

Actor Network Theory as the Analysis Instrument: Exploring Negotiation between Partners in E-Procurement Network.

Noraizah Abu Bakar
Faculty of Accountancy
UiTM Johor Malaysia

Konrad Peszynski
Faculty of Business Information Technology and Logistics
RMIT Melbourne Australia

Nurdiana Azizan
Faculty of Computer Science
USIM Malaysia

Norhayati Alias
Faculty of Accountancy
UiTM Johor Malaysia

Fatimah Alwi
Faculty of Accountancy
UiTM Johor Malaysia

Abstract

A theory provides the guidelines needed to answer common questions such as how, when, what, where, who and why (Wacker 1998). Theory can also be used as an initial guide for research design and the collection of data, as part of an iterative process of data collection and analysis, or as a final product of research (Walsham 1995). However, during the process of choosing a theory, Walsham (2006) has pointed out that a theory should be considered to be essentially subjective. Researchers need to choose a theory “which *they* feel is insightful to *them*” (Walsham 2006, page 325). As this research is about negotiation in e-procurement, which involved many actors, ANT has been used as the methodological tool to assist the researcher to ‘unpack’ the actors involved in negotiation within an e-procurement network. As stated by Callon (1986), a fundamental aspect of ANT is the methodological guidance needed to follow the activities of both human and non-human actors. Therefore, the researcher selected Actor Network Theory (ANT) as it will be utilised in the analysis chapters as a basis for analysis of the case study of negotiation in e-procurement.

Keywords: Actor Network Theory (ANT), Problematism, Interesement, E-Procurement, Negotiation

1.0 Introduction

This research is a study of negotiation between partners in an e-procurement network from the perspective of the actor network theory. The Actor Network Theory is appropriate for use in this study, because it identifies and acknowledges the key human actors and non-human actors within an organisation, and the effect that such actors may have on the potential social issues that might occur. ANT is used to investigate issues in the negotiation process that incorporate human actors such as buyers and suppliers, to investigate how the interaction between these actors can affect the negotiation process, and to identify other factors that may influence the negotiation process. The relationships amongst actors play an important role in e-procurement practices. The concepts of actor, actor network and the translation process will be used to explain the relationship between the actors that influence negotiation in the e-procurement network. These concepts are applicable because of the identification of both human and non-human actors in the negotiation process utilised in e-procurement is the critical requirement for effective negotiation. The main concept behind translation is the process of different actors' interests becoming aligned to form alliances, thus helping to develop and stabilise the network. Hence, the approach used in this study is to identify and trace networks by following actors' activities in e-procurement negotiations, and to examine the relevant new actors involved.

2.0 Literature Review

2.1 Actor Network Concepts

ANT is an acronym for Actor Network Theory. ANT is not a theory as per se. Theories usually attempt to explain why something happens, while ANT emphasises how associations are made and transformed (Latour 2005). Law (2007, page 141) has claimed that:

The actor-network approach is not a theory. Theories usually try to explain why something happens, but actor-network theory is descriptive rather than foundational in explanatory terms, which means that is a disappointment for those seeking strong accounts. Instead it tells stories about 'how' relations assemble or don't. As a form, one of several, of semiotics, it is better understood as a toolkit for telling interesting stories about, and interfering in, those relations. More profoundly, it is a sensibility to the messy practices of rationality and materiality of the world.

A key proposition of ANT is to treat human and non-human actors, as well as networks, in a symmetrical fashion (Pouloudi 2004). ANT is also known as the sociology of translation, because it outlines how actors form alliances and enrol other actors, and use non-human actors (artefacts) to strengthen such alliances. Thus, according to ANT, actor-networks are created which contain humans as well as artefacts (Callon 1986). ANT theorists want to understand, and to illustrate how they have created a bond between human actors and non-human actors (Dolwick 2009). Hanseth et al (2004) has classified this theory as a social theory of technology, because of its potential contribution in gaining a better understanding of the social context of the development, implementation and use of Information Systems (IS). ANT emerged during the mid-1980s, primarily through the work of Latour (1987, 1992, 2005), Callon (1986, 1991) and

Law (1992), and researchers have continuously used this theory in the IS field in order to explore the interaction between human and non-human actors (Walsham 1997, Saundage 2009, Holmstron and Stalder 2001). Callon (1999) has highlighted that the absence of a theory of the actor, when combined with the role attributed to non-humans in the description of actions is precisely one of the strengths of ANT. Therefore, the principles of ANT have been articulated through an elaborate vocabulary of conceptual tools that aim to describe the complexity of sociotechnical phenomena (Latour 1991). The main elements of the vocabulary of ANT that will be used in this thesis will include: *Actor, Actor-Network, Translation, Problematisation, Interessement, and Enrolment*.

3.0 Methodology

3.1 Applying ANT to this study

This study will use ANT to explore negotiation in e-procurement networks. The researcher follows the previous study by Tatnall (2010), Tatnall and Burgess (2004), Tatnall and Lepa (2003), Tatnall and Davey (2001) and Tatnall et al (2003 and 2005) in using ANT for their studies to describe and explain the study in negotiation in e-procurement network. Table 3.1 represent the application of Tatnall's previous work for this study. As for this study, ANT will be used to study actors involved in negotiation in e-procurement, to understand how the actor-network is built, and to understand how social issues influence the use of e-procurement systems.

Table 3.1: The Application of Tatnall's previous study on the study of negotiation in e-procurement network

Year	Tatnall's study	Study on negotiation in e-procurement
Tatnall and Burgess (2004)	ANT used to identify factors affecting the adoption of e-commerce in Australian SME's.	ANT will be used to identify factors influencing negotiation in e-procurement in particular the social issues and understand how social issues influence the use of e-procurement system
Tatnall et al (2003), Tatnall and Lepa (2003)	ANT used to explain how people interact with and use of information system	ANT will be used to explain and understand how actor-network is built in negotiation in e-procurement network
Tatnall et al (2005), Tatnall and Davey (2001) and Tatnall (2010)	ANT used to study the involvement of human and non-human actors in the information system.	ANT will be used to study actors involved in negotiation in e-procurement network

Based on the Table 3.1 and working on the concepts of ANT as explained above, the researcher will explore negotiation in the e-procurement network. As such, Actor Network Theory is appropriate for use in this study because it has the potential to identify and acknowledge the key

human and non-human actors within an organisation, and the effect on the potential issues that might occur. ANT is used to examine a process of building an actor network in negotiation in e-procurement. A core ANT concept used for this study is the translation process. As discussed in the previous section, the translation process is the central concept of ANT. The main concept of translation relates the process of different actors' interests being united to form alliances, thus developing and stabilising the network. Hence, the approach used for this study is to identify and trace networks by following actor's activities in negotiation in e-procurement, and by examining the relevant new actors involved. The actors can be human or non-human actors.

As Pouloudi et al (2000) states, a researcher can trace an actor-network by following the actors and observing what they do. In negotiations in e-procurement, the actors would include the procurers, the suppliers, the e-procurement tools, and the products or services procured. Identifying human actors and their activities would be straightforward because human actors can speak and express their interest or needs while forming a network with other human actors. However, in regards to non-human actors it is necessary to find someone or something to speak on their behalf. Thus for non-human actors, a 'spokesperson' is needed to speak on their behalf and defend their interests. For instance, e-procurement tools used to procure goods and services will be one of the non-human actors involved in negotiations in e-procurement. Therefore, the users of the system will be the 'spokespeople' for the e-procurement tools used. Another example of non-human actors would be the products and services procured, with the 'spokesperson' for these actors being the documentation prepared in procuring those goods and services. The aim of identifying the interests of human and non-human actors in negotiations in e-procurement is to determine how these actors relate to each other, as the concept of translation about understands the creation of actor-networks made up of both humans and non-humans (Callon 1986).

In identifying and ensuring the stabilisation of the network formed, the researcher will identify the actors involved in the negotiation processes involved in e-procurement. The focal actor will be identified at the beginning of the study, because the focal actor is the main actor involved in negotiations in e-procurement. Once the focal actor is identified, the focal actor will identify other actors involved in negotiations in their e-procurement environment. The success of negotiation between human actors and non-human actors shows that an association between them has been created, indicating that the network has been created. Negotiation between partners in e-procurement may be regarded as the stabilisation or non-stabilisation of an actor-network, as a cause of the involvement of actors. The key to success in using e-procurement tools to support negotiation in e-procurement lies in the ability of actors to form alliances among the actors involved. For instance, the involvement of e-procurement tools as non-human actors and the users of e-procurement tools as human actors in a negotiation process, indicates that the users of e-procurement tools rely on the system to expedite negotiation processes with other actors, such as suppliers. Thus, by creating an alliance with actors involved in negotiation processes, a network can be formed. In addition, the network formed can be stabilised as long as the actors involved have the ability to understand their individual roles within the network formed. This is the process of problematisation.

In ensuring the stabilisation of e-procurement network success, the appointed focal actor in e-procurement network will try to convince other actors involved in e-procurement to agree with

the interest defined for them. The interest defined by the focal actor is to ensure the goals for each actors involved in negotiation will be achieved. Besides, by agreeing with the interest proposed by the focal actor, the shortcomings due to negotiation process will be reduced in e-procurement environment among actors that involved. This is because each of actors involved in this e-procurement network will have mutual understanding on how each of them should work together to fulfil other actors need. By having this mutual understanding via interest proposed, the e-procurement network can be establish and maintain.

The success of negotiation in e-procurement network can be identifying via the enrolment process in which each actors involved accept their roles and interest proposed by focal actor. However, if the interest proposed by the focal actor is unsatisfied by the actors involved in negotiation process in e-procurement network, then, the network is considered unestablished in e-procurement environment. The negotiation process in procuring goods or services will not run smoothly and the actors involved in e-procurement network will not be maintained.

This research will use the case study research method. Case study research is the most widely used qualitative research method in information systems research (Benbasat et al 1987, Easterby et al 2002, Stake 1995 Myers and Avison 2002). The case study was conducted at an Australian University in Victoria between two parties: the Australian University as a buyer and two companies that are the major suppliers to the university. Two representatives from the Purchasing Department of the university and one representative from each supply company were interviewed via semi-structured interviews. Thematic analysis was used for coding and analysis because the sample is considered small (Boyatzis 1998). For the purpose of this research, a thematic code based the raw data was used. The findings from the case study will be discussed further in the next section.

4.0 Findings

4.1 Translation Process in Negotiation in E-Procurement at Technology University

The researcher synthesised the case study using the translation concepts to show the process of building a network in negotiation in e-procurement at Technology University. A brief description of negotiation in e-procurement at Technology University has been discussed. The systems that are used at Technology University include an e-tendering portal and an electronic order system. These systems are used to procure different types of goods and services for the university, as part of the sourcing process and in negotiation with trading partners. For instance, they are used in the procurement of office supplies and furniture. However, Technology University still uses the face-to-face method to negotiate with its trading partners.

The Supply Chain and Procurement Manager is the person who is involved in the negotiation process with trading partners. With help from the Procurement Group, the negotiation process can be effectively carried out with the trading partners. Suppliers are typically the main trading partner in the business negotiations, while other actors also have an indirect influence on the Supply Chain and Procurement Manager during the negotiation process. These actors include the

Evaluation Panel, which includes representatives from outside the Procurement Group at the university, such as Deans from several university departments. However, there are other social issues that need to be considered during negotiations in e-procurement at Technology University, in order to ensure that negotiations with trading partners are successful. The involvement of the actors in negotiations in sourcing in the e-procurement network can be shown as part of the translation process, which involves the three stages of problematisation, interessement and enrolment.

- **Building the Network – Problematisation**

Negotiation at Technology University can be treated as the process of enrolment of various actors within the organisation into the network of suppliers. In order to ensure the success of negotiation, relevant actors have to be enrolled into the network, representing the new tactics of negotiation in the e-procurement environment. If the new tactics of negotiation in procuring goods and services in e-procurement are able to assemble in an actor network, wherein each important actor has passed through the obligatory passage point and has been successfully enrolled, then negotiation in e-procurement should be successful. Otherwise, it implies failure in the e-procurement negotiation.

If the actors involved in negotiation in e-procurement at Technology University are identified, then the Supply Chain and Procurement Manager plays the main role in carrying out negotiations. This manager therefore represents the emerging network. The Supply Chain and Procurement Manager is identified as a focal actor in this study; that is, he is the person responsible for identifying and enrolling other actors in the e-procurement negotiation. The Supply Chain and Procurement Manager is responsible for the procurement personnel in his department. Each individual in the Procurement Group has their own responsibilities in regard to handling procurement activities such as ordering goods, tendering goods, and undertaking day-to-day procurement operations. However, the Supply Chain and Procurement Manager is the person responsible for handling the negotiations with suppliers. As stated by the Supply Chain and Procurement Manager:

I have the responsibility for a group of nine people responsible for procurement within the university where, some of them are looking after the purchase order systems, the tendering system and the day-to-day management of procurement.

The Supply Chain and Procurement Manager has realised that other groups of people in the university are responsible for assisting him in the negotiation process. The Deans of the departments at the university are also involved in approving the amount purchased at Dean's department. As stated by the Supply Chain and Procurement Manager:

The Head of department is a person responsible to approve the agreed value in procuring goods or services in his or her department. However, the final approval in purchasing goods is done by me before preparing the purchase order.

Another group of people involved in the negotiation process at Technology University is the Evaluation Panel. The Evaluation Panel includes representatives from outside the Procurement Group. Most of the time, the Evaluation Panel gives the Procurement Group full responsibility in making decisions regarding the selection of suppliers. Therefore, the Supply Chain and Procurement Manager is not the sole party responsible for handling the procurement and negotiation process, as there are other people involved in order to ensure that all the negotiation processes can be conducted effectively.

E-procurement tools are used at Technology University in order to procure goods and services. These tools are also used to assist the Supply Chain and Procurement Manager in his negotiation with the actors involved. However, the e-procurement tools can only be used partially to assist the Supply Chain and Procurement Manager during the negotiation process. This is because Technology University is still in the process of improving its procurement system. In addition, there are other issues, such as social issues, that influence negotiation in e-procurement at Technology University. Based on the description of identifying actors involved in negotiation in e-procurement, Table 6.6 presents a summary of the human and non-human actors involved at Technology University.

Table 4.1: Human and non-human actors involved in the negotiation process in e-procurement at Technology University

Human Actors	Non-Human Actors
Procurer – <ul style="list-style-type: none"> • Supply Chain and Procurement Manager • Procurement Group • Evaluation Panel groups • Heads of Departments 	Organisations involved in negotiation – <ul style="list-style-type: none"> • Technology University • CE Company • University Faculties and Divisions
Supplier <ul style="list-style-type: none"> • Manager of CE Company 	System operated – <ul style="list-style-type: none"> • E-tendering portal • Email • Phone • Face-to-face contact • Facsimile
	Products procured – <ul style="list-style-type: none"> • Office supplies • Furniture • Merchandise • Computers • Vehicle Leasing • Travel Management
	Social issues influencing negotiation –

	<ul style="list-style-type: none"> • Culture • Trust • Relationships with supplier and client • Corporate social responsibility • Delivery time • Communication issues
--	--

In building the actor network in negotiation in e-procurement at Technology University, the Supply Chain and Procurement Manager suggested that one strategy to help achieve the goals of the actors could be the greater influence and involvement in decision-making from the Procurement Group. Naturally, this influence and involvement should relate to the spending of funds and the procurement of goods and services at the university. For example, a supplier's goal is to try to earn more profit. Thus, by having the Procurement Group more in control of the decision-making process of the negotiation, suppliers can expedite the process with fewer obstacles to achieve their goals. Doing this would allow the suppliers to avoid any social issues that may be obstacles limiting negotiation with the Supply Chain and Procurement Manager, such as those related to trust, culture and relationships with trading partners, in order to help them achieve their goals (refer to Table 4.1). More influence in decision-making, in regard to spending and procuring goods and services, is the obligatory passage point specified by the Supply Chain and Procurement Manager. Figure 4.1 represents how the Supply Chain and Procurement Manager, as a focal actor, frames the problems occurring in negotiation in e-procurement, while identifying other relevant actors that will affect the actor network involved in negotiation in e-procurement at Technology University.

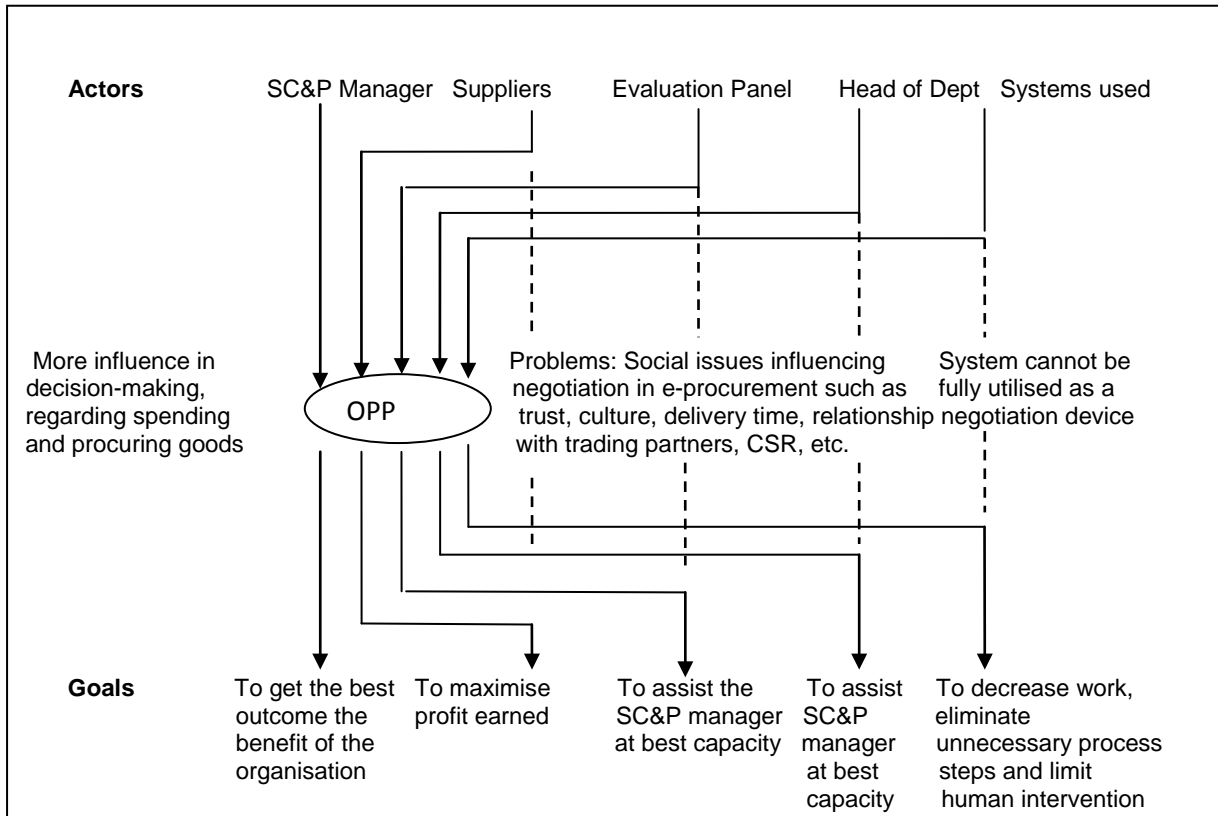


Figure 4.1: Problematisation for negotiation in the sourcing process between partners in e-procurement at Technology University

- **Building the Network – Interessement**

The second step in translation involves convincing the actors to agree on the interests defined for them by the Supply Chain and Procurement Manager. The interest defined for them by the Supply Chain and Procurement Manager is to have more influence in decision-making regarding spending and procuring goods and services with the actors involved in negotiations in e-procurement.

Association with and enrolment of suppliers

The first part of negotiation at Technology University takes place between the Supply Chain and Procurement Manager and the suppliers. The Supply Chain and Procurement Manager is responsible for ensuring his decisions regarding procurement and the negotiation process with suppliers for the benefit of university are achieved. In order to ensure that the negotiation process runs smoothly between the trading partners, the procurement department needs to have more influence in the decision-making process. Trust can be easily built with the supplier through this approach, since the Supply Chain and Procurement Manager will have more time to discuss procurement matters. Furthermore, the Supply Chain and Procurement Manager can make

decisions quickly without the need to wait for the approval of panel members regarding the procurement of goods or services.

Understanding the association with and enrolment of e-procurement tools as a procurement device

The Supply Chain and Procurement Manager needs to understand the importance of using e-procurement tools in assisting negotiation in order to procure goods and services. The purpose of using the system is to expedite the procurement process with the trading partners. However, the system cannot be utilised as a negotiation tool alone, due to the social issues influencing negotiation such as communication, trust and culture. As stated by the Supply Chain and Procurement Manager:

We also get involved with negotiation outside the e-procurement system when there is a need to solve the problem with the third party and we are playing a role of mediator by trying to reach an agreement between the two parties.

The Supply Chain and Procurement Manager needs to be alert to the capabilities of the system used in procuring and negotiating goods and services, in order to ensure the satisfaction of the system's users. By knowing the inadequacies of the system used to fulfil requirements of the procurement process, such as contract management, the Supply Chain and Procurement Manager will be in a position to try and improve the system.

Association with and enrolment of other departments

The next part of negotiation takes place between the Supply Chain and Procurement Manager, and the Deans of other departments at Technology University. The Supply Chain and Procurement Manager will work with the Deans in order to ensure that negotiations and procurements run smoothly. As stated by the Supply Chain and Procurement Manager:

A Head of Department, or somebody that has appropriate authority will approve the value of goods purchased by following the procurement procedures outlined by the Procurement Department.

Therefore, if the Supply Chain and Procurement Manager is provided with more responsibility in terms of decision-making, then the manager will be able to easily provide the information needed by the Deans in regard to the procurement process if any shortcomings occur.

Association with and enrolment of Evaluation Panel

The last part of negotiation takes place between the Supply Chain and Procurement Manager and the Evaluation Panel. The Evaluation Panel collaborates with the Supply Chain and Procurement Manager in selecting appropriate suppliers for the university. The Evaluation Panel consists of representatives from other departments outside of the Procurement Group. Thus, by having more influence in decision-making in regard to spending and procuring goods and services, the Supply Chain and Procurement Manager can easily undertake negotiations with the Evaluation

Panel because he will identify the strengths and weaknesses of potential suppliers for the university.

- **Building the Network – Enrolment**

The actors involved in negotiation in e-procurement at Technology University are enrolled, through the influence of the Supply Chain and Procurement Manager, in decision-making processes regarding spending and procuring goods and services. They undertake these processes alongside other actors enrolled by the Supply Chain and Procurement Manager. One of the successful enrolments is through the trust by the Evaluation Panel in the Supply Chain and Procurement Manager in handling and making decisions in dealing with suppliers. As stated by the Supply Chain and Procurement Manager:

The representatives from outside the procurement group at the evaluation panel will leave it up to us to negotiate with suppliers.

Despite the actor network created with the involvement of the Supply Chain and Procurement Manager, the suppliers, the Dean of Department, the Evaluation Panel and the system, e-procurement negotiation at Technology University still faces many problems related to negotiating with human actors. The factors influencing negotiation in e-procurement include a number of social issues (refer to Section 6.5). In addition, a number of non-human actors, including the products procured and the organisations involved, also influence negotiation in e-procurement.

The procurement tools used to assist the Supply Chain and Procurement Manager and the users of the system in procuring goods and services at the university impact on the social issues that may occur in negotiation as part of e-procurement. Figure 4.2 represents the actor network for negotiation in e-procurement at Technology University. The actor network shows the building of networks among human and non-human actors, the complexity of the relationships among them, and the social issues that occur in the actor network involved in negotiation in e-procurement.

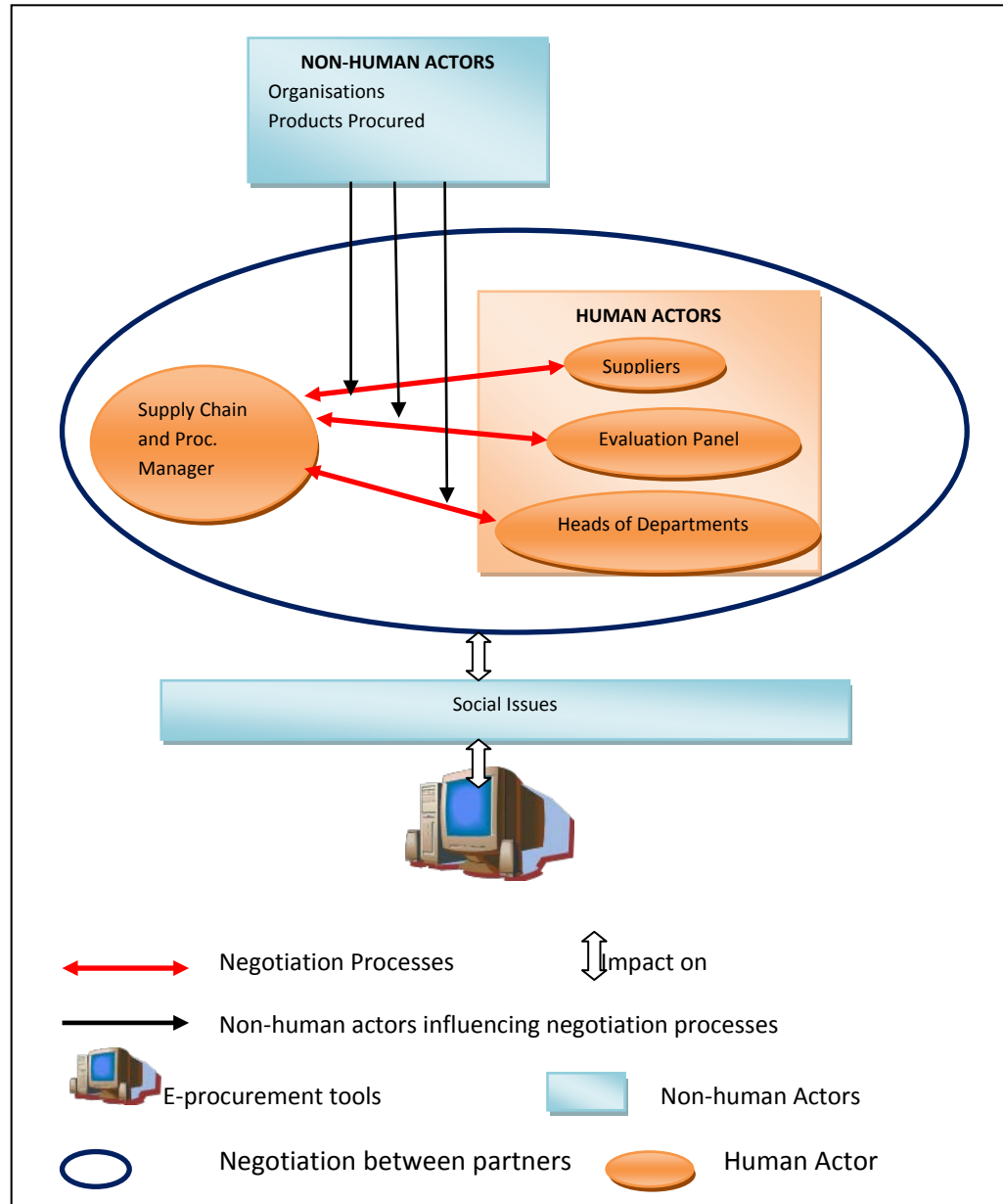


Figure 4.2: Actor network for negotiation in e-procurement at Technology University

The networks that exist in negotiation in Technology University's e-procurement network can be classified into a human network and a non-human network. Network relations can be established between human and human networks, between human and non-human networks, and between non-human and non-human networks. In the case of Technology University, the relationship between the Supply Chain and Procurement Manager and the supplier, and the Deans and the Evaluation Panel is an example of a network established between human and human actors. However, there is a need for establishing a network between human and non-human actors. This is to ensure all the actors involved in the e-procurement negotiation can liaise seamlessly. An

example of a network between human and non-human actors is between the systems used to assist the procurer in the negotiation process.

Procurers need to understand how the e-procurement system can assist them in making their tasks easier, in particular for negotiation. The e-procurement system is available for the procurer to use. The users of the e-procurement system need to understand their roles in the e-procurement network to ensure the network created through the human and non-human relationship in the negotiation process remains stable. Another network exists between non-human and non-human actors. The determinants of the relationship between the social issues influencing negotiation in e-procurement depend on the type of products and services procured by Technology University that will impact the negotiation mediums used. Therefore, for negotiation in the e-procurement network to succeed, there is a need to understand the importance of networks created between human and non-human actors and also between non-human and non-human actors. This is because each of the networks created will ensure the network's stability.

5.0 Conclusion

This study described the theory utilised in exploring negotiation in e-procurement network. E-procurement is a complex operation that includes the involvement of human and non-human actors. Negotiation in e-procurement at Technology University for procuring products is partially based on a manual system and an electronic system. Negotiation in e-procurement at Technology University involves not only trading partners, but also other parties that influence the negotiation process. In addition, the case study shows that procurers and suppliers need to understand and be aware of the importance of the social issues that influence negotiation in e-procurement. By understanding the influences of the social issues in e-procurement either as issues, or by treating them as one of the strategies used in assisting negotiation in e-procurement, the use of e-procurement can probably enhance collaboration among the stakeholders involved in business trading.

The researcher use ANT as a methodological tool to analyse the data obtained and as a lens to tell the story of negotiation in e-procurement network. This study has an implication to the body of knowledge, in its use of Actor Network Theory (ANT) as a lens for explaining the studied phenomenon. The theory can be used as a strategy to analyse and understand the issues that affect organisations. This theory use to explain negotiation process in a new environment that is electronic environment and in particular procurement. The social interactions are required among negotiators although the technology is available to use. This is due to that the human and non-human actors are bonded together in a network. Therefore, social interactions are essential in electronic environment to ensure the success of negotiation process especially in electronic environment.

Thus, Actor Network Theory is a fitting theory to use to explain the phenomena of negotiation in e-procurement networks, because the core of the theory regards the associated involvement of human and non-human actors. By using the theory as lens to explain the phenomena, the new role of actors involved can be revealed, and the network among them can be further understood. By knowing the roles, networks and factors that influence negotiation in the sourcing processes

within e-procurement networks, the value chain linking groups involved in negotiations can be improved and strengthened. Furthermore, the scope of negotiations which involve non-human actors can be explored and identified.

References

Callon, M. (1986), "Some Elements of A Sociology of Translation: Domestication of the Scallops and the Fisherman of St Brieuc Bay" in J. Law (ed.), *Power, Action and Belief*, London: Routledge, 196-233.

Callon, M. (1991), "Techno-Economic Networks and Irreversibility", in J. Law (ed.), *A Sociology of Monsters: Essays on Power, Technology and Domination*, London: Routledge, 132-64.

Callon, M., and Latour, B. (1981), *Unscrewing the big Leviathan: How actors macrostructure reality and how sociologists help them to do so*. In Knorr-Cetina, K. D., and Cicourel, A. V. (eds.), *Advances in Social Theory and Methodology: Toward and Integration of Micro- and Macro-Sociologies*, Routledge and Kegan Paul, Boston, Mass.

Hanseth, O. Aanestad, M. Berg, M. (2004), *Actor Network Theory and Information Systems. What's So Special?*. *Information Technology and People*, 17(2) 116-123.

Latour, B. (1987), *Science in Action. How to Follow Scientists and Engineers through Society*, Cambridge, MA: Harvard University Press.

Latour, B. (1991), "Technology is Society Made Durable" in J. Law (ed.), *A Sociology of Monsters: Essays on Power, Technology and Domination*, London: Routledge, 103-131.

Latour, B. (1992), "On actor-network theory" <http://www.nettime.org/List-Archives/nettime-1-9801/msg00019.html>.

Latour, B. (1992), "Where are the missing masses? The Sociology of a Few Mundane Artefacts", in J. Law (ed.), *Shaping Technology/Building Society: Studies in Sociotechnical Change*, Cambridge, MA: MIT Press 225-258

Latour, B. (1992), *On Actor-Network Theory*. <http://www.nettime.org/List-Archives/nettime-1-9801/msg00019.html>.

Latour, B. (1999), "On recalling ANT", in J. Law and J. Hassard (eds), *Actor Network Theory and After*, Oxford: Blackwell 15-25.

Latour, B. (2005), *Reassembling the Social. An Introduction to Actor Network Theory*. Oxford University Press.

Law, J. (1992), "Notes on the Theory of the Actor Network: Ordering, Strategy and Heterogeneity". *Systems Practice* (5:4), 379-393.

Tatnall, A. (2000). *Innovation and change in the Information Systems curriculum of an Australian University: a socio-technical perspective* (Doctoral dissertation, University of Central Queensland).

Tatnall, A., & Burgess, S. (2002, June). Using actor-network theory to research the implementation of a BB portal for regional SMEs in Melbourne, Australia. In 15th Bled Electronic Commerce Conference- 'eReality: Constructing the eEconomy', Bled, Slovenia, University of Maribor.

Tatnall, A., & Burgess, S. (2004). Using actor-network theory to identify factors affecting the adoption of e-commerce in SMEs. *E-Business: Innovation and change management*, 152-169.

Tatnall, A., & Davey, B. (2001). How Visual Basic entered the curriculum at an Australian University: An account informed by innovation translation. *Challenges to Informing Clients: A Transdisciplinary Approach* (Informing Science 2001).

Tatnall, A., & Gilding, A. (1999). Actor-network theory and information systems research. In *Proceedings of the 10th Australasian Conference on Information Systems* (pp. 955-966).

Tatnall, A., & Lepa, J. (2003). The Internet, e-commerce and older people: an actor-network approach to researching reasons for adoption and use. *Logistics Information Management*, 16(1), 56-63.

Tatnall, A., Clarke, S., Coakes, E., Hunter, M. G., & Wenn, A. (2003). Actor-network theory as a socio-technical approach to information systems research. *Socio-technical and human cognition elements of information systems*, 266-283.

Walsham, G. (1997), "Actor Network Theory and IS Research: Current Status and Future Prospects", in Lee, A. S., Liebenau, J. and DeGross, J.I., (Eds), *Information Systems and Qualitative Research*, Chapman and Hall, London, 466-480.

Walsham, G., and Sahay, S. (1999), "GIS for District-Level Administration in India: Problems and Opportunities". *MIS Quarterly*, 23(1), 39-65.