Actor-Network Theory in Consolidating Collaborative Web Platform Methodology for Knowledge Collaboration

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ABSTRACT

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 actors and this cannot be separated. This relationship is translated through an Actor-Network Theory, which is a sociology theory. This research is to study how sociology theory can be used as an interpreting and solution tool in information system field, in this case for creating a collaborative web platform. This research shows how Actor-Network Theory can be embedded to system development methodology such as identifying list of requirements, analyzing current system and identifying the actor's roles, but for the purpose of this article (at this stage) there is no research result presented.

Keywords: Knowledge collaboration, actor-network theory, methodology.

I INTRODUCTION

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, 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 share and transfer much more knowledge than in the past. Hence from this; collaborative environment begins to take place. Kristensen and Kijl (2008) in their research have shown that a range of recent studies have emphasized the importance of collaboration as a key driver of business performance.

Actor-network theory (ANT) is one of the theories that try to understand the processes of scientific knowledge creation and collaboration. 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). However, how ANT contributes to the development of collaborative web platform? This research is to explore the particular question, specifically on how ANT can work together in collaborative system development methodology. The scope of this study is limited to the use of ANT as the interpretation and description tool in analyzing the requirement of collaborative web platform development for knowledge collaboration.

II KNOWLEDGE COLLABORATION

Knowledge transfer is a field of knowledge management that transferring knowledge from one set of individuals to another. Transferring knowledge across global boundaries has become an important factor for organizations to success. Most research blames the failure on transferring knowledge is main cause for poor project management together with lack of executive sponsorship (Reich,2007), and 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).

Knowledge collaboration is not just knowledge transfer or share. 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. So we can understand that knowledge collaboration is two or more people collaborate to create and build the knowledge through a structured platform in order to achieve the objective. 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 (Gill, 2005).

The knowledge used or created in knowledge collaboration procedure flows from one net node to another, so that knowledge is transported or shared (Yu and Fan, 2008). As related to knowledge collaboration, the research 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 (Zhou, 2008). The increased focus on KM led government agencies to implement various KM technologies, like one-stop portals, repositories and collaborative systems such as Wikis. Collaborative system offers many features such as online discussion, shared documents, manage calendars and projects. The 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) (Hustad, 2004). The 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 growth (Thagard, 1997). 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.

One of the technologies that are driving knowledge management is collaborative technologies (Suliman, 2002) which refer to collaboration tools that 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 as a platform for collaborative environment. In information technology the term e-collaboration is used as an umbrella term that comprises several of other close 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 (Kock, 2005). Two major approaches of knowledge collaboration are knowledge repository approach and the community-based approach (Ye *et.al*, 2008).

III ACTOR-NETWORK THEORY

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. 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 (Ye *et.al*, 2008).

IV KEY ELEMENTS OF ANT

A. Actor

Actors, actants and entities are major elements of the actor-network. Any element which bends space around itself makes other elements dependent upon it and translates 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. 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).

B. 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).

C. **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, interessement, enrolment and mobilization of allies (Callon, 1986). Through these processes, the current problem comes out with the big picture of actor-network. Besides seeing the output as a single entity, this theory under 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.

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.

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).

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 (Callon, 1986).

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)

D. **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).

E. **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 (1981). Principally, the actor-network theory is focused on the elements of actor and network which are mutually constitutive. An approach for 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 (Tatnall, 2003). ANT is believed can provide added explanatory power in three primary ways (Chen *et.al*, 2003). 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.

V COLLABORATIVE ENGINEERING LIFE CYCLE METHODOLOGY (CELM)

In creating knowledge management methodology (Hussain *et.al*, 2004) have defined seven (7) steps. 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.

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 designed 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. CELM comes with four main phases which are planning, requirement, design and implementation (see Figure 1).

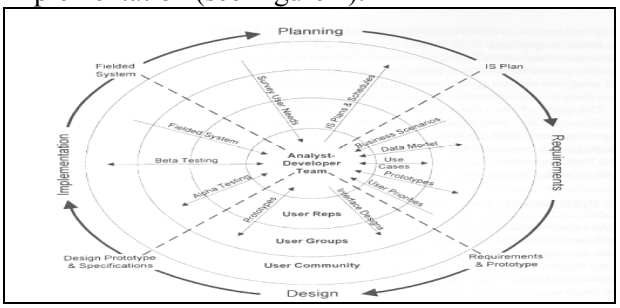

Figure 1 : The Collaborative Engineering Life Cycle Methodology

VI CELM WORKS WITH ANT

This research is also focus on how ANT can be used as a translating tool in understanding and interpreting the problem of knowledge transfer. As aforementioned, 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 web platform for knowledge collaboration (prototype).

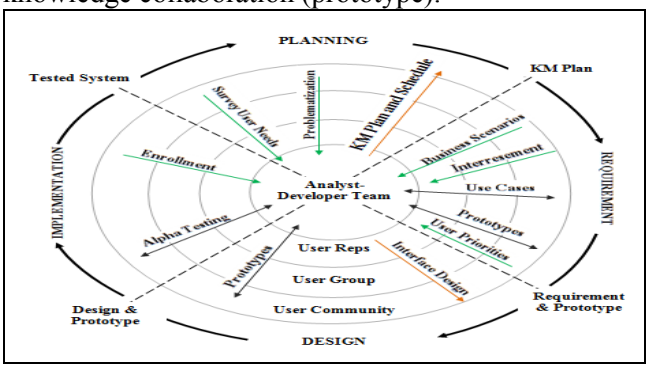

Figure 2 : ANT is applied in Collaborative Engineering Life Cycle

A. Planning Phase

KM Plan and Schedule. 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). The principle of this activity is identifying how the organization plan and manage knowledge transfer among the IT Personnel.

Survey User's Needs. The initial task of this activity is to identify the problem background and current activity of knowledge collaboration process. From there, the needs of proposing a new system need to be justified. An interview has been conducted with the representative of IT Personnel such as Assistant Manager, Head of IT Department and IT executive in an organization in understanding the problem background and the needs in improving the knowledge management among them.

Problematization. Problematization, the first moment in ANT is included in this phase. 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 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 to identify the actors and their roles,

identifying the causes that influence the problem and building the Actor-Network diagram.

B. Requirement Phase

Requirement phase focuses on the need of accurate, flexible and feasible collaborative system. The ANT theory will be used to translate the business scenarios and the needs of 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. As in survey user's needs, an informal interview has been conducted 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.

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. 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.

Interessement. Interresement is the second moment in ANT and applied after business scenario. The main activities in Interresement are identifying each actor's interest on the system and come out with the specific requirement to the collaborative platform. The combination of different actors with different roles contributes to different interest among them. The idea is to rationalize the collaborative environment in the group. With this justification, Interresement is applied into Requirement Phase in CELM.

Used Case. Use case is a powerful concept for helping an analyst to understand how a system should behave. According to Bennet, use cases are descriptions of the functionality of the system from the user's perspective (Bennet *et.al*, 2002). 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.

Evaluation. 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.

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.

C. 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.

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.

Prototype. 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.

D. 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 organizations.

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.

Enrolment. At this stage, the actors accept the defined interest. Interessement achieves enrolment if is successful. Enrolling the actors in an actor-network requires participation in activities where actor can discover and share their common interests.

VII CONCLUSION

A methodology is a step by step which been used in 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 Collaborative Engineering 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.

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