related actors even the element may be outside from the project’s scope. Normal approach in IS does not really touch on the relationship and social connection between actors while in ANT, this aspect in being emphasized as it believes that failure in understanding the social connection may contributes to the weak network.

CHAPTER 6

SUMMARY

This chapter concludes the entire tasks that take almost three months to complete. The first section presents a short introduction about the project. The second section focuses on the research experiences that have been gained during the study and finally recommendations for future research.

6.1 Project Summary

We can conclude that it is important to create a collaborative environment to enable the knowledge transfer especially among the employees. Failure of implemented successful knowledge management can contribute to the ineffectiveness of organization's operation. The process of learning can takes times for those who are new employee. Research and study need to be done in identifying the requirement before creating the collaboration platform. Besides using the traditional information system approach, researcher especially academician started to make use of another approach such as sociological theory in analysis problem. This is because certain information approach do not seems to come out with good solutions to cater the organization's problem. ANT is being used as this theory has introduced the concept of actor in particular environment. Actor can be human or non-human entity. Each actor will be treated equally during the translation and interpreting the problem. ANT deals with the social-technical devide by denying that purely technical or purely social relations are possible and considers the world to be full of hybrid entities containing both human and non-human elements (Latour, 1993). This report will finalize how ANT can translate and interpret the problem of ineffectiveness knowledge transferring process among the IT Personnel in polytechnics. The output of this

research is used to design and to develop a prototype collaborative platform to enable the knowledge transfer among this team.

Knowledge collaboration is a sub discipline from knowledge management. By using ANT, current practices of knowledge collaboration and information sharing among the IT Personnel has been identified. Several actors have been identified. The actors play significant roles in supporting the collaborative environment in their work environment. Current practices for this team to collaborate knowledge and sharing information do not efficient enough. They used multiple channels and platform to collaborate and sharing knowledge. However, those platforms only focus to particular target actors only. For instance, email is widely used by all IT Personnel in transferring the information except not all will received the information. Although email is useful tool to communicate but it does not has the element of collaborative platform. A good collaborative platform should be able to serve collaborative features such as open discussion and document sharing. Meeting and training are also can be considered as platform to collaborate. But it still focuses on target user and for those IT Personnel who are not participate will be left behind.

6.2 Applying and ANT Contributions in Research

ANT is well applied in creating collaboration environment. ANT relates with collaboration environment as this theory is part of social theory that emphasized on association of actors. The aim of this study is to understand how social theory can be implemented in information system field. Social theory is seen as a translating and analyzer tool for researcher to discover the cause and solution for problem nowadays. Those theories also help researcher to explain and analyze variously how social action, social processes, and social structures work. In the 80s, a new disciplines of social theory has been introduced which originated from sociology of science and technology study. Science and technology studies (STS) is the study of how social, political, and cultural values affect scientific research

and technological innovation, and how these in turn affect society, politics, and culture. Actor-Network Theory is being used and implemented not only in the field of technology but recently widely used in the field of information technology and system.

One case has been chosen in applying the ANT concept. There is lack of dedicated collaborative platform for IT Personnel in polytechnic. The problem is related to ANT as this issue needs an association of multiple elements to be combined and work collectively in solving the problem. Applying of ANT moments in collaboration software methodology results a new point of view in development of the system. ANT as a translation tool is embedded into the life cycle of information system methodology as stages and phase. ANT has its own stages; they called those stages as moments. ANT uses actor's concept in elaborating the moments. After doing this research, I have found out that the moments of ANT closely related and appropriately suited with information system methodology. ANT as a sociology theory is proven can be adapted in information system.

Problem and solution are being described using ANT. As mentioned above, moments of ANT have been applied in understanding the problem and cause. Hence, ANT also has produced the designed for the solution in this problem. The relationships among the actors have been identified using Problematization moment. We can see each actor depends on other actor in contributing to the successful of the collaboration environment. Each actor has each role which is aligned with focal actor's roles. The different using ANT is ANT treats all actor equally the same. Developer in information technology and system usually missed out a few elements in developing the system such as the value of relationship among the actor. Differently with ANT, this theory has emphasized the importance of understanding the value or each actor and their relation. This theory strongly tries to improve the social relationship among the actor because failed to establish the relationship may contributes to the failure of

system implementation in organization. Through this research, ANT framework and actors-network diagram has been constructed in collaborative web platform for IT Personnel.

From Problematization moment, ANT brings the output to be analyzed in Interessement moment. This research has identified organization plan in improving the knowledge collaboration and knowledge transfer. Since there are lacks of dedicated collaborative platform that can be shared by all users, a collaborative web is seen as an appropriate platform. A web based platform can be accessed by all IT Personnel which is physically located across the nation. The requirements of this platform also have been categorized accordingly based on the actor's roles. Each actor has identified their interests which need to be aligned together in producing the user's requirement. Each interest should be synchronizing to create a strong network. The research also identified the solution and plan in making the collaborative web successful such as a plan to involve all users and create a committee to manage the web.

6.3 Benefits of Collaboration Platform

Although this development only involved five polytechnics as a prototype, hence the actors involved have identified the benefits of this collaborative web. By using collaborative web, individual knowledge, talents and information can be effectively used. There are needs to employees to widening range of their skill these days especially in technical skills. Usually, no single individual possesses all the knowledge, skills, and techniques required in doing daily job. In principle, an individual might be able to learn or acquire all the techniques needed to solve a particular problem, but this can be very time consuming. If more IT Personnel can share and collaborate the knowledge, there is a greater probability that among them they will possess the necessary range of skills.

The second benefit that they can get from using collaborative web is the transfer of knowledge or skills. Much knowledge may be tacit and remain so until they had transferred or promoted to the other government agency. Collaboration is one way of transferring new knowledge, especially tacit knowledge. Furthermore, those IT Personnel are physically located apart in all states. Therefore, they need the social and management skills needed to work as part of a team instead of only having technical skills. Collaboration extends the individual's networks. Individual IT Personnel may have contacts with other IT Personnel in their field in the community who can be contacted for information or advice. By collaborating with others, the network can be extended and further productivity ensured.

The third benefit is organization can reduce cost associated with face-to-face meeting. Meetings cannot be organized to gather all IT Personnel in polytechnics. Furthermore, traveling to meet others is expensive. Certainly, by using this collaborative web, simple task and project can be distributed and broadcast to the whole team without calling up for meeting.

6.4 The Research Experience

The research has experience difficulties in the early phase of analyzing the current background using the ANT. The ANT, as described earlier is a concept of sociology that needs to be implemented in information technology field. Without any background in sociology and philosophical background, it is very challenging to understand the concept of actor-network. It took times to understand and to find ANT literatures in information system.

This research also needs a clear understanding in applying ANT in information system methodology. The comparison process has been done to differentiate information system development life cycle and each moment in

ANT. It really takes some time as both alike to produce the same result for each phase. Therefore, I have to put myself and think from the sociology's perspective how this theory can contributes to the effectiveness of developing the collaboration web in this case. In order to complete the research, I have to put aside my information technology background and tell myself to analyze this case using the ANT's view. This theory is quite a new concept being introduced in information system field.

Though ANT is widely used in many fields these days, yet from the literatures, I have found that ANT does not have a structured procedure in guiding the researcher to do the analysis. It is definitely different from normal system development life cycle in information system field as all the steps and phases are clear enough to guide the researcher. This theory however gives us another point of views in analyzing and proposing the solution in information system field as this concept touch several elements that might be overlook in IS life cycle. It does not restrict the researcher and provides the flexibility of translating the problem without concern about the category of the actors.

Developing the collaborative web does not give much problem but to gather and to collect the data is very much challenging. This is because polytechnic has many branches and physically located across the country. Therefore, I have selected five polytechnics in doing the survey. Fortunately, the responses are very good and help me a lot in completing this project.

6.5 Recommendation for Future Project

Knowledge collaboration is not a new concept. However, in doing this research, I have found that most of government organization in Malaysia does not promotes the concept of knowledge management, to be precisely; lack of knowledge collaboration effort applying in government organization. Knowledge collaboration is seen only applies in education line. How about other services

such as health and agriculture field? In future, a further research can be conducted in analyzing multiple government organization in finding the reasons for not implementing knowledge collaborative in their work culture.

ANT is seen to be an alternative approach in translating the problem and providing the solution in information technology field. However, this concept only briefly applies in this case. The ANT concept does not have capacity to provide much information on the case. Also, ANT still does not have a structured method and procedure in solving the problem. It is good to have s further research and come out with a structure of ANT concept in knowledge collaboration research. A further research also can be conducted in analyzing the use of sociology and philosophy theory and concept in information technology field and to see how those theories can help the researcher in information system field.

6.6 Conclusions

Overall, the objective of this project has been achieved which is to use and apply ANT concepts in describing the problem and solution based on actor-network theory. This project is applying ANT moments as activities in information system methodology in analyzing and producing the requirement of the collaborative web platform. Current practices, organization plan to manage and transfer the knowledge also have been identified through the ANT concept. Researchers in information system need to discover how sociology theory can be used as an alternative to innovation diffusion in understanding issues of information systems implementation. Many information systems fail due to lack of involvement and inadequate analysis by the developer. Instead of see the development of system from technical side only, ANT can be used to analyze the situation in more humanity side. It is not only look at what they do, but also be interested in what interests them, and even believe what they believe. Actor-network theory focuses attention on the networks that engineers and scientists create to get their projects done, emphasizing that no one acts alone.

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APPENDIX A

SURVEY QUESTION

A SURVEY ON KNOWLEDGE TRANSFER PROCESS AMONG IT PERSONNEL AT POLYTECHNICS IN MALAYSIA

PLEASE TAKE A FEW MINUTES TO ANSWER THE FOLLOWING QUESTIONS. YOUR HONEST OPINIONS WILL BE VERY HELPFUL IN UNDERSTANDING THE CURRENT PRACTICES OF KNOWLEDGE TRANSFERRING AMONG IT PERSONNEL IN POLYTECHNICS.

ANSWER CAN BE BOTH IN ENGLISH AND BAHASA MELAYU

SECTION A: BACKGROUND OF IT DEPARTMENT

1. NAME OF POLYTECHNIC : _____

2. NUMBERS OF IT STAFF IN IT DEPARTMENT BY POSITION'S NAME (E.G. : IT MANAGER, IT EXECUTIVE, PROGRAMMER, COMPUTER TECHNICIAN) :
   _____
   _____
   _____
   _____
   _____
   _____

3. DOES THE AVAILABLE POSITIONS SUFFICIENT ENOUGH? [YES] [NO]

4. IF NO, PLEASE SPECIFY REASONS :
   _____
   _____
   _____
   _____

SECTION B: BACKGROUND OF IT PERSONNEL AND EXPERIENCE

1. YOUR POSITION IN IT DEPARTMENT : _____

2. IS THIS YOUR FIRST POSTING DEPARTMENT IN GOVERNMENT AGENCY? : [YES] [NO]

3. IF NO, WHAT WAS YOUR LAST GOVERNMENT AGENCY? : _____

4. YEARS OF EXPERIENCES WITH IT DEPARTMENT IN POLYTECHNIC? :
   a. < 2 YEARS
   b. 2 – 5 YEARS
   c. > 5 YEARS

5. WHAT IS YOUR MAIN JOB DESCRIPTION? PLEASE SPECIFY

_____
_____
_____
_____
_____
_____

6. DO YOU INVOLVE IN PLANNING THE IT STRATEGY IN YOUR POLYTECHNIC? [YES] [NO]

7. DO YOU INVOLVE IN PLANNING THE IT STRATEGY IN DEPARTMENT OF POLYTECHNIC AND COMMUNITY COLLEGE EDUCATION (DPCCE) LEVEL FOR ALL POLYTECHNICS? [YES] [NO]

8. IF NO, WHO IS USUALLY INVOLVE IN THIS LEVEL OF PLANNING? _____

9. DO YOU INVOLVE IN ANY IT PROJECT LEAD BY DEPARTMENT OF POLYTECHNIC AND COMMUNITY COLLEGE EDUCATION (DPCCE) FOR ALL POLYTECHNICS? [YES] [NO]

(E.G. : DEVELOPING THE SYSTEM, CREATING THE IPVPN, COLLABORATION SOFTWARE, E-LEARNING, BUDGETING, PURCHASING AND TENDERING PROCESS)

10. IF NO, WHO IS USUALLY INVOLVE IN THIS TYPE OF PLANNING? _____

SECTION C: CURRENT PRACTICE OF KNOWLEDGE TRANSFER AMONG IT PERSONNEL IN POLYTECHNICS

1. HOW OFTEN DOES THE HEAD OF IT DEPARTMENT CONDUCTING MEETING AND DISCUSSION TO CHANNEL THE INFORMATION AND KNOWLEDGE SHARING AMONG THE IT STAFF IN YOUR POLYTECHNIC?

   a. ONCE A MONTH
   b. ONCE A WEEK
   c. OTHERS : _____

2. DO YOU FEEL THAT MEETING IS THE BEST PLATFORM TO ENABLE THE INFORMATION AND KNOWLEDGE SHARING? [YES] [NO]

3. IS THERE ANY OTHER PLATFORM THAT YOU USE TO TRANSFER AND SHARE THE INFORMATION AND KNOWLEDGE AMONG YOUR GROUP IN POLYTECHNICS? PLEASE LIST.

_____

_____

_____

_____

_____

4. HOW OFTEN DO YOU ATTEND ANY MEETING CONDUCTED BY DEPARTMENT OF POLYTECHNIC AND COMMUNITY COLLEGE EDUCATION (DPCCE) FOR IT PROJECT?

a. NEVER
b. < 5 TIMES A YEAR
c. > 5 TIMES A YEAR
d. OTHERS : _____

5. I KNOW AND UNDERSTAND ALL IT ACTIVITIES IN MY POLYTECHNIC. [YES] [NO]

6. I KNOW AND UNDERSTAND ALL IT STRATEGY PLANNING THAT HAVE BEEN PLANNED FOR MY POLYTECHNIC AND OTHER POLYTECHNICS. [YES] [NO]

7. DO YOU FIND IT IS EASY GET ALL INFORMATION ABOUT YOUR DEPARTMENT'S MATTERS? [YES] [NO]

8. DO YOU ALWAYS SHARE YOUR EXPERIENCE AND KNOWLEDGE ESPECIALLY ON TECHNICAL PART AMONG YOUR GROUP? [YES] [NO]

9. HOW YOU SHARE YOUR EXPERIENCE AND KNOWLEDGE AMONG YOUR GROUP?

_____

_____

_____

_____

_____

_____

10. DOES YOUR KNOWLEDGE IS DOCUMENTED FOR FUTURE REFERENCE OR OTHERS TO REVIEW? [YES] [NO]

11. IF AMONG OF YOU HAVE EXPERIENCED IN WORKING IN POLYTECHNIC FOR MORE THAN 4 YEARS, DOES HE/SHE ALWAYS LEAD YOUR IT DEPARTMENT ACTIVITIES? [YES] [NO]

12. DO YOU FEEL UNCOMFORTABLE WHEN ANY OF EXPERIENCE IT PERSONNEL HAVE BEEN TRANSFERRED OR GET PROMOTED TO OTHER GOVERNMENT AGENCIES? [YES] [NO]

13. RELATED TO QUESTION NO. 12, DOES THIS GROUP ALWAYS LEFT THE POLYTECHNIC WITHOUT PROPER KNOWLEDGE TRANSFER TO THE REST OF TEAM? [YES] [NO]

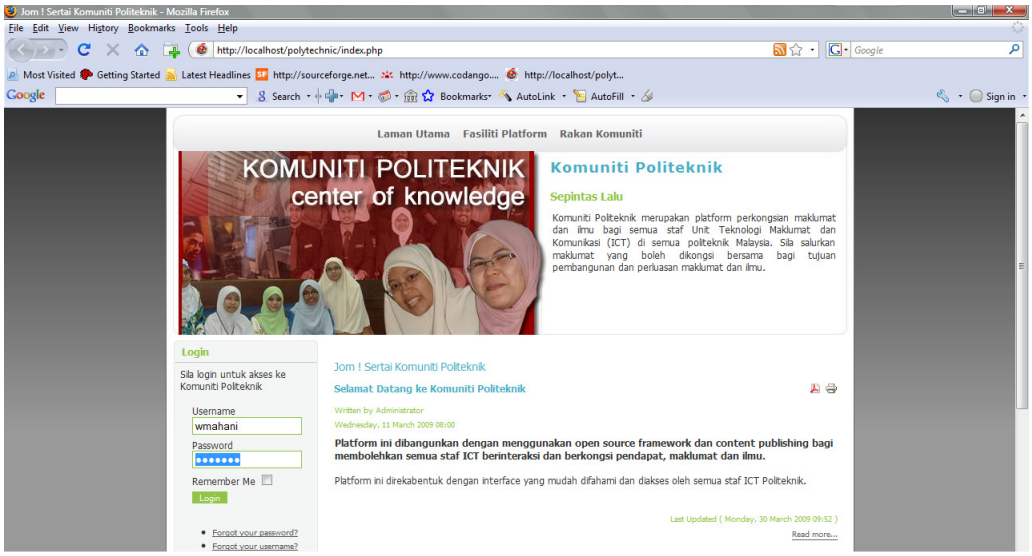
14. WHAT FACTORS DO YOU THINK CAN CONTRIBUTE TO THE EFFICIENCY OF THE KNOWLEDGE TRANSFER AMONG IT PERSONNEL IN ALL POLYTECHNICS?

15. DOES YOUR DEPARTMENT HAS ANY PLAN ON MANAGING KNOWLEDGE TRANSFER AMONG THE TEAM? [YES] [NO]

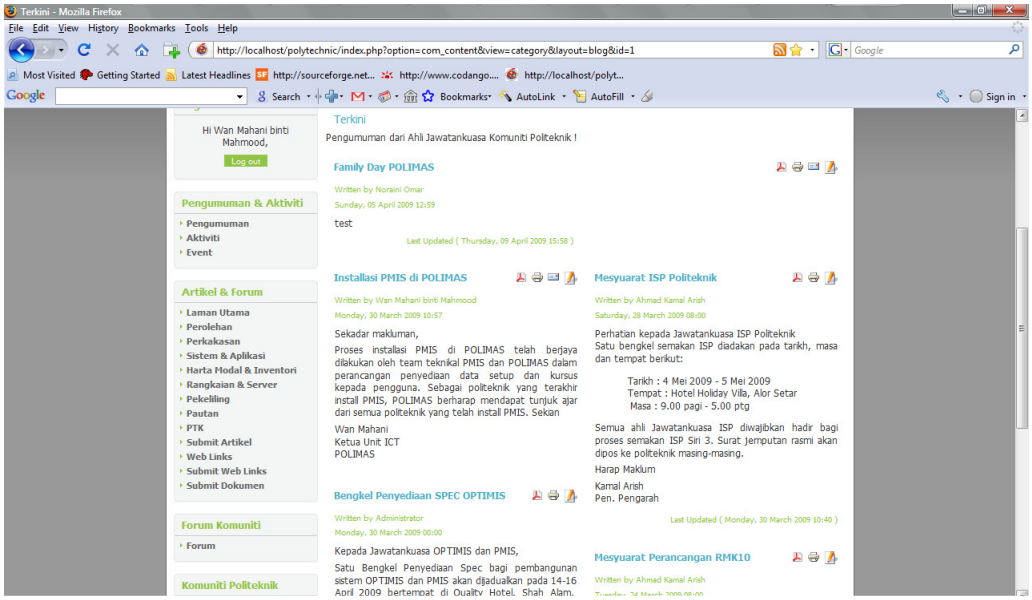
16. IF YES, PLEASE SPECIFY

APPENDIX B

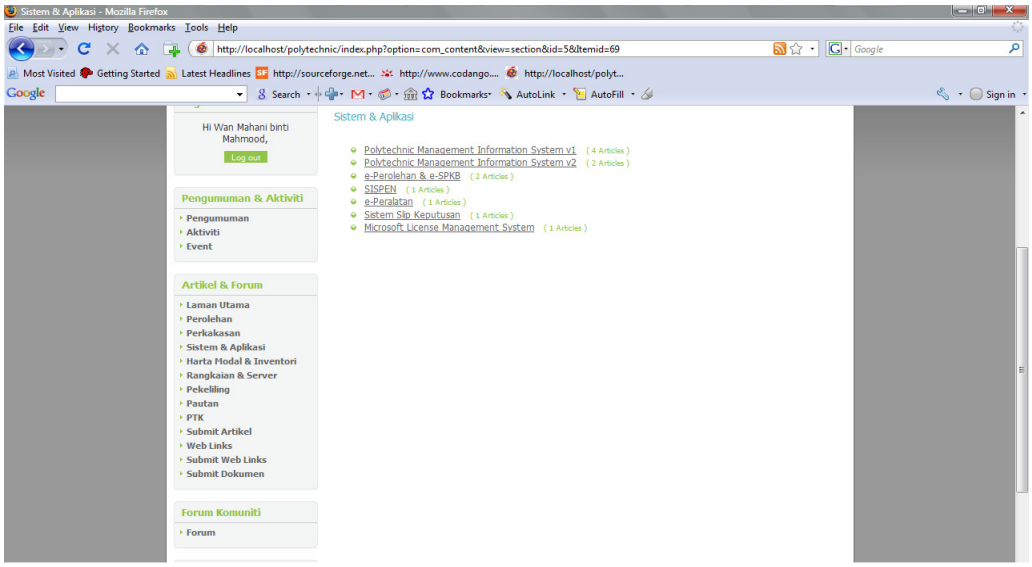
PROTOTYPE



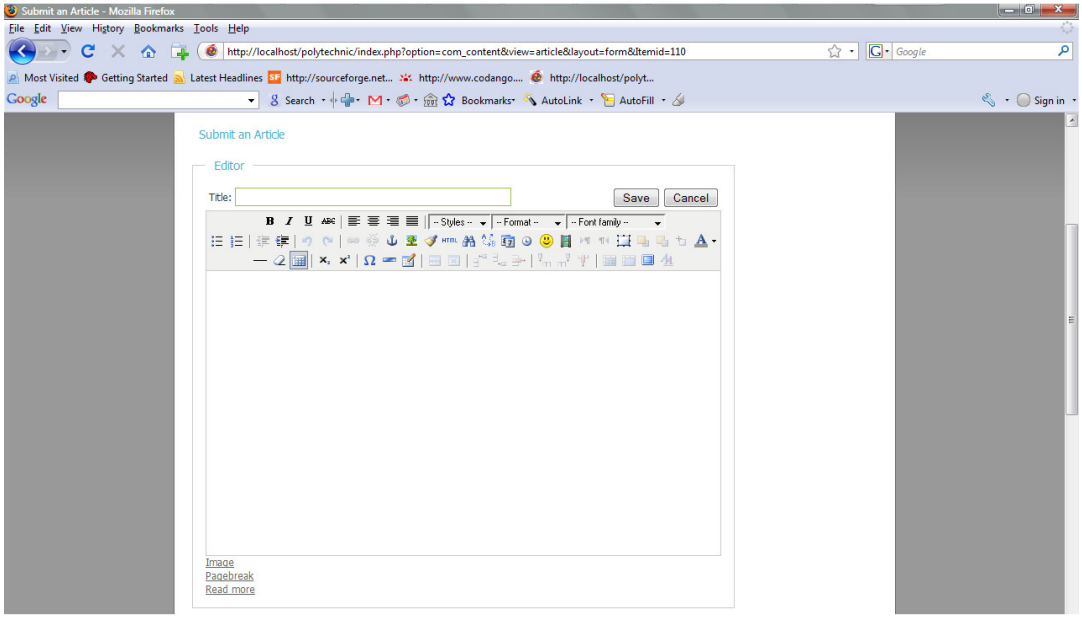
Main screen of collaborative web



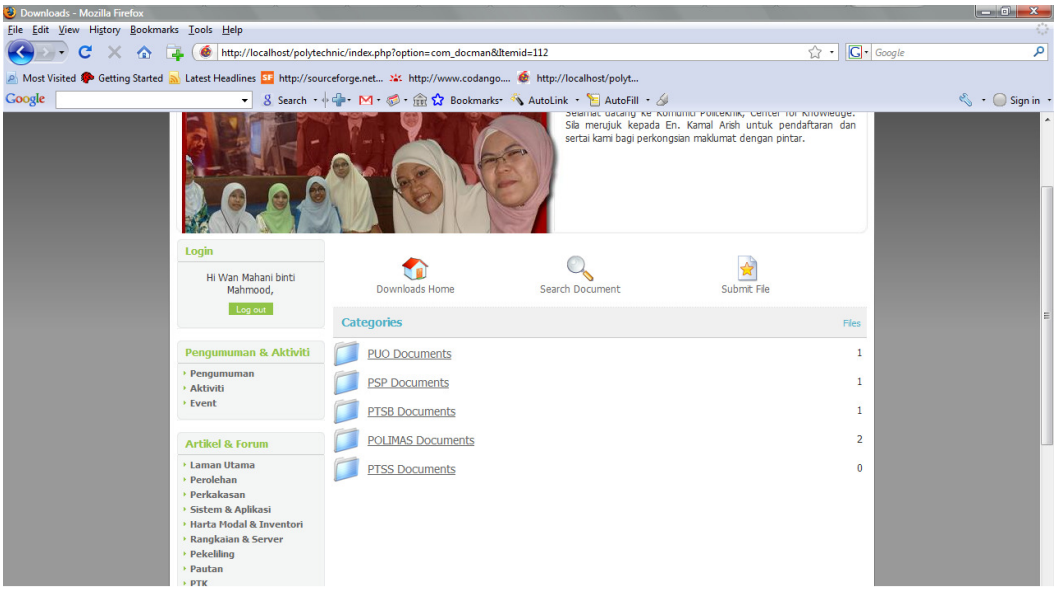
Contents of collaborative web



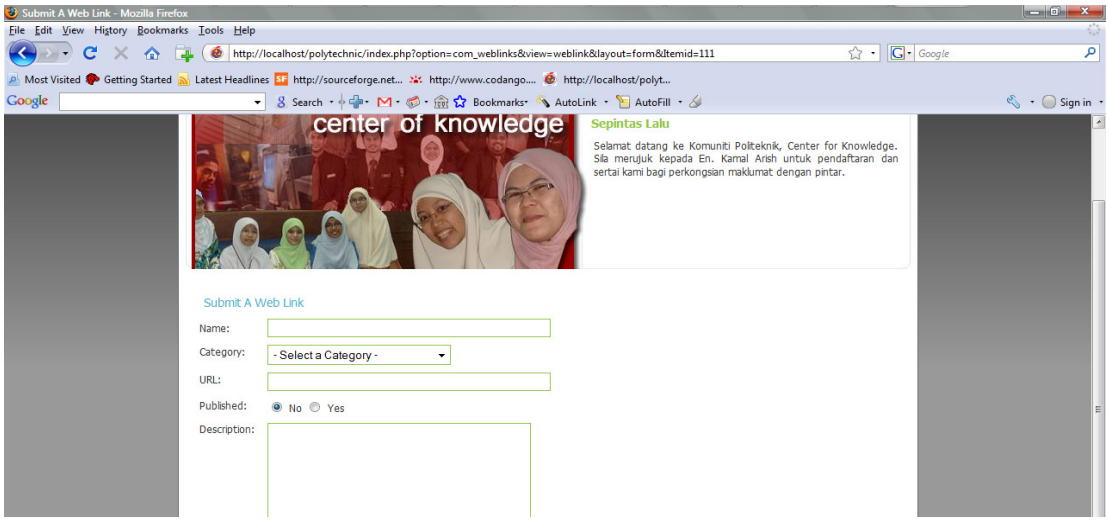
List of article that can be accessed by user



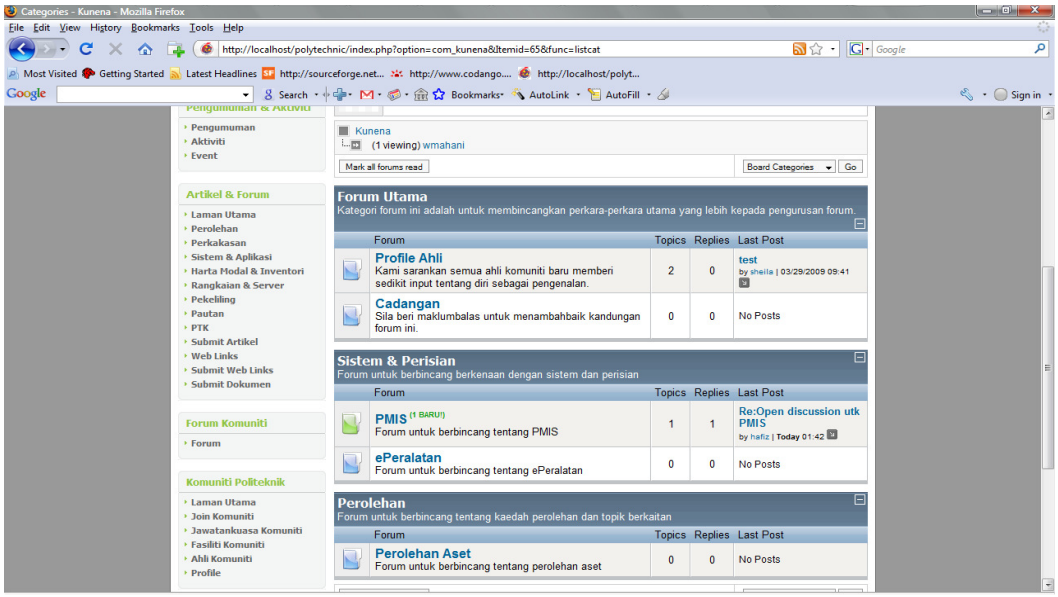
A form for user to submit an article



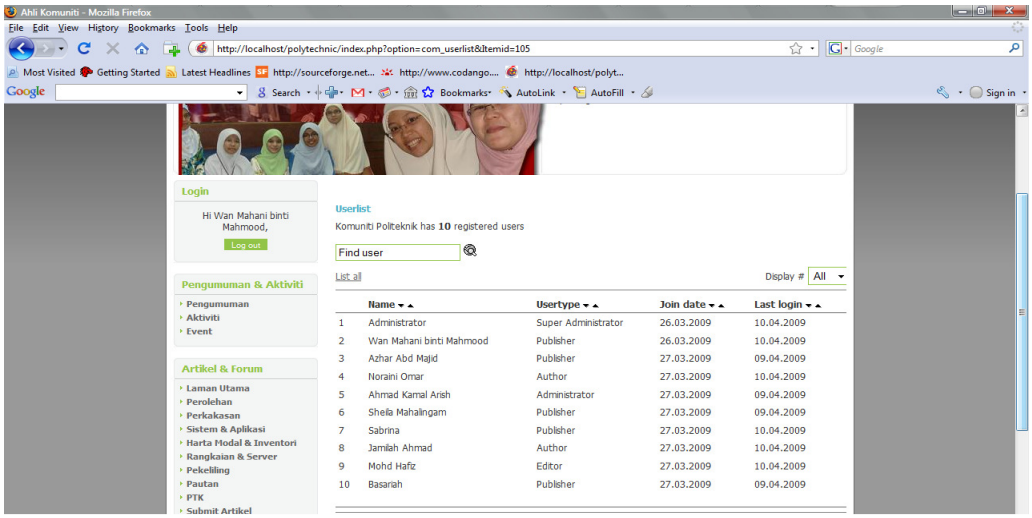
List of documents that can be accessed by user



A form to submit a web link



A discussion forum for all to participate



A list of community member

APPENDIX C

USER ACCEPTANCE TEST

[KOMUNITI POLITEKNIK]

[COLLABORATIVE WEB]

User Acceptance Test

ORIGINAL PLAN DATE: APRIL 8, 2009

REVISION DATE: APRIL 8, 2009

REVISION: 1

Revision History

Version #	Primary Author(s)	Description	Date
1.0	Amal Ibrahim	Initial Draft	April 08, 2009

1.0 Definition

The overall purpose of testing is to ensure the collaborative web application performs at an acceptable level for the customer. This document outlines the detailed plan for user acceptance testing of this application.

This test plan will be used to record the customer's sign off of the documented scenarios. Detailed test scripts/cases have been developed and will be used to record the results of user testing.

2.0 Testing Requirements

- Testing will take place in developer site. Some testers may choose to perform some testing from their regular workstations where it is possible. Test results must still be coordinated with others.
- UAT will take place beginning on April 08, 2009.
- Identified testing participants will receive instructions prior to the start of testing.

3.0 Testers/Participants

Testing participants should include representatives from all areas involved in the application. There are benefits to including representatives from across all areas to validate the systems functions before the upgrade goes live in production.

The best candidates for UAT are:

- Staff directly impacted by the upcoming system and business process changes.
- Frequent users of the application and functions planned in test scripts/cases.
- Individuals with a sound understanding of business processes in the areas they represent.
- Individuals with the necessary time to commit to this endeavor.
- Willing to experiment (to try various methods to see what works and what doesn't work).
- Patient and have a tolerance for ambiguity.

4.0 Testing Activities

Login and Logout		
Scenario	Date Tested	Notes
Access the collaborative web through http://localhost/polytechnic		Pass/Fail
Enter a username and password		Pass/Fail

Click Login		Pass/Fail
Default page should be directed you to the *Pengumuman* page.		
Click Log out button to logout		Pass/Fail

Browsing Komuniti Politeknik Module		
Scenario	Date Tested	Notes
Click and browse *Join Komuniti* page		Pass/Fail
Click and browse *Jawatankuasa Komuniti* page		Pass/Fail
Click and browse *Fasiliti Komuniti* page		Pass/Fail
Click and browse *Ahli Komuniti* page		Pass/Fail
To search a member, enter a name and click button search.		Pass/Fail

Browsing Pengumuman & Aktiviti Module		
Scenario	Date Tested	Notes
Click and browse *Pengumuman* page		Pass/Fail
Click and browse *Aktiviti & Kalendar* page		Pass/Fail
To view detail of event, click on title.		Pass/Fail
View the calendar on the right site. Mouse over on the calendar and you should be able to see the detail of the event by clicking on the date.		Pass/Fail

Browsing Artikel & Dokumen Module		
Scenario	Date Tested	Notes
Click and browse *Perolehan* page		Pass/Fail
Click one section under *Perolehan* and click to open one article.		Pass/Fail
Click and browse *Perkakasan* page		Pass/Fail
Click one section under *Perkakasan* and click to open one article.		Pass/Fail
Click and browse *Sistem & Aplikasi* page		Pass/Fail
Click one section under *Sistem & Aplikasi* and click to open one article.		Pass/Fail
Click and browse *Harta Modal & Inventori* page		Pass/Fail
Click to open one article.		Pass/Fail
Click and browse *Pekeliling* page		Pass/Fail
Click to open one hyperlink.		Pass/Fail
Click and browse *PTK* page		Pass/Fail
Click to open one article.		Pass/Fail
Click and browse Web Link page		Pass/Fail
Click to open one hyperlink.		Pass/Fail

Submitting Article		
Scenario	Date Tested	Notes
Click on the *Submit Artikel*		Pass/Fail
Enter a title for the article		Pass/Fail
Enter a complete content of article		Pass/Fail
Choose Section and Category from the combo box		Pass/Fail
Choose to show on frontpage or not		Pass/Fail
Enter date od publishing		Pass/Fail
Enter date for finish publishing		Pass/Fail
Choose level of access		Pass/Fail
Click Save button on the top right site.		Pass/Fail

Publishing Article		
Scenario	Date Tested	Notes
Go to Category and Section which article reside to be publish		Pass/Fail
Click Edit icon (which appears in blue color)		Pass/Fail
Proof reading the article		Pass/Fail
Choose Yes for Published		Pass/Fail
Choose for Start and Finish Publishing		Pass/Fail
Click Save button on the top right site.		Pass/Fail

Submitting Web Links		
Scenario	Date Tested	Notes
Click on the Submit Web Links		Pass/Fail
Enter a name for the web link		Pass/Fail
Select Category from the combo box		Pass/Fail
Enter URL for web link		Pass/Fail
Choose Yes for Published		Pass/Fail
Enter a description of web link		Pass/Fail
Click Save button		Pass/Fail

Submitting Document – Only for those who has rights to submit the document		
Scenario	Date Tested	Notes
Click on the *Submit Dokumen*		Pass/Fail
Click Submit File icon		Pass/Fail
By default, upload a file from your computer is highlighted. Click Next to proceed		Pass/Fail
Click Browse button and search for file. Click Upload button		Pass/Fail
Enter a title of document		Pass/Fail
Select a category of document		Pass/Fail

Enter a description of document		Pass/Fail
Click Permission tab and choose permission for user		Pass/Fail
Click Save button on the top right site.		Pass/Fail
Click Approve button for proof reading		Pass/Fail
Click Publish button for publish document		Pass/Fail
Click Download Home icon		Pass/Fail
Search the document and click to open		Pass/Fail

Browsing Forum Komuniti Module		
Scenario	Date Tested	Notes
Click on the Forum		Pass/Fail
By default, Recent Discussion will be the first page.		Pass/Fail
To reply a topic, click on the title of discussion		Pass/Fail
Click on Reply Topic button		Pass/Fail
Enter a message and click Submit		Pass/Fail
Repeat the same action for Categories tab.		Pass/Fail
Click Rules tab to browse a rule of forum,		Pass/Fail
Click My Profile to browse and edit your profile.		Pass/Fail

5.0 Sign-off and Acknowledgement

I understand that by agreeing to participate in this testing through the execution of the testing plan, I approve of the activities defined and authorize my department to participate as documented for the successful implementation of this application in our department.

_____ Date: ___/___/___
IT Personnel

_____ Date: ___/___/___
Head of IT Department

_____ Date: ___/___/___
Amal Ibrahim