Using actor-network theory to understand inter-organizational network aspects for strategic information systems planning

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ABSTRACT

Network perspective has been an important factor in inter-organizational strategic information systems planning (IOSISP), and has consequently become a conspicuous concern for scholars. Bearing in mind the increasing cooperation between organizations by virtue of information and communication technology, we argue that, in order to survive and prosper, realistic research must draw on the dual foundation of network theory and strategic information systems planning (SISP) research. However, network theories are as yet diversified in information systems research.

In this paper, we argue that the network perspective, more specifically, the actor-network theory (ANT), is positioned to enhance the understanding of network composition and its development during the information systems planning. The controversial insistence on the agency of non-humans distinguishes the ANT from other network theories (e.g., social network theory, strong and weak ties, etc.). Meanwhile, the translation process introduced by ANT indicates a reasonable approach to understand the network evolvement. Thus, the theory has superiority over other network theories with its understanding of network composition and network development.

This study draws largely from and originates from the SISP research field, and illustrates the appropriateness of the ANT in investigating SISP, specifically in the context of inter-organizational cooperation. A theoretical model is outlined from literature study, reflecting how ANT can be utilized to describe the inter-organizational network in terms of information systems planning. Our case study, with three universities of technology in the Netherlands (3TU) is conducted to validate this theoretical model.

The result shows that the ANT provides an appropriate way to understand the network as a heterogeneous actor-network, and the network evolvement as the translation process, which includes four elements: *problematization* indicates the most important actors, whether human or non-human, and define the problems so that other actors recognize them as their own problems; *interessement* locks those actors into alignment with approaches that we called

"device of interessement"; *enrollment* is the outcome of the previous process, whereby more allies are attached whose roles must be defined and coordinated; and *mobilization* maintains the network by verifying the representativeness of the aliens by persuading them that their interests are the same as the translator's.

To regard this study as an inceptive try for applying actor-network theory in strategic information systems planning, we make our contribution to enrich the network perspective in research of IOSISP, and draw an outline of a framework aligning SISP with the ANT for describing the inter-organizational network in terms of information systems planning, which can be later utilized by practitioners for review and improvement within their networks.

Keywords

Inter-organizational strategic information systems planning, actor-network theory, heterogeneous network, translation process, problematization, interessement, enrollment, mobilization

PREFACE

This thesis is the result of my final assignment for my study at the University of Twente. During this two-and-one-half-year study, I have encountered a great deal of challenges; nevertheless, what I have learned is even more than I expected. I owe a great deal of thanks to many people who have helped me cross all the obstacles in my way while pursuing this field of study in the Netherlands.

First and foremost, I extend my deepest gratitude to my supervisors, Dr. Ton Spil and Dr. P. A. T. van Eck. This thesis would not have been possible without their invaluable guidance. Dr. Ton Spil brought me to the world of e-strategizing in his first lecture, where I saw all the strange abbreviations including SISP on the first slide. Since then, I have learned a lot about strategy and planning regarding to IT, and it totally changed my view to these "high-level stuff" I thought before. I start realizing the true value of strategic planning, and try to learn more. Luckily, Ton told me that it would be a nice attempt to conduct some research regarding to IOSISP with the 3TU case when I express my interests to this research filed. During the half year, Dr. Ton Spil and Dr. P. A. T. van Eck gave me so many resources and helps that keep me continue with the research. Their patience and inspiration gave me a great deal of support during my study. I also appreciated their reminders to use caution in order to maintain a critical view on my research methods, processes, and analyses, which motivated me to continue to improve my research. Second, I would like to thank Frank Snels from UT, Bert van Zomeren from TU/D, and Cees du Bois from TU/e. It was a delightful experience to interview them. They contributed abundant information to this thesis, and I have learned a lot about the practical world during my discussions with them. As an international student, I never just simply take your all support for granted.

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TABLE OF CONTENT

AB	STRA	CT	2			
PR	EFACE	3	4			
LIS	TOF	FIGURES	7			
LIS	LIST OF TABLES					
1.	INTR	ODUCTION	8			
	1.1	Problem statement	8			
	1.2	Research objective	9			
	1.3	Research questions	9			
	1.4	Research method	10			
	1.5	Structure	12			
2.	LITE	RATURE REVIEW	13			
	2.1	Strategic Information Systems Planning (SISP)	13			
	2.1.1	Definition and objectives of SISP	13			
	2.1.2	General theory of SISP	14			
	2.1.3	Dynamic perspective of SISP	17			
	2.2	Inter-organizational strategic information systems planning (IOSISP)	18			
	2.3	Previous research on network theory	20			
	2.4	Actor-network theory (ANT)	23			
	2.4.1	Key concepts in actor-network theory	24			
	2.4.2	Actor-world	24			
	2.4.3	Translation	25			
	2.4.4	Actor-network	29			
	2.5	Answers to research question	31			
3.	THE '	THEORETICAL MODEL	33			
	3.1	IOSISP network context represents the actor-world	33			
	3.2	Actor-network perspective	34			
	3.3	Translation process as the dynamic network development	34			
4.	CASE	E STUDY	36			
	4.1	Introduction of 3TU case	36			
	4.2	Case study design	37			
	4.2.1	Questionnaire	37			
	4.2.2	Data collection	.38			

	4.2.3	Interview	38	
	4.3	Case study results	39	
	4.3.1	Problematization	39	
	4.3.2	Interessement	41	
	4.3.3	Enrolment	44	
	4.3.4	Mobilization	44	
5	CASE	RESULT ANALYSIS AND DISCUSSION	46	
	5.1	Result analysis	46	
	5.2	Discussion	47	
6	CONC	CLUSION AND FUTURE WORK	49	
	6.1	Conclusion	49	
	6.2	Limitation and future work	51	
REI	FEREN	ICE	53	
App	oendix .	A: Interview questionnaire	57	
App	Appendix B: 3TU federation chart 2008		60	
App	ppendix C: Definition of SISP contextual factors			

LIST OF FIGURES

Figure 1	Research model in general					
Figure 2	Research approach					
Figure 3	SISP model adapted from King (1988)					
Figure 4	A research framework for SISP adapted from Lederer and Salmela (1996),					
	Brown (2004)					
Figure 5	Conceptual research framework networked SISP adapted from Van den					
	Broek (2008)					
Figure 6	Research framework of IOSISP context adopted from Spil (2010)					
Figure 7	Interessement (Callon 1986)					
Figure 8	Four moments of the translation (Rhodes, 2009)					
Figure 9	Theoretical model					
Figure 10	The 3TU Federation at a glance					
Figure 11	The start of the 3TU network					
Figure 12	3TU IOSISP network at a glance					
Figure 13	Using dynamic SISP method supporting activities for translation					

LIST OF TABLES

- Table 1Summary of Some Key Concepts in an Actor-Network Theory (Walsham and
Sahay 1999)
- Table 2Actor definition

1.INTRODUCTION

1.1 Problem statement

When strategic planning arrived on the scene in the mid-1960s, corporate leaders embraced it as "the one best way" to devise and implement strategies that would enhance the competitiveness of each business unit (Pittman 2000). In the light of information technology (IT), the world is reshaping industries, global economies, and the way organizations work and survive. The prominent value of strategic planning of IT appears when people realize that effective IT planning can contribute to better organizational performance while inapposite planning of IT could lead to total failure. Strategic information systems planning (SISP) appears to serve as a long-term process in which organizations strive to achieve a better competitive advantage by means of IS planning. Up to now, strategic information systems planning has been a crucial concern for many organizations who want to facilitate their organizational development and explore the IT advantage.

However, the world in which we live is becoming more "connected" in terms of how computer networking has accelerated with high frequency in our daily lives. While growing information technologies have rapidly changed the face of business over the past decade, IT has made possible the sharing of large amounts of information along the supply chain, including operations, logistics, and strategic planning data (Sanders 2007), which has enabled real-time collaboration and integration among distributed organizations. Information technology connects the world so rapidly today and in such transformative ways that the organizations competing for its business, framing its strategy, and exploring its future routes might want to take serious consideration with the network context in which they are surrounded.

With the rising collaboration among organizations, information systems planning thus leads traditional strategic information systems planning (SISP) to inter-organizational strategic information systems planning (IOSISP). Prior research has built a foundation for this field, and the way in which we evaluate strategic information systems planning processes and effectiveness has matured. However, the inter-organizational view, or network view, has not

been thoroughly studied (Spil 2010). When we talk about IOSISP today, we should attach a special importance to our comprehension of the inter-organizational network as well as the way it evolves. Therefore, the network perspective must be taken into consideration.

1.2 Research objective

This master assignment initiates literature study on both SISP and network theory research domains in order to investigate issues pertinent to inter-organizational strategic information systems planning within a network circumstance. We have endeavored to achieve three purposes from this study:

- First, to lay a foundation of knowledge of SISP with emphasis on the use of theory in the inter-organizational context;
- Second, to attempt, by this research, to adopt actor-network theory (ANT) as the network perspective for understanding dynamic inter-organizational networks in terms of IS planning;
- Third, to devise a framework to describe the dynamic network for IOSISP that is expected to be created, based on actor-network theory as well as IOSISP, and tested through realistic case studies.

With the literature study, the first two objectives can be fulfilled by collecting the previous research dedicated to SISP research with a network perspective as well as research on network theory. Meanwhile, existing variables and the research framework in prior research expected to provide a possible way to conduct our research with internal validity. Based on the result of the literature review, by virtue of a case study with 3TU – Delft University of Technology (TU/D), Eindhoven University of Technology (TU/e) and the University of Twente (UT) – the third research objective is expected to be reached in order to ensure external validation from the practical world.

1.3 Research questions

The main research question is formed as follows:

How does the actor-network theory (ANT) illustrate the network aspects of inter-organizational strategic information systems planning (IOSISP)?

To answer this main question, several related sub-questions must be answered to provide a structure and reason behind the first question.

Sub-question 1:

What are the network aspects of inter-organizational strategic information systems planning?

Sub-question 2:

How can we define the network in inter-organizational strategic information systems planning with an ANT perspective?

Sub-question 3:

How do we describe the network resulting from inter-organizational strategic information systems planning from the ANT perspective?

The purpose of these questions is to procure knowledge – and answers – from two research domains – SISP and network theory – and try to find more relationships between them, based on the existing research. For the purpose of clarity, a general outline of research model is showed in Figure 1.



Figure 1 Research model in general

1.4 Research method

The research approach used in this master assignment begins with literature review and research question formulation. Mutual interaction of these two parts is the more appropriate expression of the actual work. A theoretical model is structured after reviewing the work. The 3TU case is

selected in this assignment to explain the dynamic network evolution of inter-organizational strategic information systems planning. Interviews will be conducted with relative stakeholders from three universities (TU/D, TU/e, and UT) in order to validate the proposed theoretical model with qualitative analysis.

For the literature review, through the web of science database, we start by first reviewing with keywords: strategic information systems planning, SISP, actor-network theory, inter-organizational strategic information systems planning, IOSISP network theory. Combinations of keywords are used searching for literature of application of ANT in SISP as well as IOSISP. The initial search results in a great deal of paperwork that we selected according to its citation rate and its relevance. We find that there are quite few papers that discuss IOSISP; therefore, our further literature search includes more literature, using the following keywords: inter-organizational relation and inter-organizational cooperation, in order to find more resource on IOSISP network aspects. The research approach is shown as follows:



Figure 2 Research approach

The theoretical model is expected to adopt the existing variables from the literature review in order to ensure the internal validity of the research. The case study of 3TU is based on existing documentary studies as well as first-hand information from interviewees. Our documentary studies including the newsletters of 3TU federation¹, other previous 3TU case study paper² as

¹ http://www.3tu.nl/en/about_3tu/publications/newsletters/

² Strategic cooperation of universities, Pirre, 2008. http://www.tek.fi/ci/tekstra/StrategicCooperation.pdf

well as resources from E-strategizing course³ in university of Twente. The interviews are conducted with information managers from three universities who can represent for their group in some extent, and each interview takes approximately one hour. However, limitations must be admitted in this assignment; although the three formal interviews provide necessary information for the prime phase analysis, more interviews should be conducted for further research. Besides, the documentary studies in this research only review those in English version; therefore, other documents written in Dutch are missing in this study.

1.5 Structure

This paper is organized in six sections. Section 1 introduces the background of the research, as well as research objectives, research questions and research approach. Section 2 presents the literature study with SISP, IOSISP and ANT. Section 3 proposes a theoretical model of the IOSISP with ANT perspective, which we will explain according to the literature study. Section 4 begins with the 3TU case study, after which the case introduction will be given and the case study results will be analyzed and discussed in section 5. Finally, Section 6 concludes this research and suggests further work as well.

³ Assignments from course E-Strategizing 2010, course code 235020.

2. LITERATURE REVIEW

2.1 Strategic Information Systems Planning (SISP)

2.1.1 Definition and objectives of SISP

The perspective of SISP is that of the highest levels of management. In contrast to the narrower focus of other forms of IS planning, the scope of SISP efforts is broad (Segars, Grover et al. 1998). Strategic information systems planning (SISP) has been defined by Spil (1996) as "a process whereby an organization determines a portfolio of information systems to help it achieve its business objectives." Academics have been defining the concept of SISP refers to the process of identifying a portfolio of potential computer-based applications (Lederer and Sethi 1988; Doherty, Marples et al. 1999), on the other hand, it emphasizes the alignment with the corporate strategy of organization (Doherty, Marples et al. 1999) that assists an organization in executing its business plans and consequently realizing its business goals (Lederer and Sethi 1988).

As an important management function, strategic information systems planning can help an organization use information technology more competitively, identify new, higher-payback IT applications, and better forecast IT resource requirements (Basu, Hartono et al. 2002). The purposes of conducting SISP, explained by Earl (1993) are mainly targets for five objectives:

- Aligning IS with Business Needs
- Seeking a Competitive Advantage from IT
- Gaining Top Management Commitment
- Forecasting IS Resource Requirements
- Establishing Technology's Paths and Policies

Although there are multiple objectives for SISP in theory, narrative responses from organizations usually identified two or three objectives spontaneously. Those companies that lean toward *information system strategy* might be concerned with the first two objectives, i.e., IS directors placing top management commitment above the competitive advantage goals,

perhaps reflecting a desire for functional sponsorship and a clear mandate -- *information management* enthusiasts are concerned with the fourth objective, and those who focus on the fifth objective attach importance to information technology strategy (Earl 1993).

2.1.2 General theory of SISP

Previous research on SISP has engendered the research framework into an input-process-output-implementation-outcome model which has been persistently developed and explored. King (1988) as a pioneer in a framework which may be used as a basis for describing the role of IS strategic planning in an organization.

The schematic model covered *informational input*, *resources*, and *IS planning goals* as three inputs that influence the IS planning system, which King (1988) explained as representing all the processes, procedures, and analyses that constitute the substance of IS planning. The primary IS planning output from the IS planning system is "*IS strategic plan*." Other than the specific contents of the IS plans, alternatives were considered, but were not incorporated into the final plan, and should be considered to be a planning output as well. Ultimately, these outputs would influence the overall business performance, which (King 1988) believes may be incorporated as one of a series of basic standards for strategic planning information system evaluation.

Furthermore, *organizational*, or, *external environments* have been taken into consideration under the circumstances for evaluation of SISP. Premkumar and King (1991) adapted the model from King (1988), as shown in Figure 3.



Figure 3 SISP model adapted from King (1988)

The implementation of the information plan has not been presented in the above two models Earl (1993), which indicated that "techniques were found to be only one element of SISP, with process and implementation being equally important." From the practical point of view, it is almost axiomatic that the implementation plays a significant role to achieve expected outcome of SISP.

Raghunathan and King (1988) validate their hypothesis on the relationships between those elements of the SISP models that three phases of IS planning—strategic planning, systems planning, and plan implementation—are significantly and positively related to one another. This may be interpreted to mean that firms that extensively conduct one phase of IS planning also extensively conduct the other two phases. It also reinforces the often misunderstood but relative importance of those implementation tasks and activities that are related to ensuring that the IS plans that are developed are actually put into practice.

Lederer and Salmela (1996) proposed a model to set a framework for the research agenda for SISP. The framework contains internal environment, external environment, and planning resources as inputs to planning process. Moreover, considering the information plan as output, it leads to plan implementation that influence on alignment. Brown (2004) changed "alignment" to "outcome" since he found that there were more types of outcomes. Meanwhile, according to the literature analysis from 1996 to 2002, he did not find a direct relation between the external environment and the IS planning process. A possible explanation is that the external environment can have an indirect effect by affecting an organization's internal environment. Similarly, Newkirk and Lederer (2006) indicates the external environment not as input for the planning process but as a moderator for the success of a certain approach. The general SISP research framework contributed by Lederer and Salmela (1996) and Brown (2004) is shown as follows:



Figure 4 A research framework for SISP adapted from Lederer and Salmela (1996), and Brown (2004)

The effectiveness of strategic planning, as another name for the outcome, due to an examination of literature within IS and strategic management, reveals four distinct approaches to assessing it: "goal-centered judgment," "comparative judgment," "normative judgment," and "improvement judgment" (Segars and Grover 1998).

Other than those "formal" frameworks (King 1988; Premkumar and King 1991; Lederer and Salmela 1996) which concentrated on the analytical task of deriving IS strategies from business plans Salmela and Spil (2002) argue that in allusion to the limitations of the static plans that often resulted from these formal studies, the critics suggested informal and incremental planning to ensure flexibility, creativity, and strategic thinking to comprise emergent strategies as well as planned strategies.

2.1.3 Dynamic perspective of SISP

The acknowledged model of strategic information systems planning has provided what is now the cornerstone of the research domain. Within information systems literature, much attention has been devoted to developing methodologies for conducting strategic planning (Segars and Grover 1998). Methodologies have often become the basis for characterizing the entire process of SISP within the information systems literature. Recent theoretical work suggests that such characterizations are unnecessarily narrow and that planning activities within organizations can be more accurately conceptualized as systems of behaviors, agendas, or process dimensions (Segars and Grover 1998). However, researchers continue to look for alternative approaches to SISP, as the current ones fall short regarding the business and IT perspectives. They also fail to tackle the complexity of the domain and suggest specific IS opportunities (Kardaras and Karakostas 1999).

With concrete and practical perspectives, (Mentzas 1997) describes the five phases of the IS strategy process with different stages in each phase and specific modules of activities for each stage. Kardaras and Karakostas (1999) suggest Fuzzy Cognitive Maps (FCM) as an alternative modeling approach and describe how they can be developed and used to simulate the SISP process. Another attempt with dynamic perspective is Salmela and Spil (2002)'s proposal of an incremental model for SISP. Their four-cycles method – agreeing on planning objectives and stakeholders, alignment of business objectives and information objectives, analyzing its resources and infrastructures, and authorizing actions – aims to facilitate managers in implementing a continuous planning process regarding the significance of issues in the planning agenda.

Further on the four-cycles method, Spil and Salmela (2006) explain the dynamic process as : 1) creating strategic awareness, 2) analyzing the information supply, 3) aligning business and information domains, and 4) authorizing and maintaining a new equilibrium. Meanwhile, they indicate that the repetition of similar cycles enables the network to start small and evolve incrementally over the years.

In this research, the four-cycles method is suggested to be a supporting tool that assists the strategic information systems planning. However, as a recommendation for supporting method, , we will not go into details in this paper.

2.2 Inter-organizational strategic information systems planning (IOSISP)

The information systems of an organization consist of the information technology infrastructure, data, application systems, and personnel that employ IT to deliver information and communications services in an organization (Davis, 2000). The concept of inter-organizational information systems (IOS) emerges as inter-organizational corporations increase in the practical world. Kumar & Crook (1999) define inter-organizational information systems as "information technology based systems that link multiple organizations." Davis (2000) also indicates that the term "information systems" also refers to the management of the organizational function in charge of planning, designing, developing, implementing, and operating the systems and providing services. Therefore, the concept of IS combines both the technical components and human activities within the organization as well as describing the process of managing the life cycle of organizational IS practices (Avgerou and McGrath, 2007).

Being rooted in SISP research domain, IOSISP research is comparatively a seedling that contains little research at present. Van den Broek (2008) proposes a conceptual research framework of IOSISP (Figure 5) based on the previous theories (Segars and Grover 1999).

Networked SISP process



Figure 5 Conceptual research framework networked SISP adapted from Van den Broek (2008)

Furthermore, Sulistyo (2009) adapts the framework with contextual factors instead of networked SISP input. Four contextual factors are introduced which are also being adopted by Spil (2010). Their research shows that the inter-organizational SISP process is influenced by 1) the external environment, 2) the network context, 3) the nature of the planned (inter-organizational) information systems, and 4) the resources committed to the inter-organizational SISP process.





In this research, the networked SISP input (Segars and Grover 1999) as well as the IOSISP context (Spil 2010) are adopted regarding the research question of the network context.

2.3 Previous research on network theory

Inter-organizational networks are increasingly perceived as a model for entrepreneurial firm growth where the network is an entrepreneurial growth strategy. The changes and evolvement of networks eventually lead to increased integration of activities. Innovative networks are inter-firm relationships that allow firms the access to and the creation of innovation. Both vertical and horizontal ties are possible. One of the advantages of networks could be access to a larger pool of knowledge. Indeed, all firms use relationships to access new knowledge (Lechner and Dowling 2003).

The literature on networks is quite extensive today. From social networks to organizational networks and beyond, networks have been and continue to be an emerging and developing field of study that has spanned many disciplines, including, but not limited to, organizational theory and behavior, strategic management, business studies, health care services, public administration, sociology, communications, computer science, physics, and psychology (Provan 2007).

Among all the network theories, in this research, we found that the actor-network theory has showed an appreciable way to understand and describe the dynamic network in the strategic planning of IS. The actor-network theory is a ruthless application of semiotics. It tells us that entities take their form and acquire their attributes as a result of their relations with other entities (Law 1992). The ANT provides the perspective of understanding the elements of the network: the actor-world. Meanwhile, it is a theory dedicated to understanding change and order (Monteiro 2000) – in other words, the theory is suitable for the dynamism of inter-organizational strategic information systems planning.

The theory frames controversial events and presents them as a hub to study the negotiations associated with moving from one state to another. For actor–network theorists, the achievement of order is ongoing; it is an actively negotiated outcome. The actor–network theory was originally part of the field of science and technology studies (STS) and has been applied by a variety of IS process-oriented researchers to remind us that technology is not just a static artifact, but able to be introduced within a variety of organizational contexts without conflict.

Other typical examples of the network theory are network governance theory, strong and weak ties, and social network analysis. The network form of governance has received significant scholarly attention in the past few decades, but to date, no comprehensive theory for it has been advanced or sufficiently and theoretically detailed (Jones, Hesterly et al. 1997). The analysis of social networks is suggested as a tool for linking micro and macro levels of sociological theory. The procedure is illustrated by elaboration of the macro implications of one aspect of

small-scale interaction: the strength of dyadic ties (Granovetter, 1976). Social networks evolve over time, driven by the shared activities and affiliations of their members, by similarity of individuals' attributes, and by the closure of short network cycles (Kossinets 2006). SNA can be a very effective tool for promoting collaboration and knowledge-sharing within important groups, such as core functions of an organization, research and development departments, and strategic business units (Latkin 1995).

2.4 Actor-network theory (ANT)

Actor-network theory (ANT) – also known as the sociology of translation – is a sociological theory originally developed by Science and Technology Studies (STS) scholars *Michel Callon* (Callon 1986), *Bruno Latour* (Latour 1996), and the sociologist *John Law* (Law 1992) as an attempt to understand the processes of innovation and knowledge creation in science and technology⁴. The theory is an increasingly influential, but still deeply contested in its approach to understand humans and their interactions with inanimate objects (Cresswell, Worth et al. 2010).

Actor-network theory examines the motivations and actions of actors who form elements, linked by associations, of heterogeneous networks of aligned interests (Walsham and Sahay 1999). The advocators of ANT argue that our society is to some extent made by "actor-worlds," which associates heterogeneous entities (e.g. Callon 1986; Latour 1996). By means of "translation," the actor-world defines these entities' identities, the roles they should play, the nature of the bonds that unite them, their respective sizes, and the histories in which they participate. As the actor-world is heterogeneous and complex -- not only because it consists of heterogeneous entities, but because the relationships that bind them are also heterogeneous – the notion of "actor-network" is introduced to describe the possibilities of the elements and translation that occur between them, or in other words, the dynamic and internal structure of the actor-world (Callon 1986a).

The controversial insistence on the agency of non-humans distinguished the theory from other network theories. It is concerned with the processes that bring about things that are not usually thought of as constructed (Law 1992). While with the lens of the ANT, networks are materially heterogeneous, and an actor-network contains not merely people, but non-human entities such as technology and organizations, which are collectively referred to as "actors." In such a sense, ANT is also described as a "material-semiotic" method, which maps relations that are simultaneously material (between things) and semiotic (between concepts). Correspondingly, the actors in the theory could be understood as a material-semiotic actor, for instance, Jesen and Lauritsen (2005) describe IT reports as material-semiotic actors whose effects on their environments exceed or bypass discussions of content or motivation.

⁴ http://www.learning-theories.com/actor-network-theory-ant.html

2.4.1 Key concepts in actor-network theory

Actor-network theory is not a stable body of knowledge that researchers can rely on in an unproblematic way, as its developers themselves frequently revise or extend its elements (Walsham and Sahay 1999). However, some key aspects of the theory have remained relatively stable over the last decade or so of its development and use (Law 1992) for a more complete description). Table 1provides a brief summary of the key concepts in this theory:

Concept	Description
Actor (or actant)	Both human beings and nonhuman actors such as technological artifacts
Actor-network	Heterogeneous network of aligned interests, including people, organizations and standards
Enrollment and translation	Creating a body of allies, human and non-human, through a process of translating their interests to be aligned with the actor- network
Delegates and inscription	Delegates are actors who "stand in and speak for" particular viewpoints that have been inscribed in them, e.g., software as frozen organizational discourse
irreversibility	The degree to which it is subsequently impossible to go back to a point where alternative possibilities exist
Black box	A frozen network element, often with properties of irreversibility
Immutable mobile	Network element with strong properties of irreversibility and effects that transcend time and place, e.g., software standards

Table 1 Summary of Some Key Concepts in an Actor-Network Theory (Walsham and Sahay1999)

When placing the actor-network theory in a sweeping picture, it consists of three general concepts: actor-world, translation, and actor-network. The actor-world indicates the ANT perspective of the world, or the society in which we live. Translation provides the methodology of the theory, which also shows the process of networking in the actor-world. Eventually, an actor-network appears as the result of translation, which also represents the dynamic actor-world in a graphic way.

2.4.2 Actor-world

An actor-world associates heterogeneous entities. It defines their identity, the roles they should play, the nature of the bonds that unite them, their respective size, and the history in which they participate. But actor-worlds must not be represented as shoppers in a well-stocked supermarket, choosing what they wish to buy from a pre-established list. In short, there is no world, or worlds, from which pre-existing elements can be extracted. Nor is there a world that guarantees that the combinations created by the actor-world are realistic (Callon 1986a). By inserting the entities into a cluster of heterogeneous relationships, an actor-world places them into a network. It is the context that gives each entity its significance and defines its limitations. It does this by associating the entity with others that exist within a network (Callon 1986a).

However, reality could be infinite in theory, but in practice, as a result of the translations that are introduced in the ANT, an actor-world is limited to a series of discrete entities whose characteristics or attributes are well defined; thus, the actor-world can be structured and represented by actor-networks. In other words, an actor-world is a network of simplified entities which, in turn, are other networks.

2.4.3 Translation

Although our society could be depicted by the actor-worlds, it does not remain in a static state. Actor-network theory assumes that social structure is not a noun, but a verb (Law 1992). To explore the dynamic process of the formulation of the actor-world, the concept of translation has been introduced, which is also the core of the actor-network approach..

All translation works to solidify actor-worlds (Callon 1986a). It is the delineation of a scenario which is at first merely an endeavor. Translation concerns itself with how actors and organizations mobilize, juxtapose, and hold together the bits and pieces out of which they are composed; how they are sometimes able to prevent those bits and pieces from following their own inclinations and separating from this composition, and how they manage, as a result, to conceal, at least for a time, the process of translation itself and so turn a network from a heterogeneous set of bits and pieces, each with its own inclinations, into something that passes as a punctualized actors (Law 1992).

(Callon 1986) indicates four moments of translation:

1. Problematization

The problematization answers the question of how to become indispensable. It describes a system of alliances, or associations, between entities, thereby defining the identity and what each one wants. The use of term "problematization" instead of "problem" offers two advantages: it means that the problem definition emerges from a performance and not just from a

perspective. Second, it implies that the problematization is not a singular event but is done over and over again, because dynamic practices make up a problematization (Broer, Nieboer et al. 2010).

The definition of the actors brings the most relevant stakeholders into the story. These actors cannot reach their goals by themselves due to their respective obstacles; therefore, they need to align their interests with other actors through cooperation. The primary actor attempts to establish itself as an obligatory passage point between the other actors and the network, which makes it indispensable. Two main activities are started in this phase:

- The interdefinition of the actors
- The definition of obligatory passage points (OPP)

The questions formed by the prime actors bring other actors directly into the actor-world. A single question of the prime actors can be enough to involve a whole series of actors by establishing their identities and the links between them. The definitions of these actors could be quite rough at the first place. However it is sufficiently precise to explain how these actors are necessarily concerned by the different questions which are formulated.

The prime actors do not limit themselves simply to identifying a few actors. They also show that the interests of these actors lie in admitting the proposed questions. For A as the prime actor, B and C play as the other actors, if B wants to achieve a similar goal with A, whatever its motivation may be, if C hopes to preserve its benefits that associate with A, whatever their reasons, then they must know the answer to the question of A, and recognize that their alliance around this question can benefit each of them.

2. Interessement

The interessement answers how the allies are locked into place. Interessement is a series of processes by which actors seek to lock other actors into the roles proposed for them in a certain program. It involves obtaining the actors' interest and negotiating the terms of their involvement. The primary actor works to convince the other actors that the roles it has defined for them are acceptable.⁵ What could otherwise be seen as a process, interessement is in reality

⁵ http://en.wikipedia.org/wiki/Actor-network_theory#Translation

the group of actions by which an entity attempts to impose and stabilize the identity of the other actors that it defines through problematization. For instance, as Figure 7 depicts, A interests B by cutting or weakening all the links between B and the invisible (or at times quite visible) group of other entities C, D, E, etc., who may want to link themselves to B (Callon 1986).



Figure 7 Interessement (Callon 1986)

Devices of interessement are needed in order to ensure the success of the interessement. Technology, physical devices, political force, or even textual content (e.g., Papadopoulos and Wongkaew, 2008) are all potential devices of interessement in the practical world.

3. Enrollment

The enrolment answers the question of how to define and coordinate the roles. It is a set of strategies in which the prime actors seek to define and interrelate the various roles they are allocated to others.

Interessement achieves enrolment if it is successful. To describe enrolment is thus to describe the group of multilateral negotiations – the trials of strength and tricks that accompany the interessements and enable them to succeed (Callon 1986). The device of interessement, however, does not necessarily lead to alliances, or to actual enrolment. For enrolment to be successful, it requires more than just one set of actors imposing their will on others; it also requires these others to yield (Singleton and Michael 1993).

The issue at this phase is to transform a question into a series of statements which are more certain. Enrollment designates the device by which a set of interrelated roles is defined and attributed to actors who accept them. If B is to be enrolled, they must first be willing to assist for solving the A's obstacles. However, this is not easy to achieve, and in practice A will have to lead their longest and most difficult negotiations with the B.

In the Figure 7 which we spoke of earlier, C, the party to be excluded does not surrender so easily. C has the possibility of interrupting the relationships between A and B. C does this by also interesting B which is coveted by all. Nevertheless, some actors are enrolled without any resistance. Therefore for the most part, the negotiation is carried out between few "tough" actors. Callon (1986) illustrates the different possible ways in which the actors are enrolled: physical violence, seduction, transaction, and consent without discussion.

4. Mobilization

The mobilization of allies answers the question, "Do the delegate actors in the network adequately represent the masses? Who speaks in the name of whom? Who represents whom?" These crucial questions must be answered if the project led by the researchers is to succeed (Callon 1986). Mobilization is a set of methods used by the prime actors to ensure that supposed spokesmen for various relevant collectivities are able to represent those collectivities and not betray them. Of importance here is the establishment of the spokesperson's legitimacy.

Using the notion of spokesman for all the actors involved at different stages of the process of representation does not present any problem. To speak for others is to first silence those in whose name we speak. It is certainly very difficult to silence human beings in a definitive manner but it is more difficult to speak in the name of entities that do not possess an articulate language: this supposes the need for continuous adjustments and devices of interessement that are infinitely more sophisticated (Callon 1986).

These moments constitute the different phases of a general process of translation, during which the identity of actors, the possibility of interaction, and the margins of maneuver are negotiated and delimited. However, these four moments can overlap. At the end of the four moments, a constraining network of relationships has been built (actor-network). But this consensus and the alliances which it implies can be contested at any moment. Translation becomes treason once an enrolled entity refuses to enter the actor-world in order to expand into others. Translation cannot always be taken for granted, and the strategies used depend upon the particular circumstances in which they develop.

A brief conclusion of the concept of the four moments of the translation is shown as follows:



Figure 8 Four moments of the translation (Rhodes, 2009)

2.4.4 Actor-network

The actor-world may be more or less extended, heterogeneous, and complex. The actor-network is introduced to describe this range of possibilities and the translations that occur between them.

Not only is the actor-world comprised of heterogeneous elements, but their relationships are also heterogeneous: exchange relationships, power relationships, relationships of domination, sub-contractual relationships, and so forth (Callon 1986a).

If we wish to construct a graphic representation of a network by using sequences of points and lines, we must view each point as a network, which in turn is a series of points and lines, and we must also view each point as a network which in turn is a series of points held in place by their own relationships.

The terms "actor-world" and "actor-network" draw attention to two different aspects of the same phenomenon. The actor-world emphasizes the way in which these worlds, built around the entities that create them, are both unified and self-sufficient. The actor-network emphasizes that they have a structure, and that this structure is susceptible to change.

A major focus of the theory, when applied in particular contexts, is to try to trace and explain the processes whereby relatively stable networks of aligned interests are created and maintained, or alternatively, to examine why such networks fail to establish themselves. Successful networks of aligned interests are created through the enrollment of a sufficient body of allies and the translation of their interests so that they are willing to participate in particular ways of thinking and acting that maintain the network (Walsham and Sahay 1999)

Law (1992) argues that "if we want to understand the mechanics of power and organization, it is important not to start out assuming whatever we wish to explain." The theory deals with the matter of concern versus the matter of fact. By no assumption in the beginning, in the ANT perspective, there is no reason to take for granted which company is bigger or which group is more powerful. In discussing these differences, we should study how this comes about -- how, in other words, size, power, or organization are generated.

The concept of the heterogeneous network is the primary tenet of the actor-network theory. This lies at the heart of the actor-network theory, and in a way suggests that society, organizations, agents, and machines are all effects generated in patterned networks of diverse (not simply human) materials (Law, 1992).

Walsham and Sahay (1999), in concluding the key concepts of the ANT (Table 2), indicate that a major focus of the theory, when applied in particular contexts, is to try to trace and explain the processes whereby relatively stable networks of aligned interests are created and maintained, or alternatively, to examine why such networks fail to establish themselves.

As Latour (2005) asserts, "the task of defining and ordering the society should be left to the actors themselves," thus make the ANT as a process methodology that assumes that actors know is certainly implicit and often explicit (Bryson, et al, 2009). As a method, Latour (2005) argues that an ANT study should focus on five categories of controversies. They include the nature of: groups and how they are defined; action and its manifold causes; agents, including human and non-human actors; facts versus "matters of concern"; and studies showing how the social sciences can be said to be empirical.

2.5 Answers to research question

Sub-question 1:

What are the network aspects of interorganizational strategic information systems planning?

Previous research with SISP and IOSISP has indicated several aspects of input for the information systems planning process, especially in interorganizational settings, such as networked SISP input (Van den Broek 2008) and IOSISP context (Spil 2010). According to their results, the planning process of information systems is largely influenced by those factors; therefore, we consider them to be the network aspects of interorganizational strategic information systems planning.

Sub-question 2:

How can we define the network in interorganizational strategic information systems planning from an ANT perspective?

ANT scholars claim that society can be understood as an actor-world, where human and nonhuman actors are involved in heterogeneous relationships. The actor-network, on the other hand, depicts such actor-worlds through its translation process. Interorganizational strategic information systems planning builds its actor-world with relative stakeholders, ideas, technologies, and other components. Therefore, by adopting the concept of an actor-network that represents the IOSISP actor-world, we consider the network of IOSISP to be *a network driven by the goals of prime actors who associate with other heterogeneous actors by means of a necessary approach through translation process*.

Sub-question 3:

From an ANT perspective, how do we describe the network resulting from interorganizational strategic information systems planning?

Four elements of the translation process enable us to understand network development from a dynamic point of view. To describe the network, four elements are required: problematization, interessement, enrolment, and mobilization. Actors, as well as their goals and obstacles, thus need to be defined to describe these four elements.

3.THE THEORETICAL MODEL

Based on the literature study, we have developed a framework as depicted in Figure 9.



Figure 9 Theoretical model

3.1 IOSISP network context represents the actor-world

Based on previous research (Spil 2010, Sulistyo 2009), the context of IOSISP includes the following four main factors: *external environment*, *IO environment*, *nature of IOS*, and *resources*. Moreover, both *informational resources*, as well as *non-informational* resources, need to be considered. With the lens of ANT, it cannot be assumed that these factors are fixed

entities. Changes may occur in the structuring of connections between people, technologies, and documents, resulting in a different context. Following this notion, actor-network theory may undermine the methodological assumption that those factors in IOSISP context associates as heterogeneous entities and their identity, the roles they should play, the nature of the bonds that unite them, their respective size, and the history in which they participate should be identified.

When considering what is involved in the inter-organizational network, different categories of stakeholders, policies, technologies, or even other ideas can be counted, thus making the inter-organizational network an exact heterogeneous network. Moreover, this heterogeneous network only exists when actors make effect and will evolve dynamically along with the IOSISP process.

3.2 Actor-network perspective

A crucial analytical move made by actor-network researchers is the suggestion that social is nothing other than patterned networks of heterogeneous materials (Law, 1992). The information strategy network can be seen therefore as a network of heterogeneous materials, and in this sense, IOSISP is a way of reforming the "social" of the inter-organizational environment by playing the role of heterogeneous engineering. Relations among actors only exist when they strive to achieve similar goals. Obstacles that block their common route need to be solved to ensure successful network alignment.

3.3 Translation process as the dynamic network development

The translation process answers the evolvement of the network in IOSISP. Despite knowing the important actors, achieving their goals requires more effort to ensure successful network alignment. The prime actors want to be indispensable and recognized by other actors and assisted in developing the network. Next, the allies need to be strengthened; thus, their roles in this network have to be defined and associated. The process is not always smooth, however, for those who do not represent their roles have to be replaced in order to refine the network. Through the four elements of translation, those questions are expected to be solved, and the network will continue develop in right direction.

In the 3TU case, we will explain the inter-organizational strategic information systems planning using the ANT perspective with its four elements of the translation process.

4.CASE STUDY

4.1 Introduction of 3TU case

On 24 February 2004, the Dutch cabinet approved a proposal from the three leading universities of technology in the Netherlands—Delft University of Technology, Eindhoven University of Technology, and the University of Twente—to federate, which sets out joint ambitions in education, research, and knowledge valorization.⁶

In 2007, these universities officially joined forces in the Federation of Dutch Universities of Technology (3TU.Federation). This federation is dedicated to maximizing innovation by combining and concentrating strengths in research, education, and knowledge transfer.⁷ It doesn't intend to redistribute research fields and resources or create a bureaucratic organization but instead aims at becoming stronger while maintaining individual identity and reputation.⁸

Challenges arise with opportunities, and although they hold collective interests, these universities clearly have their own brand, reputation, and special features.⁹ Each university has its own strategic planning perspective and way of working. Despite the soft side, an important difference in their IT infrastructure makes cooperation a challenging task. Accordingly, interorganizational strategic planning has been brought forward to make 3TU cooperation as practicable as possible and thus enhance the corporation's effectiveness.

During this cooperation, interorganizational strategic information systems planning is very important to facilitate communication among the three universities and to ensure their alignment is feasible. After six years of cooperation, the 3TU network has now come together and been very successful. For instance, the 3TU Digital Learning and Working Environment (DLWO) project has succeeded in taking a significant step forward. It is now technically possible to search each university's separate course catalogue and find results presented for

⁶ http://www.3tu.nl/fileadmin/3tu/Publications/about_3tu/archive/communiqueeng.pdf

⁷ http://www.3tu.nl/en/about 3tu/

⁸ 3TU_Newsletter_April 2008,

http://www.3tu.nl/fileadmin/3tu/Publications/newsletters/archive/3TU_Newsletter_April2008.pdf

⁹ Case Study - Strategic Cooperation of Universities of Technology, Case: 3TU. bY Pirre Hyötynen, Kati Korhonen-Yrjänheikki

3TU as a whole. Although this may sound simple, it is a major step forward in terms of technology. A service-oriented ICT architecture is being gradually introduced, and TU/e successfully achieved this in the early part of 2009. Following the introduction of a new teaching system, TU Delft and the University of Twente have begun putting into place the necessary technological advances. The search function will be expanded in the upcoming period, and Identity Management will also be incorporated within the model, making secure transactions possible.¹⁰



Figure 10 The 3TU Federation at a glance¹¹

The 3TU case has been studied as an example of typical interorganizational cooperation. Tapia (2009) describes the 3TU federation, referring to its IT architecture (Figure 10). By using enterprise service buses (ESBs) that allow interoperability of the ISs of the three universities without modifying their user interfaces, the 3TU solved the problems that were due to different ISs in these universities. Moreover, it also provides the advantage of further extension of the network.

4.2 Case study design

4.2.1 Questionnaire

The questionnaire was designed with five categories of questions according to our research objectives and was also based on the input-process-output model of SISP research in chapter 2:

- Network perspective: to find out what the interviewee thinks of the network in 3TU cooperation

¹⁰ 3TU_Newsletter_December 2010,

http://www.3tu.nl/fileadmin/3tu/Publications/newsletters/3TU_newsletter_december2010.pdf

¹¹ ASSESSING BUSINESS-IT ALIGNMENT IN NETWORKED ORGANIZATIONS by Roberto Guadalupe Santana Tapia, 2008

- IOSISP context: to get cooperation of the most important actors in 3TU regarding information systems planning
- IOSISP process: to have a sense of the existing process of IOSISP in 3TU
- IOSISP outcome: to check what the 3TU network has achieved so far
- Other questions: to consider the network type and the biggest obstacle in the current phase.

For the detailed questions, please see the questionnaire in Appendix A.

4.2.2 Data collection

The case study in this paper starts with literary research that aims to learn the general background of 3TU cooperation. Three interviews were conducted with information managers from each university to collect information about the 3TU network and IS planning process. Important questions¹² were asked about the network perspective, IOSISP context, and the IOSISP process. The original intent was to have at least two persons from each university, but following a suggestion of a first-round interviewee, other interviews about this content would be redundant within their group. Based on the above resource, the 3TU case is analyzed that in consequence to an under develop actor-network of 3TU strategic information systems planning.

4.2.3 Interview

Regarding our research domain, the expected interviewees are people from the above-mentioned three technology universities who are responsible for information systems planning or IT strategy planning of the university. The selection starts with the UT contacting information managers of the universities. Through recommendation of the UT information manager, we contact two interviewees from TU/D and TU/e. The original intent of the interview was to choose two interviewees form each university, but as representatives of their specific group, the interviewee provides sufficient information for study at this phase. Considering the suggestion given by interviewees, to avoid redundancy, we only conducted three interviews.

The interviews were face-to-face conversations. Each interview lasted approximately one hour, and all conversations were recorded with the permission of interviewees.

¹² See questionnaire in Appendix A.

4.3 Case study results

4.3.1 Problematization

Before investigating the network of 3TU information systems planning, the first question to be addressed was what and who makes up 3TU. In terms of ANT perspective: the interdefinition of actors. Two categories of entities are identified as heterogeneous entities. The table below shows the most important human actors, as well as nonhuman actors.

Human actors	Identity				
Boards of each university	High-level strategy planning and decision making				
ICT directors	IT strategy planning				
Education managers	Educational requirements analysis				
Trojka	Six people, including IT directors and CIO from each university				
ICT group	Supporting staff working on the architecture and information				
	system				
Nonhuman actors					
Politics	The ministry/government of the Netherlands				
Industry	Industries in Holland that already cooperate or plan to cooperate				
	with the three technology universities				
Service-oriented	The idea of integration				
architecture					
ESB	Enterprise service bus as the crucial technical tools needed to build				
	the architecture				
Standard	Standard for educational information (XCRI, HODEX)				
	Standard language for ESB (XML)				
Student information	The digital leaning and working environment (DLWO), e.g.,				
systems	Blackboard, sharepoint				

Table 2 Actor definition

The actors presented in the above table are identified through interviews and the documentary study of 3TU. Once we accept that the 3TU is constructed from this range of heterogeneous elements, the next question to ask is how can we describe its construction. In the very beginning of the network, the entities are fettered: they cannot attain what they want by themselves. Their road is blocked by a series of obstacles.

3TU integration brings together the three technology universities in Holland into a context of 3TU actor-world. The federation, however, does not result from the universities themselves but rather from the external environment. Both the government and industries in Holland point out that it might be too much and also too expensive to deal with these universities. Therefore, discussion is needed to find a solution. On the other hand, those universities also confront challenges from increasing competition around the world. Improvement is needed for their further development and a better competitive position. With a connected problem and common interests, the actor-world of 3TU can be initiated. Figure 11 shows the start of the actor-network of 3TU, with actors from both the external environment and the inter-organizational environment.



Figure 11 The start of the 3TU network

So far, the actor-network does not deal with the inter-organizational information systems planning, but it does provide the precondition for upcoming cooperation in terms of IS planning. To realize the integration idea of 3TU, IT contribution can make inter-organizational

cooperation much easier; therefore, the ICT group from each university is required for the mission. IT strategy is needed to revitalize 3TU cooperation. Decisions have to be made with technology, people have to be involved with vision and the standard or policy has to been decided for control. In such ways, actors are defined in planning the information systems for 3TU.

4.3.2 Interessement

After the actors have been defined for 3TU IS planning, alignment is still only loosely coupled. Although each actor enlisted by problematization can submit to being integrated into the initial plan, each one can also refuse the transaction by defining its identity, its goals, projects, orientations, motivations, or interests in another manner. They are formed and adjusted only during action. Consequently, interessement is needed as the group of actions by which an entity attempts to impose and stabilize the identity of other actors it defines through problematization.

The initial force and discussion have given birth to the subject of 3TU, but survival requires steady alliance. The establishment of the 3TU federation is certainly a valid movement that stabilizes high-level alignment, and financial support was received from the government that facilitates the 3TU federation. However, other actors may not have as strong an interest as the board and external actors to integrate 3TU. More interessement devices are therefore required to build necessary alignment.

The idea of service-oriented architecture compels the ICT groups from the three universities to start working on the enterprise service bus (ESB), which will ease future cooperation with the different information systems. Trojka aligned to the board with the feasible technology that can solve the cooperation problem among 3TU in IS perspective. The ICT groups are building the architecture, which benefits from internal integration with other IS in each university and also provides for future expansion. They have arranged for future meetings and discussion, such as a formal meeting with around 50 people from 3TU every half-year, during which they can communicate with each other for planning goals and future development. Moreover, XCRI was selected as the main standard for building the electronic learning and working environment.

In brief, the device of "interessement" in the current phase of 3TU network for IS planning is listed as follows:

- Financial support (external)
- Establish 3TU federation (board level)
- Service-oriented architecture
- Formal meeting
- Informal meeting, discussion, video meeting

By these actions, 3TU attempts to stabilize the alignment and get involved actors closer to this network. If successful, the interessement confirms (more or less completely) the validity of the problematization and the alliance it implies. In practice, however, things often do not progress ideally with the plan. Although the idea of integration is an extremely good idea, realizing it requires considerable work.

Figure 12 shows the 3TU network evolved with more actors aligned. It indicates the movements and detours that must be accepted as well as the alliances that must be forged. The Boards, the ICT group, and the educational managers as well as other technological factors are fettered: they cannot attain what they want by themselves. Their road is blocked by a series of obstacles problems. The future of those actors is strongly relying on other actors within this network. For these actors the alternative is clear; either one changes direction or one recognizes the need to assist other actors go through their obstacles. Figure 12 describes a system of alliances, or associations, between entities, thereby defining the identity and what they 'want'.



Figure 12 3TU IOSISP network at a glance

4.3.3 Enrolment

The device of interessment provides a practical approach for aligning the actors, but success is never ensured. Just having a network framework does not necessarily lead to alignment. Therefore, actual enrolment is needed to bring the network into actual alignment. To describe the enrolment is to describe the methods that accompany the interessment and ensure its success. In this research, enrolment is described against the device of interressment. Several possible approaches for enrolment are shown below:

Negotiation capability

To enrol the external actors in the 3TU network, they are expected to give financial support or political support. Negotiation appears to be the approach used most often to attract the external investigation.

Authorizing

Support from the board of 3TU decides whether or not the ICT directors can realize their idea. To enrol the ICT directors, the board is expected to agree to a certain extent that Trojka can get authorization for their proposal of IT projects.

To describe enrolment is to describe the group of multilateral negotiations, trials of strength, and tricks that accompany the interessements and which enable them to succeed. In practice, however, enrolment strongly depends on the capability of the actors—for instance, the negotiation ability of the board or the professional skills for building the service-oriented architecture. Challenges arise when no evaluation of such capabilities is made. Further description of the skills needed for enrolment requires more investigation into actor capability evaluation, which requires the next step of mobilization.

4.3.4 Mobilization

Regarding an actor's capability for enrolment, questions need to be answered that represent the actor and whether or not they are representative.

In terms of strategic information systems planning, the Trojka is represented as the primary actors within the 3TU IS planning network. From bottom-up perspective, they will propose potential IT strategy to the board. For the ICT groups, they conduct their work according to the

IT strategy or IS plans from directors. The members of the Trojka must be capable or responsible for IT strategy planning within the 3TU context. In this case, the Trojka consists of ICT directors and CIOs from each university who take responsibility for IT strategy planning and that ensures them a representative for the primary actors in 3TU IS planning.

The board from 3TU is responsible for general strategy planning, which includes the IS perspective. Whether the board will be responsible for the negotiation work with external actors of 3TU is unknown at this point. The board representative is responsible for IT strategy, but for communication with external actors, further investigation is needed, which may lead to enrolment of new actors.

Education managers are not involved enough at UT and TU/D according to the information managers' perspective. Educational managers are supposed to be responsible for function or requirement analysis and delivering the results for the IS that can be used for 3TU goals.

The service-oriented architecture represents the integration idea of 3TU in IS perspective. Regarding technological problems, its role fits exactly the solution regardless of how much independence IS has in each university. The enterprise service bus further provides solutions for the architecture. In this case, these two actors have been accepted for representing the role expected for 3TU IS planning.

3TU IS planning has adopted the standard of XCRI for educational information. The choice for the educational information standard turns out to be more flexible, and in Europe the XCRI is the most accepted one in terms of higher education. Therefore, within the 3TU context, since they are all Dutch universities, the European standard can fulfill the goal and control consistency. A potential risk exists, however, when these universities try to expand their network and cooperate with a university that does not use that standard. New mobilization may be required for this actor.

5 CASE RESULT ANALYSIS AND DISCUSSION

5.1 Result analysis

The actor-world of 3TU in terms of SISP is a world in which ICT directors and CIOs (Trojka), its prime mover, forms a part. The entities included for 3TU IS planning, act, react, and cancel out each other in the same way as any other. They may be either individual or collective. Actors enrolled in the 3TU IS planning network become aligned to solve their obstacles, which will not work without the 3TU actor-network.

The three universities seek to cooperate to become more visible from an international perspective, whereas, on the other hand, the 3TU network is only one of many networks in which each university is involved. In the 3TU perspective, the problematization in this research can address the most important actors that are necessary for 3TU IS planning. Roles have been defined for 3TU IS planning, and the Trojka is the prime actor in this case. Actors include people with a related vision for 3TU IS planning, and the idea and technology that are feasible to realize the cooperation, as well as the policy that ensures standardization. While the network of each university is expanding, in other word, when the subject leads university to another actor-world, similar problematization structure can be a useful reference for analysis.

In the interessment process, the 3TU federation was established to align general stakeholders for 3TU cooperation. In the IS planning perspective, informal meetings and discussion are important for ICT groups to communicate with each other, but alignment with educational managers is lost in TU/D and UT. From a 3TU network perspective, another potential risk is weakening participants who seek to cooperate with another network. For instance, an assumption based on a geographic relationship, may lead UT to cooperate with German universities, which then reduces the strength of 3TU.

At present, not all the device of interessment lead to true alignment. The educational managers are not actually enrolled in UT and TU/D. Enrolment turns out to be quite complicated to describe since, in practice, negotiation and communication strongly depend on human-actors,

as well as in a qualitative sense. Roles of the educational managers need to be defined so they can realize what they can be in the network. Besides, it appears the 3TU network still in an early age, therefore, this leads to more job-on mobilization, where actors are evaluated for their representative. Not only for evaluating the network, the mobilization also strike to refine the network and accelerate the cooperation with more precise actors.

Methodologically, the four moments of translation are the way the network was formulated and evolved in practice; however, to ensure success of network development, or in other words, to make sure that the dynamic network grows as the prime actors intended, a practical IOSISP method should be addressed to support network development. For instance, devices of interessement should be provided, as well as analysis and negotiation with other actors.

5.2 Discussion

The discipline of information systems is by its very nature a socio-technical one (Tatnall 2002). Strategic information systems planning also need to consider both the social and technical part. Nevertheless, it makes the network perspective more confused concerning which aspect needs to be emphasized. Utilization of heterogeneous entities (Bijker, Hughes and Pinch 1987) avoids questions of "Is it social?" or "Is it technical?" as missing the point, which actually should be "Is this association stronger or weaker than that one?" (Latour 1988). With the actor-network theory, all heterogeneous entities are treated equally.

If someone wants to analyze the field of research regarding inter-organizational relations and networks, it is necessary to somehow determine which individual pieces of research are part of it and which are not (Oliver and Ebers 1998). Much IS research may benefit from being informed by an actor-network theory perspective, where they can be clearly pictured and investigated. Through the problematization, heterogeneous entities are defined as those which are most related to the other obligatory entities in the network. It proves an approach for understanding network consistency. Relationships between those actors are considered as being their obstacles and related goals. The strength of the relationships between actors is not pointed out in the research, which needs to be further involved for evaluating the network.

Identifying all the heterogeneous elements in an actor-network can be difficult, and this is ultimately up to the discretion of the researcher. Known as the problem of selection, identifying

the most concerned actors from an IOSISP context would be the primary work for understanding the inter-organizational network.

Is the inter-organizational context distinctly different compared with the single organization context? Through the 3TU case study, it seems the inter-organizational context did not have much influence on the participants' original network. This may be because the network is still in an early phase and most cooperation is conducted in an experimental sense. However, all three universities have benefited from the 3TU network to a different extent. Namely, strategic information systems planning in an inter-organizational context benefits the participants as a way of understanding and learning. Benefits of inter-cooperation may be revealed through the single organizational network rather than directly from the inter-organizational network. The TU/e, who benefit most from the 3TU cooperation, receives same idea from the 3TU network, but better alignment (OPP) within their own university enable them to make best out of the network.

Alignment between actor-network theory and strategic information systems planning is still loosely based on this research. For each moment of translation, methods from SISP research can be adopted to assist the analysis. For instance, the four cycles method in the literature part may help for investigating the actor-network with more specific methodology. This study only attempts a start for the actor-network theory perspective when dealing with IOSISP.



Figure 13 Using dynamic SISP method supporting activities for translation Figure 13 indicates that to support the activities along the translation process, a dynamic method of SISP or IOSISP can make its contribution for develop the network.

6 CONCLUSION AND FUTURE WORK

6.1 Conclusion

The primary purpose of this study is to enrich the network perspective in strategic information systems planning research. Our work introduces the actor-network theory (ANT) perspective, which helps to understand the "network" in interorganizational strategic information systems planning (IOSISP) research. Four elements of the translation process are summarized for describing the network, and our theoretical model proposes a feasible route to align the SISP research with an ANT perspective.

The basic philosophy of the ANT is to consider the network evolvement as a translation process. The first moment of translation is termed problematization. The network engenders with the correlative actors—whether human or nonhuman—which would be identified through problematization. Few actors as a translator-spokesman define the interests and problems of other actors who may only be concerned with their own interests. Other actors are then approached to join in solving the problem through forming an alliance with the translator-spokesman. In this way, the translator-spokesman establishes an obligatory passage point (OPP) and renders himself as indispensable in the network.

To get the actors interested and then negotiating terms of their involvement, *interessment* is a process aimed at convincing actors to accept the definition of the translator-spokesman by using the necessary approach, which is termed as "device of interessment," and used to detach the actor from elsewhere and then join them to this network. In practice, such a device could be a physical instrument, information technology, or even a social approach.

Enrolment is expected to occur if the interessement is successful. Thus, enrolment plays a crucial role in ensuring successful alignment. This process could be described as a set of strategies in which the actors seek to define and relate to the various roles they had allocated to others.

Finally, the mobilization process verifies the representativeness of the selected actors and refines them, if necessary. It maintains commitment to the problematized cause of action and ensures the continued position of the OPP. Of importance in this step is establishing the legitimacy of the spokesperson.

What is noteworthy is that from the 3TU case study we found that enrolment turns out to be the most challenging element, since it strongly depends on each actor's abilities, sophisticated negotiation might required, which can be difficult to estimate and relies on various components to work.

The alignment between ANT and SISP has been indicated in our theoretical model (Figure 9):

- The research framework from previous research on SISP provides a network context that enables problematization with a foundation to investigate the most relevant and important actors.

- As the translation process proceeds, effective and reliable methodologies are required to analyze and make decisions for different elements. Dynamic methods from SISP research show its potential capacity to meet this need with various supporting methods, such as the four-cycles method (Spil & Salmela, 2006) that we present to our interviewees.

Elaboration of the translation process has been made with a practical setting; the result assists in reviewing and understanding the network by practitioners. The proposed theoretical model could be used as a framework for practitioners to analyze their network during planning of IT and finding the obstacles that can be solved later by looking through the SISP method.

Prior to our research, arguments were made about the differences between single organizational and interorganizational settings regarding strategic information systems planning. Our findings address such issues through the 3TU case study—that when inter-organizational cooperation adopts service-oriented architecture with the approach of the enterprise service bus rather than information systems planning, the strategic planning only refers to the planning of services or message that needs to be standardized. Thus, the IOSISP appears to be a problematic expression for such a situation. Therefore, this problem must be addressed before conducting SISP research within a future inter-organizational setting.

Our primary intent in performing this research is to increase our understanding of network aspects in interorganizational strategic information systems planning (IOSISP) from the viewpoint of research conducted in both network theory and strategic information systems planning (SISP). The alignment between these two disciplines is still controversial, but the importance of the network perspective has been acknowledged by scholars as well as by practitioners.

This research has present an attempt to adopt the actor-network theory (ANT) toward expatiating network aspects of strategic information systems planning within inter-organizational settings. However, it would be not precise to claim the 3TU cooperation is exactly inter-organizational strategic information systems planning. For first reason, many works still being done in own way of the universities. And for the second, with an experimental sense, many jobs of the 3TU cooperation still remain in informal way. Nevertheless, through the lens of ANT, strategic information systems planning could be referred to as a goal-oriented way in which human stakeholders, as well as the nonhuman elements, are both taken into account as being actors that comprise the network. Wanting to achieve mutual goals, those actors need to be aligned into a network in which they need to overcome their obstacles to ensure successful alignment. In such way, our study biased toward network study rather than IOSISP.

6.2 Limitation and future work

A number of limitations of the current study need to be noted, as well as directions for future research. The case study was conducted within the field of education, as pointed out by previous researchers when considering the external environment and the type of industry that could have an impact on the SISP process. Therefore, the external validity of the research has its limitations. Secondly, this research intends to start as a trial, although three interviewees from three different universities are represented for their group, and provide sufficient information with a one-hour interview for current study. It would be wrong to claim that this is enough for a network aspect analysis with multiple actors involved. In addition, our present theoretical model still requires more elaboration on details, and the dynamic SISP method that can be utilized to support the translation process remains as a proposal.

For these reasons, future work may require more empirical research with different types

of industries in order to find out if the results vary because of industry type. In-depth studies should be conducted to receive feedback from more components within the 3TU case. Last, but not least, further work with integration insights needs to be explored to examine how the SISP method (e.g., Spil & Salmela, 2006) can be utilized in practice for supporting the four elements of the translation process. Namely, further develop of the model in Figure 13.

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Appendix A: Interview questionnaire

Interviewee information Name:

Job position:

Main responsibility/role:

Network perspective

This part attempts to investigate the network perspective in practical point of view.

- 1. What do you consider of the concept "network" in strategic information systems planning?
- 2. When you think this "network" formulated in the case 3TU? (before/during/after IS planning)
- 3. What is the level of influence that this "network" impact on the planning effectiveness? (low/medium/high) And in your opinion, how does the network influence on the IS planning?

IOSISP context

This part is trying to identify the most important actors that IS executives considered in IOSISP

- 4. Who are the most important human stakeholders or group in the strategic information systems planning of 3TU in your experience? (people or group that involved who can actually affect or change a state)
- 5. How does the stakeholders influence the IS planning in 3TU?

	First Tier	Second tier	Support
TU/E TU/D UT	Upper management	Students Lecturers Researchers System designers Education managers	Supporting staff

6. What is the most important non-human factors needed for the planning? (technology, policy, other precondition, etc.)

IOSISP process

This part focus on the IOSISP process as heterogeneous engineering, and trying to find out how does the actor-network formulated against resistance.

Comprehensiveness (low / medium / high)

Definition: The extent to which an organization attempts to be exhaustive or inclusive in making and integrating strategic decisions.

7. What kinds of analyses were made before and during the planning process?

Formalization (low / medium / high)

Definition: Existence of structures, techniques, written procedures and policies that guide to the planning process.

- 8. How were the planning team selected? Were they formally appointed?
- 9. How were the decisions being made? Was there any formal procedure?

Focus (creative / control oriented)

Definition: Balance between creativity and control orientations inherent within the process structure.

10. How to standardize the IT use of different universities?

Participation (broad / narrow participation)

Definition: The breadth of involvement in planning; e.g. number of planners involved, representation from various functional areas.

11. What was the way that the planners of each university coordinate with each other and with their own university?

Consistency (low / medium / high)

Definition: The frequency of planning activities or cycles as well as the frequency of evaluation/revision of strategic choices.

12. How frequent was the planners meet?

IOSISP outcome

Whether and how the heterogeneous engineering leads to IOSISP effectiveness?

- 13. Was the network now differing than what you faced with before and during planning? What were the main differences?
- 14. What were the most important thing you think the planning process bring to the organization and to you, respectively?

Other questions:

- 15. What kind of network you think the 3TU network likely to be fitted in?
 - relational networks, based on trust,
 - hierarchical networks, based on authority,
 - contractual networks, based on agreements

16. What are the most important obstacles needs to be overcome for the planning?



Appendix C: Definition of SISP contextual factors

Contextual Factors	Definitions			
The external environment	Consists of type of industry involved in the SISP			
	process, heterogeneity of the external factors in an			
	organization's external environment, including external			
	stakeholders, dynamism of changes in the external			
	environment, and hostility that refers to environmental			
	threads such as market pressure and politics.			
(Inter)organizational environment	Consists of (Inter) organizational structure and			
	governance, (Inter) organizational size, organizational			
	culture and the role of IS function.			
Nature of IOS	Refers to how IOS is planned inter-organizationally.			
Resources	Consists of informational resources (business goals and			
	plans, IS mission and vision), non-informational			
	resources (user, IT and top management commitment,			
	financial resources, trust) and IOSISP planning goals.			

(From	Figure	23	Van	den	Broek	et	a 1	2008	h
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