

12-14-2013

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Recommended Citation

Ou Yang, Shirley and Huang, Cheng-Chieh, "Unpacking the Network Pictures of the ICT industry in Taiwan" (2013). *GlobDev 2013*.
9.
<http://aisel.aisnet.org/globdev2013/9>

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Unpacking the Network Pictures of the ICT industry in Taiwan

Completed Research Paper

Abstract

This study analyzes how a developmental state fosters its ICT industries through the network alliances among a boundary organization and ICT industries. The cooperative networks of ICT industries play a strategic role for the national development in a global networked economy. We argue that different network pictures lead to different managerial strategies and capabilities. Drawing on studies of network pictures, this study details an interpretive case study in a major semi-government sponsored ICT marketing research institute in Taiwan. We explore the relationships between this boundary organization, ICT businesses and their dynamic networking relationship. The findings highlight how the inertia of network pictures stabilizes value creation activities and capabilities in the boundary organization, thus limiting it opening to a more radical future-oriented strategic network.

Keywords: Business network, ICT4D, Case study, Network pictures, Boundary organization

1. Introduction

Information and communication technologies (ICT) have long been regarded as a key engine for development, but in today's global networked economy, this taken-for-granted perspective leaves room for debate. A swarm of countries have taken ICT-enabled development as national strategies to foster national competitiveness and reduce poverty since 1990s (Heeks, 2008). ICT for development (ICT4D) has become a global trend in both developed and developing countries, provoking the hope to leapfrog to the new knowledge economy, and the fears to be left out of the network (Castells, 2010). However, the optimistic, reductionist perspective of ICT-enabled development overlooks the complexity of social embeddedness of ICT innovation. Whether or not ICT-enabled development guarantees success, and how the interplay among technology innovation, multiple stakeholders, and publicly and privately sponsored policy-makers together affects the unique institutional condition with development goals in each country, remains unclear.

Study suggests that business networking is a widely adopted strategy for the industrial nations, such as European countries, the USA and Japan to reconfigure their knowledge and maintain the innovative capability (Gibbons et al., 1994; Powell, 1990). Developmental states, on the other hand, adopted governmental ICT incubation policies to make their way into the global production network. Their successful stories of fast growing exports of ICT services from a diverse group of countries, such as Taiwan, Korea, Singapore, India, China, and Malaysia, have still inspired many developing countries today (Avgerou, 2003).

Previous studies of strategic networks (Axeleson and Easton, 1992; Håkansson and Snehota, 1995; Möller and Svahn, 2003) mostly focused on either the "network of organizations" or "network organizations" among private corporations in advanced industrial states. The former represents any group of organizations or actors that are spontaneously interconnected in relationships (Möller and Halinen, 1999), whereas the latter refers to the cross-organizational ties that are stable and have shared values among the members (Amit and Zott, 2001). However, how governmental incubation strategies of ICT4D

in developmental states facilitate the collaboration between public and private sectors through strategic networking, has rarely been addressed.

Our purpose in this study is to address these gaps. We explore the networking strategies adopted in the developmental states, specifically, the network alliances among a boundary organization and ICT industries Taiwan. A "boundary organization" is a particular form of network, created by a government agency in the developmental states to bring scientific information into the policy arena and bridge the collaboration among stakeholders (Schneider, 2009). For example, many countries governments sponsor science and technology parks where government or a government appointed manager integrates all of the necessary elements for "the projection and commercialization of advanced technologies by forging synergies among research centers, educational institutions and technology-based companies" (Frieden, 2005; Petree et al., 1999). Hsinchu Science Park (HSP) in Taiwan as a sort of boundary organization is now one of the world's most significant areas for semiconductor manufacturing. Other examples, such as publicly sponsored scientific research institutes and laboratories also play pivotal roles in fostering synergy through investments, preferential policies and focused leadership to achieve innovation-driven growth strategies.

In this paper, we conducted in-depth field work of a semi-government sponsored ICT marketing research institute and its clients in Taiwan. Since Taiwan-based ICT firms now account for about 85% of the world's production of PCs and 95% of laptop computer production (Institute for Information Industry, 2010), the marketing information collected by this boundary organization play a crucial role in the global ICT industry with this globalized production network of outsourcing from Europe and America and manufacturing in Asia. Unfolding the social embedded action and the network alliances of this boundary organization, therefore, makes the ICT development strategies of Taiwan transparent and valuable for reference.

We chose Möller and Svahn (2003)'s "network picture" as a theoretical framework to investigate this interplays between this Taiwanese boundary organization and its networking relationships with ICT industries. We argue that different network pictures lead to different managerial strategies and capabilities. Extending the application of network picture analysis to a boundary organization context, we attempt to provide a new angle to look at how the developmental capacity of ICTs is socially embedded within the context of innovation and results from the efforts of different stakeholders in developmental states.

The objective of this research is, therefore, two-fold: (1) to investigate how network pictures of a boundary organization make sense in Taiwan-based ICT industries; (2) to reveal how a boundary organization optimizes its strategic networks and increases its ability for continual technical innovation. As the boundary organization we examined is a Non-Governmental Organization (NGO) incorporated through the joint efforts of public and private sectors, this study also echoes Walsham et al.'s (2007) call for more in-depth research on the role of non-governmental organization in IS-related development, which has received less attention in the studies of ICTs and developmentalism.

The remainder of this paper is organized in six sections. In the next section, we review the literature on boundary organizations, ICTs and developmental and corporate strategic networks; followed by introducing network picture analysis, which serves as the theoretical framework; in section 4, we discuss our research method. Finally, sections 5 and 6 provide an analysis and discussion of our findings.

2. Literature Review

Our review of the literature focused on three areas of research: *the nature of boundary organization* (Schneider, 2009; Guston, 2001), *ICTs and development* (Walsham and Sahay, 2006; Avgerou, 2003, 2010), and *strategic corporate networks* (Granovetter, 1985; Möller and Svahn, 2003, Möller et al., 2005). Very few empirical investigations for the ICT4D phenomenon have integrated these three areas of research in one study before.

The first area of research addresses *the nature of boundary organization*. Studies concerned with boundary organizations and boundary objects have emerged from the field of science and technology studies, as well as public administration studies. With more and more successful policies depending on the relentless cooperation among public and private sectors and NGOs, the boundary organization is

established to use a network-type of structure to integrate various participants from multiple agencies on the same level or across hierarchical levels (Schneider, 2009). This type of boundary organization is often initiated by a government agency. In comparison to networks, boundary organizations are generally expected to have more characteristics commonly seen in an official organization. They help to bridge agency boundaries, and oftentimes bring rising technical information into governmental decision making processes. Also, boundary organizations offer sites for collaborating, forming new relationships, creating new ways of knowing the problem and leading to better solutions than what a single organization could have reached (Guston, 2001).

Boundary organizations provide sufficient incentives to create boundary objects which are produced from different perspectives of participants, thereby bringing success to these organizations (Guston, 2001). The most cited boundary objects are scientific assessments and research reports, used by boundary organizations to produce physical objects of collaboration. However, there is no clear articulation how the networking relationships and knowledge transfers via boundary objects of “boundary organizations” have come into being.

The second area of research is centered on *ICTs and development*. The most prevailing view in the ICT4D domain is that ICT innovation is an instrument for development. Advanced by certain influential international development organizations, this view regards the development potential of ICT as a taken-for-granted (Avgerou, 2003). It presumes that the more the investment in ICT and other technologies, the higher the level of development the market mechanisms bring about. Avgerou (2010) further identified and compared two perspectives on ICT4D discourses: *ICT innovation as transfer and diffusion*, and *ICT as social embedded action*. She concluded that the social embeddedness perspective is a better position than the first, because this perspective claims that more effectively the interplay between the technology innovation and the multiple, changing social dimension in developing countries, allowing an in-depth explanation of how institutional conditions affect both publicly and privately sponsored efforts of policy-making and link ICT in heterogeneous networks with development goals (Walsham et al., 2007; Silva and Figueroa, 2002; Sayed and Westrup, 2003).

Walsham and Sahay (2006) classified of the ICTs and development literature into four categories, namely, broad issues linking to ICT and development, facilitating cross-cultural employment, adapting and cultivating IS locally, and focusing on particular technologies (Walsham and Sahay, 2006; Walsham et al., 2007). Although these topics include broad issues linking to ICT and development, facilitating cross-cultural employment, adapting and cultivating IS locally, and focusing on particular technologies, how ICTs really influence and interact with a wide range of institutional actors is often neglected. In this paper, we focus on the category of broad issues linked to ICT4D, taking a *social embedded* perspective, because we address the related issues of ICT industry and national development in their network contexts.

In the third research area, we review corporate strategic networks, a similar idea to the *social embeddedness* perspective in ICT4D literature, recognizing that economic transactions are embedded in the specific context of social conditions (Granovetter, 1985). Network relations assume the dependence on resources provided by others and the sharing of secured resources. In fact, the open nature of a network makes it a better and more flexible mechanism than a market for learning and transferring new knowledge and techniques (Eisenhardt and Martin, 2000).

In the industrial marketing literature, a number of ways have been proposed to categorize corporate strategic networks, such as the suppliers’ network, distribution network, and R&D network and competition alliance. Some authors devise categories based on the types of mutual dependence in a network relation (vertical or horizontal), the properties of network governance (bilateral or multilateral) or the characteristics of tasks in a network (Park, 1996). Hite and Hesterly (2001), stressing the issues of intentionally developed networks and their management, proposed that the evolution of firm networks is dominated by path-dependent processes during their emergence but become more intentionally managed as firms mature.

Möller and Svahn (2003), Möller et al. (2005) advanced the potential for intentional “management of networks” further, and classified 3 types of strategic networks on the basis of a value system continuum: (1) demand-supply network (stable, well-defined value system); (2) business renewal networks (established value system/incremental improvements); and (3) emerging business networks (emerging value system/radical changes). They argued for different types of strategic networks requiring different

managerial skill sets or capabilities, according to the underlying value systems of each type of network (see Table 1).

Table 1. Value production and network capability of a corporate strategic network			
	Demand-supply networks	Business renewal networks	Emerging business networks
Value system	-Effective production and delivery of products, -process excellence, and flexibility	-Gradual innovation for improved efficiency -Innovative solutions for supports customers' business	-Radical innovation opening up new business opportunities
Production capability	-Production capability -Delivery capability -Process improvement capability	-Incremental innovation capability -Process improvement capability	-Radical innovation capability -Mastering customer's business capability
Network management ability	-Cross-organizational management information system -Customer service and network management	-Deeper partner capability -Customer service and network management ability -Network mobilization capability	-Network visions capability -Network orchestra capability -Network mobilization capability

Adapted from: Möller and Svahn, 2003

In summary, our assessment of the literature indicates that the three areas of research, though developed by different domains of studies, are in agreement on investigating how human and nonhuman elements interweave in the heterogeneous networks to benefit the network participants. Yet, differences still remain. On the one hand, both boundary organization and ICT4D studies acknowledge that state organizations play a significant role in shaping the political rules and social norms that are influential to the economic actors. On the other hand, the studies on corporate strategic networks concentrate mostly on private corporations. Government sponsored boundary organizations are seldom recognized in the context of strategic networks, which would call for a deeper investigation. Given that a boundary organization often joins or creates different strategic networks to help the state government with its policy goals in developmental states, we believe that the network picture is an appropriate theoretical perspective to adopt to analyze the boundary organization at the centre of a network and to examine what network management abilities have been developed.

3. Theoretical Framework

The notion of network pictures refers to the different understanding that actors have of the network (Ford et al., 2002). Network pictures are created by the actors' subjective and idiosyncratic sense-making about the constituting characteristics of their company's operational network context. These perceived network pictures form the backbone of a manager's understanding of relationships, interactions and interdependencies. Therefore, network pictures not only constitute an important component of the individual decision-making processes of the manager, but also represent an important aspect of a company's strategy, its strategizing process and tactics within a complex web and exchange relationships (Ford et al. 2002; Henneberg et al., 2006). Ford et al. (2002) describes the network picture as:

[All] of the actors involved in a particular issue in the network will have their own different "picture" of the network. This picture is the basis for their perceptions of what is happening around them and of their actions and reactions in the network (Ford et al., 2002, p.4).

A central assumption of the notion of network picture is that a market is not regarded as composed of isolated dyadic exchanges, but is characterized as interactions of many relationships in a network. Although similar constructs have been studied in both the organizational behavior literature on mental pictures (Weick, 1995) and the strategy literature on managerial cognition (Hodgkinson and Johnson, 1994; Osborne et al., 2001), the concept of network pictures advances these constructs to include dynamic relationships in a (cooperative or competitive) network context embedded in organizations, thus taking a more holistic business-to-business exchange view.

In line with Weick's (1995) notion of sense-making, network pictures are essential to the construction process of an organization's identity. In one way, managerial network pictures often mirror the managers' attitudes, beliefs and expected outcomes built upon their subjective understanding of how the network is presented; in another way, the mental representations secure defined outcomes. In other words, the appropriateness of network pictures refers to their ability to help actors achieving desirable outcomes, particularly in uncertain and ambiguous occasions (Weick, 1995; Henneberg et al., 2006). However, these shared understandings of the relevant actors are also likely to bring domain consensus on the roles and expectations of most members in the network, which can lead to mindless or thick-headed network inertia.

Network picture analysis, therefore, can help to deconstruct an organization's network context on two levels: the content level and the representation level. The former involves questions such as "what is the content of the network?" and "what do the pictures represent? ", and the latter addresses the questions like "how do the pictures represent the content?" (Henneberg et al., 2006). Together, the two levels of analysis comprehensively depict both the ongoing product of social interaction among the network actors, and their inference from a variety of clues rather than the objective given.

From our perspective, as our focal concern is to investigate the strategic network alliance of a boundary organization and ICT industries through the unpacking of their network relationship, we believe network picture analysis serves as a proper theoretical lens to more deeply probe into the dynamic B-to-B social interaction.

Network Pictures Analysis

We proposed several research questions when we first entered the research field:

1. In a single boundary organization, why do the consultants of hardware group act and think so differently from the consultants of the software group?
2. Are there internal or external factors which affect the working patterns and market predictions of the two groups?
3. How could the eight dimensions of Network pictures help to explain the differences of the two groups?

Progressive analysis of the results produced a distinctive 4th question:

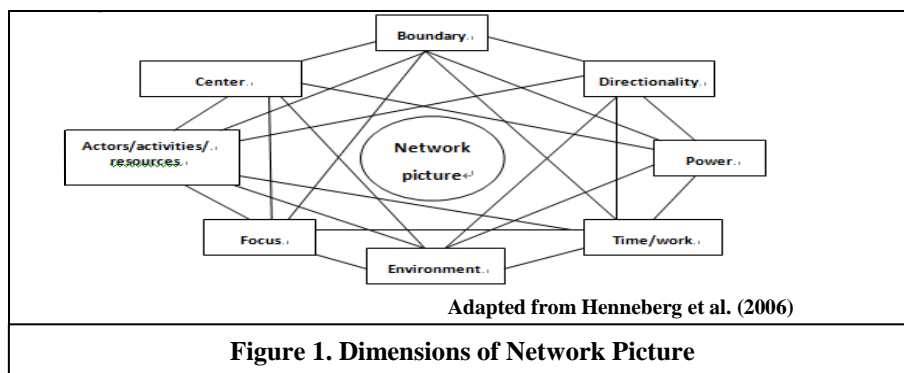
4. How are the relationships within boundary organization impacted by its social embeddedness in the global and local ICT industry?

We adopted the eight dimensions of network pictures that Henneberg et al. (2006) proposed as a analytical framework. They include boundaries, center/periphery, focuses, actors/activities/resources, directionality of interactions, time/task, power and environment (see Table 2), to deconstruct the actors' understanding of a corporate network. These building blocks for network pictures present an idea of an "open concept," where not all elements necessarily appear in every network picture, but from where the network pictures of a manager can be observed analytically and systematically.

Table 2. The Eight Dimensions of Network Picture	
Dimension	Meaning
Boundaries	The depth and width of a network picture. This refers to that actors subjectively select to establish a boundary. Depth can be regarded as a measure of the relationships a company has involving the direct supply of goods/services. Width is used to examine the nature of relationships that a company has with other influencers outside the formal product/service delivery system. Actors make decision on where they choose to cut-off the network picture. Boundary choices influence the richness and complexity of network pictures.
Center/periphery	Network pictures may have a clear center, for example, a value chain or star network of highly integrated companies. A periphery refers to the network pictures without a clear center.
Actors/activities /resources	A network picture consists of various types of actors, activities or resources. The actors can be individuals, groups of individuals or whole companies. They can be specific functions or activities, individual actors/managers, or the effects of recursive social process.
Focus	Focus refers to whether a network picture is ontologically based on physical objects (with emphasis on sets of connected firms) or relation (with emphasis on sets of connected relationships between firms).
Directionality of interactions	Interactions are the core of a network. There are two aspects of directionality: unidirectional, for example the relation of a buyer or seller; and multidirectional or interdependence of relationships, for example, being neutral, assisting, hindering, synergizing, lacking or completing.
Time/task	A network provides information regarding time horizon involved. A network is designed to exploit a short-term task or a long-term, continuous relationship.
Power	Network pictures might involve power issues by indicating the strength of relationships of the actors/activities/resources have involved. The networking relationships can be considered as relatively independent in a reciprocal relationship or relatively dependent. There are strong and weak ties.
Environment	It refers to the external environmental factors that are outside the visibility of the network picture.

Resource: Henneberg et al., 2006

Henneberg et al. (2006)'s network picture framework, shown in Figure 1, was applied to our specific research site of a government sponsored ICT research and consulting institute in order to explore how their consultants are influenced by and make sense of their network pictures in terms of decision making, action taking, and in return generating different results when they participate in different industrial networks. The next section details our interpretive case study of ICT industry in Taiwan over a 2-year period.



4. Research Method

We adopted an interpretive case study to explore the sense making of boundary organization members on their network activities. We used case study research as empirical evidence from real people in contemporary real-life organizations. The purpose of research cases is to contribute to knowledge in a particular field. Research cases are normally used as empirical evidence to convince other researchers of the applicability (or inapplicability) of a particular theory or proposition (Myers, 2009).

The underlying assumptions of research case studies are normally classified three-fold: positivist, interpretive, and critical (Orlikowski and Baroudi, 1991; Myers, 2009). Positivist researchers assume that reality is objectively given and can be described by measurable properties (Lee, 1994). Positivist case studies attempt to test theory and increase predictive understanding. Critical researchers assume that social reality is historically constituted and it is produced and reproduced by people. Critical researchers challenge those prevailing beliefs, values, and assumptions that might be taken for granted by the subjects themselves, rather than simply describing current knowledge and beliefs (Alvesson and Deetz, 2000). Interpretive researchers assume that access to reality is only through social constructions such as language, consciousness, shared meanings, and instruments. Interpretive researchers focus on complexity of human sense-making as the situation emerges, instead on predefined variables (Myers, 2009).

In this case study, we employ an interpretative stance, as we believe “reality” to be socially constructed and can be articulated as a result of human sense-making activities on the part of participants and researchers (Walsham, 1995). This epistemological stance of interpretivism is also aligned with the concept of network pictures that we have chosen to apply to the empirical setting.

Case Background

Taiwan-based ICT firms play a crucial role in the global supply chain of international ICT products. The Taiwanese government has embraced a progressive transformation policy view since the 1970s, and has intentionally injected resources to engineer ICT to be a locomotive industry in Taiwan. The most successful case was Taiwan’s Hsinchu Science Park in the 1980s, forming a high-tech knowledge exchange community to develop the ICT industry. Later, Taiwan became an international product processing stronghold based on Original Equipment Manufacturer (OEM)/Original Design Manufacturer (ODM), also with the support of government policies and the strategic incubation of small-sized enterprises. In 2005, Taiwan was at the forefront of such IT industries as notebook computers, wafer contract foundries, IC encapsulation testing and IC design. The ICT industry is undeniably the largest of the major industries in Taiwan, with total annual revenues of US\$220 billion. The Taiwan-based companies, such as Foxconn and Quanta have become the world’s largest computer OEM/ODM manufacturers, and other firms like Compal, Wistron, and Acer also had annual revenues in excess of US\$100 billion in 2010 (Digitime Research, 2011). These Taiwan-based ICT manufacturers are all important strategic partners for the global giants like Hewlett-Packard (HP), Apple and Dell.

The Research Site

Our case study focuses on the network activities of a boundary organization in Taiwan. An ICT marketing research institution (X Institute) was selected as our research subject. The unit of analysis of this study is the industrial level.

Established in the 1980s, X belongs to one of the two major government sponsored boundary organizations (the Industrial Technology Research Institute, ITRI, and the Institute for Information industry, III) The primary task for X institute is to create boundary objects, knowledge and insights through industrial report issues for industrial or government policy making, to send its consultants to participate in public presentations, conferences and to facilitate ICT development in Taiwan. The institute's significant position of Taiwan-based ICT industries in the global supply chain make it irreplaceable not only at the domestic, but also the global level.

The network activities of X were selected as the study subject for three reasons. Firstly, the industries studied or consulted by X cover a wide and complicated range of disciplines, which is rare in IT marketing research firms across the world (i.e., some firms focus on single hardware products and others on enterprise software). Therefore, X Institute has to deal with various stakeholders and guide the diverse and complicated networking relationships of its consultants. Secondly, given X's think-tank role in the Taiwanese government, we believe its views are influential in the decision making processes of both public and private sectors. Finally, made-in-Taiwan ICT products are sold around the world and the existing ICT industrial policies of Taiwan can serve as an instructive example for developmental states.

Highly reputed international marketing consulting firms, such as IDC and Gartner, have significant influences on ICT industries and markets at both global and regional levels. However, this type of organization is rarely selected as the subject of a study (Klincewicz, 2009), and as indicated by Walsham and Sahay (2006), this is indeed a "topic that is important but often neglected".

Data Collection and Analysis

In the two years (Jan 2008 to Dec. 2009) of participation and observation in the study field, the data collected involved field study notes, internal documents, conference participation and observation notes. The primary data source was face to face interviews with consultants at X Institute. One of the researchers was a consultant for X Institute over the period of study. For this reason, the informal conversations and observations during the period of employment allowed the researcher to obtain an in-depth understanding of the organizational culture and attitudes relevant to its network relationships.

The data collected consisted of three stages, planning, collecting and analysis (Myers, 2009). The planning stage started before entering the study field so as to carefully evaluate the goals of study and determine the resources and research tools needed. In the collecting stage, the authors kept an open mind to document the observations, experience of participation and the dialogues made in informal and interactive interviews in the field. Later, further field observations and interactive interviews were conducted. A semi-structured interview protocol was designed for interviews in the field.

As there was the involvement of a wide range of ICT products, services and markets (e.g., commuting systems, network communications, E-commerce), 2 groups of consultants were included in this study: One group (designated Hardware group) focuses on the survey of Taiwanese ICT hardware OEM manufacturers, while the other (designated Software group) is dedicated to the survey of the ICT software applications market in Taiwan. Seven consultants, covering half of the total consultants of the 2 groups, were selected as our interviewees. As the interviewees were selected from staff members of longer than two years, and specializing in diverse subareas of ICT, they were able to give insights into various network contexts. These insights were especially useful for validating the interpretations derived from the documentary analysis. Each of the interviews lasted approximately 1 hour and was tape-recorded for subsequent analysis.

To analyze the data, we applied the theoretical framework of network picture analysis to organize and present our qualitative data. We followed Klein and Myers's (1999) principles of interpretive case study to investigate more deeply the behavior, decision making, and sense making of the field consultants' in the

network activities. A comparison was made between the different network activities, network relations and network pictures established in the two research groups: Hardware group and Software group. For data verification, the technique of data triangulation (Myers, 2009) was adopted by combining different data sources, and we also incorporated the feedback of our interviewees to strengthen our analysis.

5. Analysis

Here we use Henneberg et al. (2006)'s eight dimensions of network pictures to analyze our case. Results reveal that different network pictures were observed according to the two groups of consultants (Hardware groups and Software group) and their different network relations. Table 3 shows the network pictures of these two groups.

The Network Picture of Hardware Group

The network picture of Hardware group was a somewhat concentrated and tightly connected network as shown in our observations and interviews. This network had a clear center occupied by several hardware OEM manufacturers specializing in laptop computers (e.g., Quanta, Compal and Wistron). The boundary of this network was established based on the product lines of these OEM firms. Therefore the network of Hardware group was based on the leading actors rather than relations.

Network picture dimensions	Hardware group: Concentrated "politics" network	Software group: Loose, "territorial" network
Boundaries	More than 1 dozen of Taiwan-based hardware OEM suppliers	Hundreds of market application firms in Taiwan
Center/periphery	The major OEM manufacturers are located at the center of the ICT hardware market	No distinct center, however, the boundary organization is expected to be a leading actor
Actors/activities /resources	Contact with product managers and first line managers of these firms and acquisition of the estimation of production.	Contact with top management and knowledge of the strategies for the market and where the industries are going.
Focus	Quantity of products produced, price and the moves of major firms	Market status and trends in applications
Directionality of interactions	Mutual benefits, and exchange of information between competitors	Network members feed strategic information to the boundary organization
Time/task	Long-term relations were established based on interactions every quarter	Varies every year and from project to project
Power	Consultants assume at a neutral position	Consultant are expected to play a semi-governmental role
Environment	Intensive attention from media around the world and investment banks	Less attention from outside, supervision on government projects

Hardware group consultants were basically concerned about the quantity of the shipping orders the Taiwan-based ICT hardware OEM manufacturers received. The networking activities included the consultants visiting them on a regular basis and conducting interviews quarterly with the product managers or first line managers in the OEM firms to collect information of the orders and the prices of products. When Hardware group consultants compiled this marketing information (refer to task) through the OEM manufacturers' network, this data could to a certain extent forecast the economic trend of global ICT industries, since more than 80% of ICT hardware were manufactured by these firms.

We also found that the directionality of interactions between the boundary organization and network members were bilateral in Hardware group's network picture. The boundary organizations collected information from OEM firms in the network. The individual firms provided their data to the boundary organization and received overall market trend and competitor information in return. One of the Hardware group consultants admitted that it required long term interactions to establish a trusting relationship with the managers in OEM firms.

"It all started when senior consultants introduced us to the firms and we provided them with related reports based on previous interviews, such as industrial reports of the last quarter and news reports of ICT industries. Trust was established little by little during the visits back and forth, and in time they started to feed us with their corporate information one bit at a time... The trust grew from there in Q2, Q3 and onwards, as the accuracy of information provided started to improve." (N2)

As the market information derived from Hardware group consultants have profound influences on government policies, industrial investments and corporate operations, these consultants needed to confirm repeatedly the reliability of these numbers before publishing anything. One consultant recalled the process of how these reports were produced:

"We only get segments of information every quarter...We have to double-check the segments from each company, and then cross-examine the data for a clear picture of the entire industry. Naturally, not every company tells us the same story. We double and even triple-check the data before producing a trustworthy number for the production and sales report of every quarter." (N4)

Therefore, members of external environment including people of the industries, news media and investment banks keep a close eye on X Institute when it publishes the industrial reports generated by Hardware group. In terms of power, the consultants of Hardware group need to play a neutral role and earn the trust of each individual firm. They also need to be cautious in the compilation of overall numbers without revealing the shipping quantity of a firm to its competitors, in order to avoid influencing stock prices or causing a price war.

The Network Picture of Software group

The network picture of Software group, on the other hand, was loosely structured without a focus and a well-defined leading actor. The actors of the network are composed of hundreds of ICT software application firms in Taiwan. With less than 2% of the global market share, these application firms are mostly small in size and located at the borders of the software market in terms of global software industries, essentially without significance at a global scale. Therefore, the marketing report and trends of this local market are relatively inconsequential.

From a network focus point of view, the focus of Software group was based on relations, as opposed to the OEM firms on which Hardware group's focus was based. As a boundary organization, X was expected to become an intermediary between these firms and the government. As the Taiwanese government rose funding to support the R&D of X Institute, the government became a key institutional driving force from external environment. In order to exert an influence on the institutional arrangements, the actors in the Software group, thus, were mostly the top management of these software firms.

"Those whom we interviewed were mostly high-level executives such as general managers and CEOs," said one of Software group consultants (S3). "They were willing to talk to us because they thought that we spoke for the government, and they hoped to provide some suggestions to the government or even get funding from the government."

The board chairman of an application developer informally shared the following with a Software group consultant:

“I know you don’t make decisions (on government policies), but I believe I can make a difference in changing government policies by talking to each one of you.” (B1).

As for the power structure of the network, Software group consultants were thus considered by the network members as playing a role similar to a semi-governmental industrial promoter. These software firms were hoping that X Institute could be a platform or a legitimating mechanism to increase the visibility of their innovative ideas or acceptance of their products in the market.

“The entire software field covers a massive range of grounds. We hear new names being created every year. That’s how the software industry works. These firms need an unbiased third party to help them validate their projects and expertises. There are overwhelming expectations that we play that role...” (S1)

Several Software group consultants mentioned that application developers expected them to “speak” for them. Therefore, for directionality of interactions, it was the firms uni-directionally providing the knowledge and information of their products.

6. Discussion and Conclusion

The previous analysis reveals two different network pictures of the consultants in the boundary organization. In this section, we will further discuss how these pictures represent their content.

Contrast to Henneberg et al. (2006) who found four types of network pictures in Japanese traders’ and UK managers’ network contexts (Sphere model, World model, Politics model, and Reductionist model), we found two distinct patterns: the “politics” network and the “sphere” network, emerging from the network pictures of X Institute as a boundary organization. The actors of both networks consisted of different stakeholders, such as boundary organizations, firms, boundary objects and the government. Different aspects of the depth and width of the network led to different relationships and networking patterns of the actors.

The network picture of Hardware group consultants was similar to the pattern of the “politics” network in Henneberg et al. (2006)’s study. Such networks characterize with a well-defined center and emphasize a few representative actors and the power relations within. These consultants made contact with the major ICT OEM manufacturers, resulting in a customer driven market view that focuses on the demand of the global brands, such as Apple, Dell and HP, etc.

From the corporate strategic network perspective, the network picture of Hardware group in fact presents a *demand-supply network* in Möller and Svahn (2003)’s value system, refer to Table 1. The hub firms are the major OEM manufactures that have tight links to the value systems of the giant global brands, such as Apple, Dell and HP etc. As Möller and Svahn (2003) stated, the hub requires a well established and strong demand position in the field. This powerful position can signal to important component vendors, design and manufacturing service providers that they can benefit from a tighter value system in terms of larger volumes and more stability.

To manage this type of vertical network requires the managerial capability to coordinate and information and knowledge of the value system constituting the complete business process of the network (Möller et al., 2005). As the boundary organization plays a role to integrate and coordinate the intimate knowledge dispersed among different actors at different levels of the networks, the networking activities that the Hardware group consultants are engaged in help to codify the knowledge of the business process, to mobilize knowledge sharing and transformation, to reduce the cost and effort that individual network participants need to spend on market information collection and most importantly, to stabilize the value systems of ICT hardware manufactures. This could explain why the boundary objects (industrial marketing reports) produced by Hardware group consultants are more highly attentive than the ones produced by Software group, because the knowledge transferred in this group is tightly link to the dynamics of global hardware demand-supply network.

The network picture of Software group consultants, in contrast, is closer to the “sphere” network as described in Henneberg et al. (2006). They suggest the pattern of this type of network is characterized by a lack of focus, a clear and well-defined network boundary, as well as a directional interaction between the spheres.

In our case study, the network picture of Software group displayed a seller-oriented view. Since the members in this “sphere” network were mostly local software application firms, their daily practices were essentially to implement their products into different business contexts. What the firms really need is the situated knowledge helping them to align their innovations with the local companies, and to make sense of the processes of change for the local people. Naturally, the generic research reports of this “sphere” network have no appeal to them. Rather, their real concerns are fostering government incubation efforts as grant funder, anchor tenant, referee to legitimize their software innovative ideas, integrating both private sector entrepreneurialism and public sector stewardship, thus making friendly institutional arrangements. Without doubt the actors of this “sphere” network regarded the boundary organization and government as the leading actors.

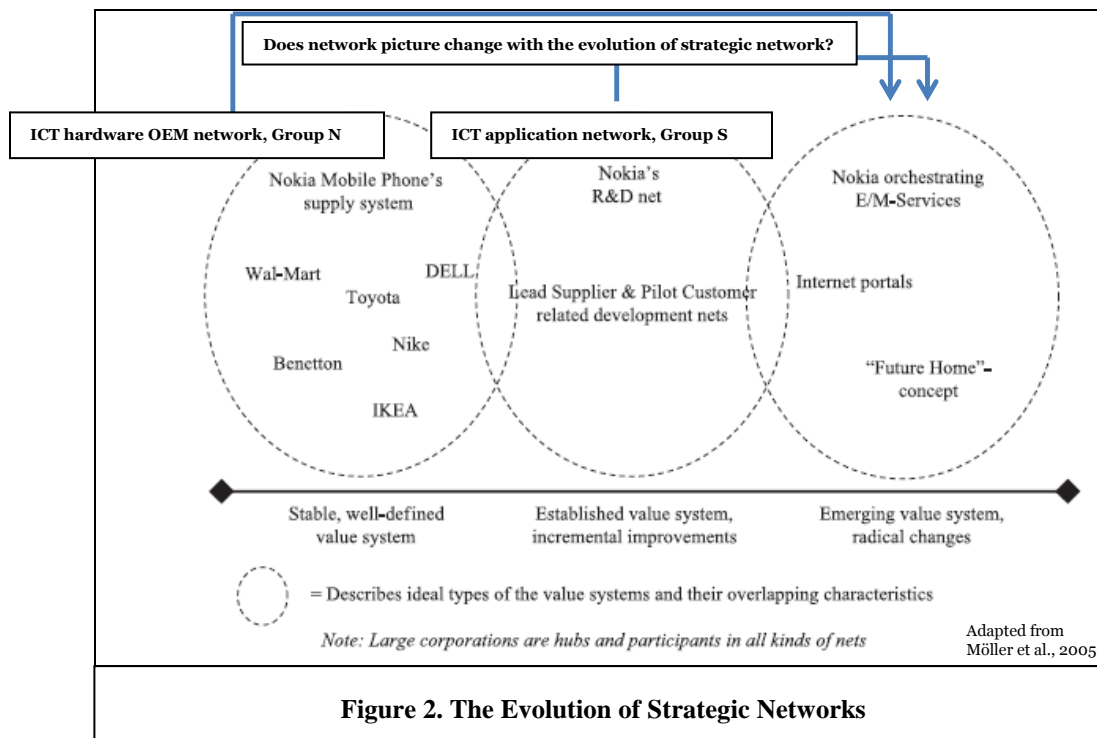
Interestingly, our findings of the “sphere” network in this case were different from the descriptions of Henneberg et al. (2006)’s in terms of the dimensions of power and directionality of interaction. For Henneberg et al. (2006), this type of network did not appear to obviously represent either actors and clear power relationships, or dominating directional interactions. However, we found that the local software application firms saw the boundary organization as a “spokesman” who is able to create an organizing vision in ICT software industries, pushing the institutional forces to support the legitimization and mobilization in the diffusion their innovative software applications (Wang and Swanson, 2007). These differences between of Henneberg et al. (2006)’s study and ours might be due to the different actors involved in the networks. Henneberg et al. (2006) focused on business networks, while we emphasized on the network pictures of a boundary organization in this network. In the network picture of the Software group, the client firms even expected X Institute to serve as an institutional force to legitimize new ideas. As a result, the boundary organization was weighted unequally with respect to other network actors in this sphere network.

The network picture of the software application firms also demonstrates a *business renewal network* in Möller and Svahn (2003) ‘s value systems, refer to Table 1. This type of strategic network is used to foster local products and produce new technology or business innovations – involving the incremental modification of existing routines and capabilities. Möller and Svahn (2003) suggest the capability to manage a *business renewal network* is to bridge communities of practice—experts in various technologies, software developers, and business managers who are essential in creating new, specialized knowledge (Zollo and Winter, 2002).

In our case study, however, we found that whereas the software firms were trying to attribute the leading role to the boundary organization, the consultants themselves did not seem to be ready to take the self-initiated responsibility, making this “sphere” network an immature *business renewal network*. The immateriality might result in the historical development of Taiwanese ICT industries, which heavily rely on venture capital funds and initial public offering as principal source of corporate financing. Unlike South Korea, where giant family owned conglomerate, *Chaebol*, remained the dominant player in high-tech industry and overseas business expansion, the Taiwanese government has strategically incubated small and medium size high-tech firms or start-ups, instead of family business (Kim, 2007). In absence of the strong financial backing of a giant parent company, the role of the policy network lined up industrial planning agencies, state-owned industrial banks, and investment funds, private venture capital, high-tech start-ups, public research organizations etc. is more salient than the self-initiative business network. The expectation for the governmental engagement in identifying trajectories of technological diffusion and innovation, and serving as a locus for coordinating joint R&D activities and collaborative business strategies remain strong (Chu, 2007).

As shown in Figure 2, Möller et al. (2005) used Nokia as an example to illustrate the three different strategic networks of the mobile phone’s supply chain system, R&D system and orchestration of emerging mobile (E/M) services. In our research, we found the strategies and network management capability of the boundary organization were restricted in terms of its mainstream network picture. Although the *demand-supply network* of the hardware OEM firms has been the dominant picture of Taiwan’s ICT industries in the historical context, this old OEM manufacturer’s way of thinking of anticipating a stable,

efficient, closely tightened value system, hinders the mainstream ICT discourse in Taiwan from opening to a more flexible *business renewal sphere network* perspective. This *network inertia* caused by the existing network picture also deters the boundary organization from improving its innovation and integration abilities, let alone from transforming to an *emerging business network* perspective, which requires the abilities for radical change and to face uncertainties.



In conclusion, our findings of the network pictures of a boundary organization reveal the path dependent processes of ICT driven economic growth, which, as suggested by Avgerou (2003) and Hite and Hesterly (2001), are related to the *network inertia* of its network contexts. In this sense, the historically developed network pictures might constrain both the evolution of strategic networks and the economic changes of a nation, as Möller and Svahn (2003) have argued.

In our case of Taiwan, the development of Taiwan, starting from the "ICT innovation as transfer and diffusion" perspective of the 1970s, has successfully helped its economy grow from a low-income level to a middle-income level. However, whether or not these policies can lead to a more future-oriented economy transformation to face the new challenges of ICT4D 2.0 (Heeks, 2008), such as cloud computing and smart mobile phone services, remains to be seen and researched. The ability to unpack the existing *network inertia* of the ICT industries is of great significance.

Theoretically, this study contributes to the ICT4D literature by incorporating the theories of network pictures and corporate strategic networks with national ICT innovation strategies. We provide a real life case in Taiwan supporting the *social embeddedness* perspective of ICT4D as an in-depth explanation of the interweaving between technology innovation and its institutional arrangement. We also expand the existing industrial marketing literature by observing boundary organization as a different type of strategic network in developmental states.

Practically, this study suggests network picture analysis as a powerful policy making instrument to help developing countries and developmental states unpack the dark side of ICT-enabled development. Drawing on the network picture framework, previously undiscovered factors have come to light. By spotlighting the possible existing *network inertia* in a boundary organization, decision makers are encouraged to reexamine existing paradigm, to reallocate resources, and to reconfigure the extended

relationships in a more strategic and proactive way. The fast changing global economy calls for less rigidity and draws attention to integrating social embeddedness beyond institutionalized settings.

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