INTERORGANISATIONAL NEW SERVICE DEVELOPMENT CAPABILITY IN THE MOBILE COMMUNICATIONS ECOSYSTEM

PhD Thesis

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This thesis marks a fundamental milestone in my life. It is a manifestation of my passion in undertaking a journey via the road not taken – a journey that required enormous courage in the face of daunting trials and tribulations – a journey not without its rewards – a journey that has fundamentally shaped me into the personality I am today.

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"Two roads diverged in a wood, and I—
I took the one less travelled by,
And that has made all the difference".

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people and events that unfold around me. That serves to remind me that the Holy Trinity is ever present to those who have faith and the sincerity to live.

This thesis is dedicated in passion for the souls in Purgatory

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Abstract

Advances in platform technologies suggest that the evolution of common digital-media platforms will usher in a proliferation of applications and services in the new media business space. However, organisations are unlikely to develop services on their own because of the diverse range of skills, resources and knowledge required to succeed in the digital age. Organisations specializing in domains as diverse as content development to technology infrastructure provision are increasingly finding themselves structurally dependent on one another through network arrangements such as business ecosystems. They find themselves contributing their specialist competencies in providing end-to-end rich media services such as Mobile TV and Mobile Music services within the context of the business ecosystem. This emerging trend has intrigued new service providers in the mobile services industry in their attempt to understand the underpinning concepts that affect the capability of such business ecosystems to develop new rich media mobile services.

This thesis contributes to our understanding of the new service development (NSD) literature in complex business networks with technologically dynamic and structurally changing environment. In understanding how interrelated businesses develop new rich media mobile services on common technological platforms within dynamic business environments, the thesis moves the analytical focus from the level of a focal business to the level of the "business ecosystem," a collection of related businesses and institutions. It examines how platform technologies such as Service Oriented Architectures (SOAs) bring about a new business potential in business ecosystems.

The thesis identifies the business concepts that impact on NSD capability from two primary dimensions; *network interconnectedness* and *business customer collaboration*. Literature suggests that the concepts “network interconnected” and “business customer” collaboration are critical in defining interorganisational NSD capability. Network interconnectedness is defined by concepts such as joint dependence, New Service Development Platform (NSDP), network centrality, structural differentiation and ‘co-opetition’. The notion of customer collaboration is defined by the concept of lead customer knowledge.

The setting for the thesis is the infocoms (IT, Telecommunications and Media industries) sector. The unit of analysis in the thesis is the rich media mobile services business ecosystem. A qualitative approach was adopted to provide; (a) greater depth of insight to gain a better understanding of the phenomenon present in business ecosystems and, (b) to address the lack of, or limited, theoretical frameworks available to guide this research. Being a new phenomenon, case study data was collected to refine the working propositions developed from literature. Theory building follows the process identified by Eisenhardt (1989).

The case study approach is based on semi structured interviews that investigates contemporary phenomenon in a real-life context. The key informant technique was employed in selecting respondents for the research. The single case study approach was chosen with the view to developing a more comprehensive understanding of the phenomenon that characterizes a business ecosystem to assist in theory building. Concerns of external validity were traded off against opportunities to gain greater insights into yet incompletely documented phenomenon.

The research findings reveal that joint dependence, New Service Development Platform (NSDP), network centrality, structural differentiation and coopetition affect the capability of the business ecosystem in developing new services. Joint dependence rather than network interconnectedness is the cornerstone concept that affects the new service development capability of business ecosystems. Joint dependence is explained by the notion of embeddedness; mutual empathy and mutual commitment; structural congruence; and familiarity and mutual forbearance displayed in the actions of actors within the business ecosystem.

The concept of a New Service Development Platform (NSDP) that affects the capability of a business ecosystem in developing new services provides standardized reusable components that are important to the service development capability of the business ecosystem. This modular feature of the NSDP provides the fundamental building blocks for the Mobile TV service which enables the business ecosystem to reduce service development time and costs; as a result enabling the business ecosystem to create a proliferation of services and variety of niche services.

Network centrality emphasizes the importance of key organisations in the overall structure, the well-being and the future prospects of the business ecosystem. The evidence deduced from this thesis indicates that the determinants of network centrality (i.e. the framework of SLAs in the ecosystem guided by the primary SLAs between the primary actors, New Service Development Platform (NSDP) and the Interorganisational New Service Development Framework (INSDF)) provides for the visibility and attractiveness of the network operator as the central actor in the ecosystem.

Structural differentiation suggests that the emergent systemic property that actors (organisations) come to occupy in an identifiable set of network positions is in fact niches. Actors' unique and specialized area of competencies promotes the necessity for business ecosystems to be on a constant search for such niche actors within and without the business ecosystem to ensure the vitality and the capability of the business ecosystem in creating new rich media services. The creation of niches according to the evidence deduced in this thesis indicate a joint niche creation initiative; a systematic effort in strategic niche management initiatives; and the diligent management of key technologies on a trial and error basis on the part of the primary actors in the Mobile TV ecosystem.

Finally, the analysis of the notion of coopetition in this research reveals that it is not merely the dynamics of coopetition that contribute to the new service development capability of the ecosystem. Rather the evidence suggests that the dynamic forces of a coopetitive relationship between actors enable the emergence of dynamic capabilities. It is dynamics capabilities from coopetitive relationships that make the contribution to increased new service development capability of the Mobile TV ecosystem.

Keywords: *New service development capability, interorganisational networks, business ecosystem, rich media services.*

Declaration

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(Stephen Pragasam Singaraju)

Date: ______________________

Chapter 1
Overview and Background

1.1. Introduction

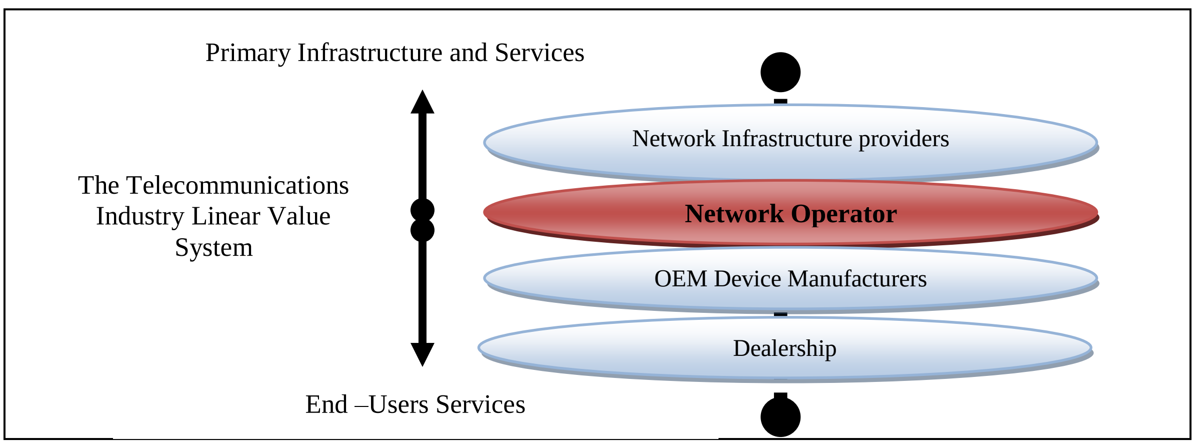
This chapter provides a brief background to the latest developments in the global telecommunications industry and articulates the issues driving this research. The literature gives rise to some fundamental questions, which gives structure to the larger scope of the inquiry. In particular the business ecosystem concept, a core concept defining the thesis is introduced and its relevance to the changing mobile services landscape is explained. The generic actors that typically populate the rich media business ecosystem are defined. This then provides the basis upon which the relevant theoretical domains are identified. The theoretical domains from which this thesis is derived are then briefly mentioned before the literature gap is defined. The chapter concludes with a brief description of the overall structure of the thesis.

1.2. Background and Research Motivation

Industry reports claim that the global mobile telecommunication industry recorded 1.8 billion users in 2004 (ITU, 2007). The International Telecommunication Union (ITU) data indicate that worldwide mobile cellular subscriber numbers surpassed the 3 billion mark (i.e. close to 50 percent of the world's population) in August 2007. This has been attained on the back of mobile device sales growth which has been robust across almost all regions in the world. The number of mobile services subscribers has, as a result of the growth in mobile devices sales grown between 20 to 30 percent globally since 2000, when they stood at 12 percent. This figure is expected to grow to 3.5 billion by the end of 2009 (McQueen and Reid 2005; Informa Telecoms and Media 2005).

The combination of 3G (Third Generation) wireless broadband and the gradual improvement in computing functions such as display and storage technologies has augmented the usage and capabilities of mobile devices (Tilson and Lyytinen, 2006). The 3G transition transcends beyond a technology upgrade (Barnes, 2002). With the emerging portfolio of services, mobile network operators are moving far beyond voice telephony and simple text messaging (Barnes, 2002).

Figure 1.1: The Mobile Telecommunications Industry Linear Value System



However, until the mid of this decade, incumbent network operators such as AT&T in the US, BT, Deutsche Telecom and France Telecom in Western Europe, and NTT in Japan were preoccupied with promoting value provided by traditional services such as voice telephony and simple text messaging. These services, due to their simplicity in provision, in comparison to rich media services[1] such as mobile TV and mobile music, required only the traditional way of doing business – the linear systems

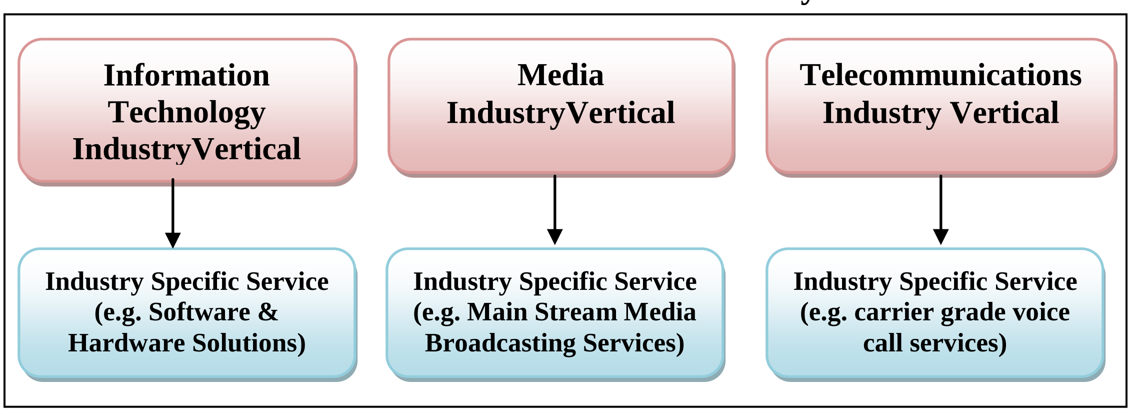
[1] In the context of this thesis, rich media mobile services are defined as value-added services based on content and applications that the user can access on mobile devices.

approach. This was consistent with the way network operators were typically organized with their value chain partners – i.e. linear supply chains (as illustrated in *Figure 1.1*).

The logic behind such linear relationship is that network infrastructure providers such as Ericsson, Siemens or Alcatel Lucent provide the required infrastructure for the provision of, for example, a new voice service. The network operator upon acquiring the necessary infrastructure then proceeds to develop new voice services. The devices OEMs (Original Equipment Manufacturers) such as Nokia, Samsung and Sony Ericsson would then develop compatible mobile devices that are able to deliver these new voice services to end-users. Ultimately the new voice service is then commercialized and made available through an authorized dealership network (Ancarani and Shankar, 2002, 2003). The network operators viewed their relationships with their business partners from two dimensions – mainly upstream and downstream, in a strictly supplier-vendor relationship as illustrated in *Figure 1.1* (Fransman, 2002).

As argued by Achrol (1997), the linear network as represented in *Figure 1.1* refers to a set of direct supply or distribution relationships organized around a focal organization best positioned to monitor and cope with the critical contingencies or value activities in a particular market. The circumstance represented in *Figure 1.1* describes a linear network in an industry-specific chain of suppliers and distributors, organized around a focal organisation, the network operator. The network operator often performs only limited service development functions. In particular, network operators act as an integrator between themselves and business firms providing specialist services and technologies. The network operator's primary task is to provide marketing expertise and resources; a technology platform for other organisations to provide service; and product or technology components that is required to develop the final product or service for end-user consumption (Achrol and Kotler, 1999). Similar developments were observed in other industries such as the Media and IT industries. For example, content owner such as CNN and Walt Disney have predominantly dealt with content aggregators to distribute their content to providers of cable or satellite TV service. Similarly software organisations develop alliances with operating system providers such as Microsoft or Computer Hardware manufacturers such as Dell or Hewlett Packard to market their software application to the end users (Peppard and Rylander, 2006). These industry verticals were predominantly preoccupied with industry specific service development initiatives as illustrated in *Figure 1.2*.

Figure 1.2: Service Development Initiatives in the IT, Media and Telecommunications Linear Value Systems

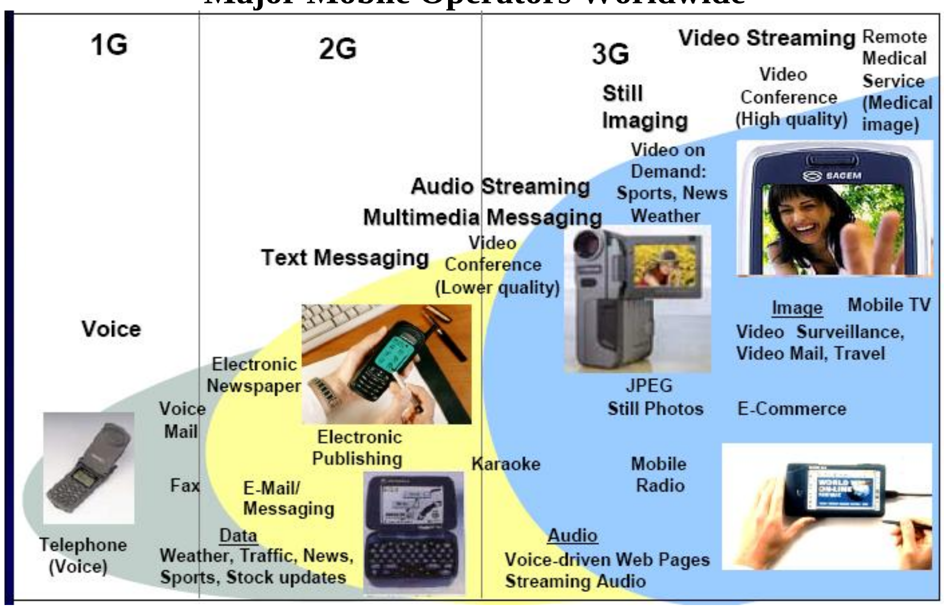


However, with the passage of time, network operators in the telecommunications industry increasingly found themselves operating in an era of digital convergence[2] (Collins, Bane and Bradley, 1997). Digital convergence resulted in a shift from a

[2] Digital Convergence is the priming of underlying digital technology components and features such as voice, texts, video, pictures, broadcasts, presentation, streaming media, global connectivity and personalized services; the combination of all of these features and abilities from multiple electronic systems into a simplified, converged and computer-mediated communication system to enable individuals to interact, play, communicate, collaborate and share information in many new and different ways (http://www.globrocks.com/globrockssitearticles/digitalconvergence.html)

competitive environment characterized by linear industry systems comprising voice communication (telephony), visual communication (media), and data communication (Information Technology) towards a new "infocommunication" sector (also referred to as the infocoms sector) (Collins, Bane and Bradley, 1997; Barnes 2002; Kärrberg and Liebenau , 2005; Fransman, 2002). The emergence of the infocoms sectors provided the means for network operators to explore opportunities in offering rich media services.

Figure: 1.3. Selected Data Services (Rich Media Services) Offered by the Major Mobile Operators Worldwide



Source: International Telecommunications Union (ITU), http://www.itu.int/osg/spu/presentations/2003/Srivastava_trends_mobile_data_0703.pdf, Accessed on 9th November, 2008

Rich media services are content and application based services[3]. They typically involve technologically enhanced motion, sound, video, interactivity or a combination of these elements. The final outcome emerging from such technologically enhanced content and applications includes services that have a relatively high degree of content

[3] Content includes movies, news, documentaries, music files, etc. Applications would typically include software such as those applicable for mobile games.

such as mobile news, mobile music, mobile TV, mobile video conference, mobile commerce, mobile location-based information, mobile radio and remote media services (as represented in *Figure 1.3*). These services then emerge as rich media mobile services delivered for the consumption of end-users through rich media service-enabled mobile devices via a public mobile telecommunications network.

The more popular types of rich media mobile services available include information services, directory services, banking and trading, shopping and mobile ticketing, and entertainment (Barnes, 2002; Camponovo and Pigneur, 2003; Sadeh 2002). The most common information services include news, sports, business news and the weather forecast.

Network operators realized that in order to be able to provide rich media services, a complex arrangement of organisations will need to be formed. The provision of these content and applications involves a complex network of content and technology providers working very closely with the network operator in a complex adaptive system referred to in this thesis as the business ecosystem. The realities posed by the dynamism of the new infocoms 'network economy' and the nature of services being developed rendered the value chain concept inappropriate to analyze the telecommunications industry in the 21st century with the aim of uncovering sources of value (Normann and Ramirez, 1994; Parolini, 1999; Achrol and Kotler, 1999, Tapscott et al., 2000; Hakansson and Snehota, 1989; and Campbell and Wilson, 1996, Peppard and Rylander, 2006). The business ecosystem concept therefore provides a good framework for this thesis to explore the dynamics affecting the development of rich media services.

1.3. The Concept of Business Ecosystem and its Relevance to Rich Media Services

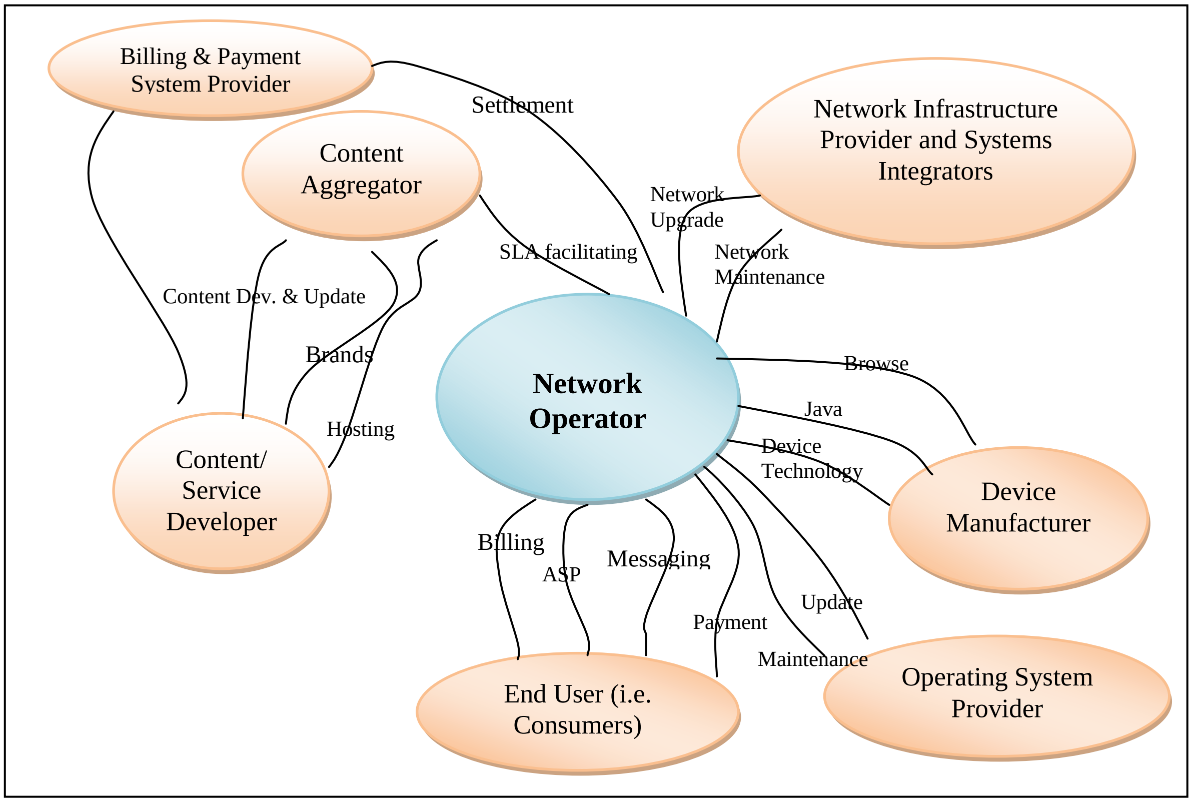
A business ecosystem is a loosely coupled system that consists of a focal business and other types of interdependent organisations (Moore 1993; 2006, Lewin, 1999; and Iansiti and Levien, 2004). It also encompasses organisational actors and their relevant environmental components, such as markets, technologies, and institutions, which are related to the constituent businesses. Moore (2006) states that the term 'business ecosystem/s' refers to "intentional communities of economic actors whose individual business activities share in some large measure the fate of the whole community" (p. 34). Thus, in the business ecosystem model, a particular business is not seen as an independent entity but rather as a part of a larger whole referred to as a business ecosystem that spans a variety of businesses. The ecosystem presumes a dynamic process in which interdependent businesses evolve in an interactive manner as changes in a business set the stage for responses through subsequent changes in other industries (Moore, 1993; Iansiti and Levien, 2004).

The studies by Peppard and Rylander (2006), remapped the way the telecommunications industry is viewed – from a predominantly linear value chain approach to a complex adaptive network system with business ecosystem characteristics. In introducing the concept of strategic nets on a continuum of value system networks, Möller, Rajala, and Svahn (2005) have argued that rich media mobile services business ecosystems are effectively positioned as strategic nets with emerging value systems characteristics.

Emerging value systems as defined by Möller et.al. (2005) covers several modes including competition alliances; resource/capability access alliances; resource and capability development alliances; market and channel access/cooperation alliances; ‘‘networking forums’’—company or institutionally driven. Möller et.al. (2005), however, goes further to introduce the concept of multidimensional value nets (MDVNs) and places rich media mobile services business ecosystems in this category of strategic nets. MDVNs are explained as emerging systems exhibiting radical change. A MDVN typically contains a hub or a core organisation, sometimes called a ‘‘hollow’’ organisation, that creates its market offer by integrating the products and services required from a group of different types of suppliers and channel firms. Amazon.com for example, was cited as a good illustration of a hub or a core organisation in a ‘new economy’, whose own core capabilities are formed by network building, coordinating skills and enhancing customer-relationship skills. MDVNs are formed with a view to creating new technology platforms or new business concepts requiring the orchestration of several actors and the creation of new value activities. The more complex the business network, the more the need for harnessing of knowledge and developmental capabilities of multiple actors to generate value in such business network (Tapscott, Ticoll, and Lowy, 2000). Möller et.al. (2005) provides the example of mobile services such as mobile-payment systems, which require intimate knowledge and actor cooperation between actors such as banks, telecom companies and various software producers before the service can be offered as an end-to-end solution to consumers.

Along with the transition in network infrastructure to Internet Protocol (IP) based technologies and the change in emphasis of service offerings from voice-based service to data services (i.e. rich media services), network operators found the organisational arrangements and relationships between themselves and the content and technology providers typically resembled a kind of 'ecosystem' (Peppard and Rylander, 2006).

Figure 1.4: The Partial Rich Media Services Business Ecosystem



Source: Peppard, J., and Rylander, A. (2006), "From Value Chain to Value Network: Insights for Mobile Operators," *European Management Journal*, 24 (2-3), 128-141. (p.135)

Peppard and Rylander (2006) argue that, in contrast to a traditional value chain, the mobile services value chain can be more realistically and fundamentally remapped into a multidimentional network structure. For example, a typical rich media mobile services business ecosystem would consist of individual actors such as content/ service developers, content aggregators, network infrastructure providers, systems integrators, network operators, device manufacturers, billing and payment system providers, operating systems providers and end-users (i.e. consumers) as illustrated in *Figure 1.3* (Peppard and Rylander, 2006; Camponovo and Pigneur, 2003). *Appendix 1* provides a brief illustration of the unique roles, business interactions, and core activities of the various categories of actors that form the rich media services business ecosystem. *Figure 1.4* describes a typical business ecosystem behind the provision of rich media services.

Figure 1.4 reveals that the ability to deliver rich media mobile services to customers requires collaboration among various actors within a network. For example, the network operator does not have the capability to single-handedly provide Mobile TV services to end-users without first collaborating with content providers to develop and channel content in the proper specifications via the infrastructure provided by the network operator. Telecommunications network architectures, mobile devices, applications and services need to be compatible based on the requirements of a common standardized platform. This requires collaboration among the various actors within the network to achieve a certain degree of standardization in both content and individual infrastructures designed to channel content for the ultimate services consumption experience of the end-user (Camponovo and Pigneur 2003).

As organisations have accelerated innovation in their own business domains, they have discovered it would be a daunting if not an impossible task to drive innovation independently. For every advance made in their specific business domains, there are complementary innovations that must be integrated for the total system to be able to develop the sum of its parts. This in turn enables the end-users or the customers to benefit in terms of consuming products and services that prior to such arrangements never existed. Complementary advances often must co-evolve across organisational boundaries because no single firm has all of the required specialized knowledge and managerial resources necessary for the whole system (Moore, 2006). Indeed, a substantial solution to a customer's need may require the participation of dozens or even hundreds of diverse contributors, each of which is a master of fast-moving, complex and subtle developments in its own domain (Moore, 1993).

Closer observation of *Figure 1.4* also reveals how actors from different linear value systems (i.e. industries) are represented. For example, actors such as content aggregators, network operators and the operating systems providers are all actors originating from the media, telecommunications and information technology value systems respectively. Through the availability of common technology platform such as an IP based technology networks provided by network operators, actors from diverse vertical value systems are integrated in the context of a business ecosystem. Hence, the business ecosystem represented in *Figure 1.3* is a constellation of actors from multiple value systems integrated through a common platform of service development – the IP based platform.

1.3.1. The Characteristics of a Business Ecosystem

Despite the differences in the definition concerning the notion of a business ecosystem, there is agreement that some characteristics are essential in any business ecosystem (Moore, 1996, 1998; Moore, 2006; Iansiti and Levien, 2004). The first and most fundamental characteristic associated with a business ecosystem is *interconnectedness*. Interconnectedness is defined as the link between actors within a business ecosystem. This link between networks of organisations is exhibited in the technologies they share, the products they jointly develop, and the consumers they seek to collectively serve (Iansiti and Richards, 2006). Iansiti and Levien (2004) argue that business ecosystems are characterized by a large number of loosely interconnected participants who depend on each other through their interconnectedness for their mutual effectiveness and survival. This means that organisations in a business ecosystem share their fate with each other through the mutual dependence that is manifested in their interconnected business activities. The benefits of being a member of a business ecosystem include the opportunity to form alliances and thrive in a network, protected from potential external threats (Lewin, 1999). However, interconnectedness may lead to a situation where changes in one part of the network are propagated throughout the system so that an organisation may not survive despite its best efforts (Lewin, 1999).

The second characteristic defining business ecosystems is that the ecosystem is focused on a '*common output'* (Iansiti and Richards, 2006). In contrast to the vertically integrated environment of the 1960s and 1970s, today's industry is divided into a large number of segments together producing specialized components, systems, and services (Iansiti and Richards, 2006). These specialized components, systems, and services in the context of a business ecosystem are very often orchestrated to produce just a single end-to-end product (Iansiti and Richards, 2006). This simply means that organisations that comprise the ecosystem are coordinating their resources for a common output – the development of a 'single concerted product or service offering'. The degree of interaction required among firms in such business ecosystem settings is truly astounding, with hundreds of organisations frequently involved in the design, production, distribution, and implementation of a common output for the business ecosystem. This collaborative process of developing new services in the ecosystem is essentially a fundamental value creating activity influencing the flow of resources and the spread of risks in relationships between actors (Iansiti and Richards, 2006). This same collaborative process of developing new services in the ecosystem is also manifested in the trust and commitment driving the substance of the relationship (Iansiti and Richards, 2006).

The third characteristic defining business ecosystems is the inter-dynamics between *competition* and *cooperation*. Moore (1993) and Iansiti and Levien (2004) argue that ecosystems base their success on both 'competition' and 'cooperation'. Lewin (1999) further argues that part of the complexity of interactions that define the interorganisational dynamics in an ecosystem is not limited merely to cooperative interactions but also competitive interactions. Ecosystem leadership is seldom uncontested according to the various observations made by Moore (2006). Intra-ecosystem struggles are manifold as organisations seek to ensure that their particular contributions remain highly valued as the overall vision of the ecosystem advances in alignment with the environmental conditions that dictate decision-making. Therefore, when interactions between organisations are examined in the context of an ecosystem, the entire complexity of interactions has to be taken into consideration to obtain a better understanding of the phenomena (Lewin, 1999).

A business ecosystem can also be defined in terms of '*landscapes'* (i.e. industries). Lewin (1999) defines a business ecosystem as consisting of several organisations, each at a certain position in its own industry. These industries are then coupled to each other through the interactions between these organisations that represent the unique industries in the ecosystem. This implies interconnectedness so that changes in one industry have an effect on other industries; i.e. those of competitors, collaborators and complementors. Moore (2006) highlights the significance of organisations that comprise the business ecosystem establishing interfaces and protocols in integrating the various industries that comprise the ecosystems in putting together the contributions of each organisation that comprise the total business ecosystem.

In defining the ecosystem, Iansiti and Levien (2004) introduce the concept of the *'roles'* associated with the various organisations that comprise the business ecosystem. There are four different roles that organisations can occupy in business ecosystems. *Keystones* are central actors that serve as the enablers and have a great impact on the whole system, although they constitute a small portion of the total number of organisations in the ecosystem (Iansiti and Levien, 2004). Thus, organisations such as Microsoft and GM, for example, are conceivably the central actors in their own business ecosystems (Moore, 2006). *Niche actors*, on the other hand, make up the majority of the business ecosystem (Iansiti and Levien, 2004). *Dominators* and *hub landlords* are the kinds of organisations that attract resources from the system, but do not function reciprocally (Iansiti and Levien, 2004).

Central to the emergence and coherence of the business ecosystem is the concept of a '*platform'*. Iansiti and Richards (2006) argue that "a platform is a set of tools or components that provide building blocks for application providers" (p. 81). Basing their arguments on computer operating systems such as Microsoft Windows and Red Hat Linux, Iansiti and Richards (2006) suggest that these operating systems are in fact ‘platforms’. These operating systems are seen to provide extensive development tool sets upon which millions of developers can then more easily develop end-user applications. Platforms perform a critical role in ecosystems in that they make available consistent and reliable components that make application providers more efficient in developing applications (Iansiti and Richards, 2006). As a result, the platform providers are strategically positioned to facilitate innovation, productivity and the general health and well-being of the whole ecosystem (Iansiti and Richards, 2006). In analyzing IT ecosystems, Iansiti and Richards (2006) observed that organisations which provide applications or components that are part of the platform. This suggests that central actors are in fact platform providers. These central actors have the opportunity to form the crucial ‘*hubs’* in the ecosystem (Iansiti and Richards, 2006). The platforms developed by central actors are used by other organisations in the business ecosystem to add value to the new service being developed collectively by members of the business ecosystem. In this way, platform providers effectively connect many application providers to each other and to end-users, defining critical common interfaces, as well as reusable components (Iansiti and Richards, 2006).

Having assessed the arguments that define the concept and characteristics of business ecosystems, it is apparent that the value network concept as propagated by Peppard and Rylander (2006) shares similar characteristics with business ecosystems as defined by Iansiti and Levien (2004), Iansiti and Richards (2006), Moore (2006) and Lewin (1999). The concept of business ecosystem is then applied to the context of rich media services to better understand the phenomena describing the development of new rich media services.

1.3.2. Key Actors and their roles in the Rich Media Mobile Service Business Ecosystem

The generic roles within the Rich Media Services Business Ecosystem consist of users, network operators, device manufacturers, service providers, content providers and content owners. *Users* define the value proposition in the development and delivery of a Rich Media Services Business Ecosystem (Peppard and Rylander, 2006). The consumer market rather than the business market has been the driver for mobile services up to this point in time (Peppard and Rylander, 2006). Business market needs are centered on supporting the mobile workforce and enhancing business processes. Consumer needs are focused on infotainment in a combination of information and entertainment services (Alanen and Autio 2003).

In the Rich Media Services Business Ecosystem, the *network operator*s in particular seem to play an important role (Peppard and Rylander (2006). Examples of companies that qualify in this category of actors include AT&T and Sprint in the US; BT, Vodafone and Orange in the UK; and NTT in Japan. The network operators can be typically classified by the type of service they provide. These actors are typically divided into mobile network and mobile service operators (Camponovo and Pigneur, 2003). Mobile network operators own and manage network base stations and network infrastructure (Camponovo and Pigneur, 2003). They sell network services to mobile service operators, who in turn sell services to users and own the billing relationship (Camponovo and Pigneur, 2003). In most instances, these two operator roles are performed by the same organisation (Camponovo and Pigneur, 2003). This thesis does not concern itself with mobile service operators but with mobile network operators (referred in his thesis as the "network operator"). Network operators not only develop services but also own and maintain a mobile network infrastructure. The network operators' business is based on network licenses (Camponovo and Pigneur, 2003). Due to a scarcity of radio frequencies, licenses have been granted to a restricted number of operators. This regulation of the telecommunications industry does not allow for free competition (Camponovo and Pigneur, 2003). Network operators play a critical role as they occupy a strategic position within the business ecosystem. These network operators provide the network infrastructure that forms the basis upon which all other actors within the business ecosystem are connected via resources mobility and interdependent activities (Peppard and Rylander, 2006).

Device Original Equipment Manufacturers (or Device OEMs as referred to in this thesis) are actors that develop and assemble mobile devices (Camponovo and Pigneur, 2003). Example of companies that fall into this category of actors include Apple, Nokia, Sony-Ericsson, Samsung, Motorola and LG. Device OEMs combine the device modules of different actors in the business ecosystem on specific handset models as requested by the network operator. These include modules supplied by hardware providers, middleware providers, application providers and system integrators for the network operator (Alanen and Autio, 2003). This enables rich media services such as Mobile TV and Mobile Music to be consumed by the end-users through select ranges of devices (Alanen and Autio, 2003).

Software providers develop software products for devices and network platforms. Software includes operating systems, databases, browsers, personalization options, billing systems, and customer relationship management and security provisions

(Zhang 2002, Sadeh 2002). For example, a leading operating system in the area of mobile devices is EPOC, developed by the Symbian consortium, which includes actors such as Psion, Nokia, Ericsson, Motorola and Matsushita (Zhang 2002). Windows CE is a competing operating system developed by Microsoft (Sadeh 2002). The software developers work in close collaboration with devices manufactures in the development of new mobile devices. This is consistent with meeting the objective of device manufactures in making their devices capable of running a broader range of applications including rich media services (Camponovo and Pigneur, 2003).

Content aggregators are service packagers of mobile content (Camponovo and Pigneur 2003). These companies package mobile services for users from various content providers, predominantly in the form of channels (Camponovo and Pigneur 2003). A challenge faced by content aggregators has been the diversity of devices, which requires the services to be customized for use in each device (Camponovo and Pigneur 2003). For example, the movie content supplied by the content aggregators' partners has been typically developed to meet broadcasting standards, for services delivered via cable networks to homes (Camponovo and Pigneur 2003). However, the formats available for broadcast technology are incompatible for Mobile TV applications (Camponovo and Pigneur 2003). Mobile TV applications require video formats in different standards (i.e. usually in FTP[4]) to be compatible for video streaming[5] or simulcast[6] services more commonly used in the development and delivery of Mobile TV services. It is for this

[4] See *Appendix 12* for a brief discription.

[5] **Streaming media** are multimedia content that are constantly received by, and normally presented to, an end-user while being delivered by a streaming provider (e.g. network operator).It applies to media that are distributed over telecommunications networks, as most other delivery systems are either inherently streaming (e.g., radio, television) or inherently non-streaming (e.g., books, video cassettes, audio CDs).

[6] **Simulcast** is a portmanteau of "**simul**taneous broad**cast**", and refers to programs or events broadcast across more than one medium, or more than one service on the same medium, at the same time.

reason that their partnerships with network operators are critical for the delivery of their content through mobile devices (Camponovo and Pigneur 2003).

A *content provider* generates content for mobile services. In the mobile industry context, content can be seen as a product available by itself or as a complementary component of the actual product for sale – e.g. a news content made available by CNN via the mobile TV service (Camponovo and Pigneur 2003). Content providers can make their content available through many different media types, namely: TV, radio, newspapers, internet portals, and now thorough mobile portals (Camponovo and Pigneur 2003). The original content for distribution through these various mediums requires minimum adaptation prior to distribution via the various delivery channels (Sadeh 2002). This makes the cost through the reuse of digital content relatively low (Sadeh 2002). Creation of media content is the core competence of media companies (Feldmann 2002). The content providers are heavily dependent on network operators to distribute their content for a charge to the end-user (Camponovo and Pigneur 2003).

A *content owner* holds the content rights (Camponovo and Pigneur, 2003). The content owner can be the same party as the content provider; however, these two roles can also be independent of the other. Examples of content owners are Disney, Warner Music and football leagues. Content rights management is an integral part of the mobile service industry (Camponovo and Pigneur, 2003). In order to utilize established brands, media concepts and content services, an agreement with the content owner is needed.

In addition to the roles described above, there are a number of technical enablers in the mobile industry, such as *network infrastructure providers*, and *systems* *integrators*. Their fundamental role is to deliver the critical technical requirement such as the network infrastructure and systems integration work, common technical platforms and applications for service provisioning to the mobile networks (Camponovo and Pigneur, 2003) (see Appendix 1). Examples of such companies include Siemens, Ericsson and Alcatel-Lucent. A *regulator* is also an important party in the mobile industry value network. They govern the legal environment in which the industry operates in each country (Camponovo and Pigneur, 2003).

These actors although are part of a particular ecosystem, are not limited in their participation to any specific ecosystem. For example, content providers such as record label like EMI, Universal Music, Sony BMG and Warner Music extend their participation in multiple business ecosystems around the world with the objective of maximizing revenue from the sale of music content. These record labels are participants of multiple mobile music ecosystems involving major network operators such as BT, Telenor, AT&T, Sprint Vodafone, Telstra and NTT seving markets as geographically diversed as Noth America, Western Eupore, South Asia and Asia Pacific. Likewise other actors such as device manufacturers, system intergrators and software providers participate is multiple ecosystems for similar economic reasons (Peppard and Rylander, 2006).

1.3.3. The Business Ecosystem Concept and its Contribution to the Thesis

Having described the business ecosystem concept and its relevance to the rich media mobile services development, this section describes how the business ecosystem concept contributes to the development of the thesis.

The work by Peppard and Rylander (2006) and Möller et.al. (2005) remains descriptive with no empirical data to support their claims. Peppard and Rylander (2006) and Möller et.al. (2005) limit their inquiry merely to the development of conceptual frameworks. More importantly both of these pieces of academic work (Peppard and Rylander, 2006; Möller et.al., 2005) do not explore the capabilities of focal firms in developing rich media mobile services. Heikkinen, Mainela, Still and Tähtinen (2007) take a more focused approach to analyzing the roles of various organisations involved in the network in developing a rich media service. In applying an initial conceptual framework built on network management literature and role theory, Heikkinen et.al. (2007) examines the roles of the various actors that contribute the new service development process within the context of the mobile services network. Although being empirically grounded, the study is not designed to explore and describe the concepts that affect a network's capability in the development of rich media mobile services. Rather, the study focuses on the roles played by various organisations in new service development, at various stages of the new service development process, based on a single case study.

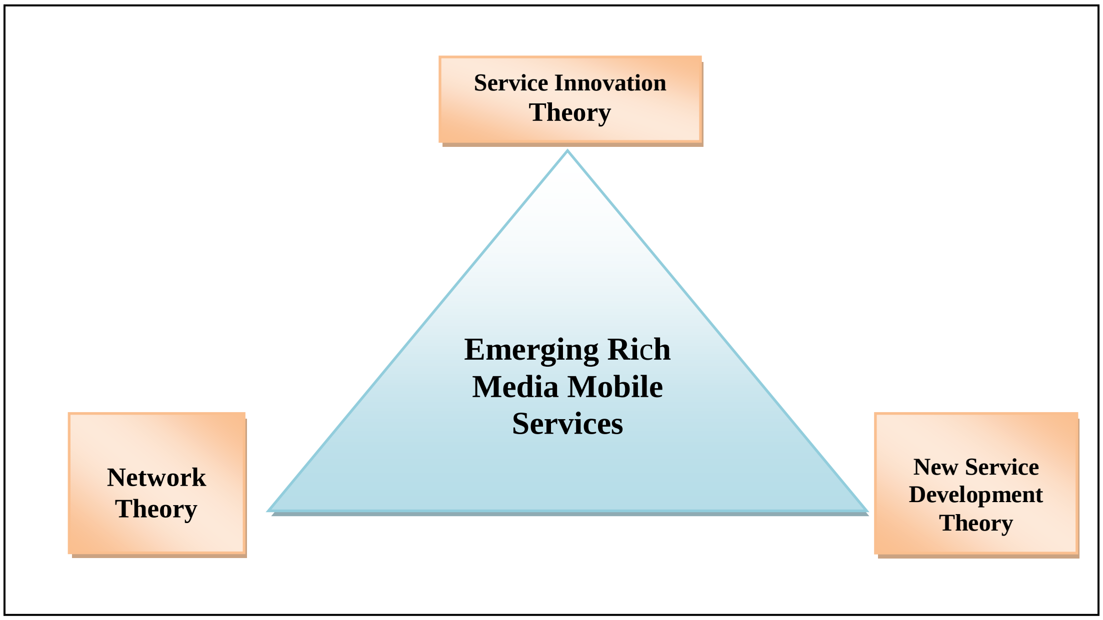
The gap in the literature as identified in the analysis of Peppard and Rylander, (2006); Möller et.al., (2005) and Heikkinen, et.al., (2007), forms the motivation for the application of the business ecosystem concept in the development of rich media mobile services. In applying the business ecosystem concept, this thesis explores resultant concepts affecting NSD capability in developing rich media mobile services. The thesis is developed around a single case study – the Mobile TV case study. This study aims to explore the research gap identified in literature – i.e. the concepts that affect a network's capability in the development of rich media mobile services. The thesis builds a framework that examines the NSD (New Service Development) capability of a business ecosystem in designing, developing and providing rich media mobile services to the marketplace.

The understanding of the development of new services within the context of a business ecosystem leads this research inquiry to three literature domains. These theoretical domains include *innovation theory* (Rogers 1983; Burgelman and Sayles 1986; Utterback 1994 ; Gopalakrishnan and Damanpour, 1997; Hauser, Tellis and Griffin, 2006), *new service development literature* (Shostack, 1981, 1987; Cowell, 1984; Scheuing and Johnson, 1989; Easingwood and Storey, 1996; Johne, 1994; Lovelock, 1996; Johne and Storey, 1998) and *network theory* (Pfeffer and Salancik 1978; Håkansson, 1982; Burt 1983; Granovetter 1985; Håkansson and Johanson, 1992; Ford, 1998; Achrol, 1997, 1999; Gulati and Gargiulo, 1999; Wilkinson, 2001). Through a better understanding of the three streams of literature, the aim of this thesis is to develop theory through the analogy of a business ecosystem. The anology of a business ecosystem is applied to aid in understanding the development of new services in business networks. The analogy can aid our understanding of businesses as an ecosystem by vividly highlighting certain pivotal concepts that describe the capabilities of a business ecosystem in developing rich media services.

1.4. Theoretical Positioning

Figure 1.5 graphically illustrates the three theoretical domains from which this thesis is drawn. Chapter 2 explains the three theoretical domains underpinning this research in greater depth. It examines the latest developments in the stream of literature within each domain and then proceeds to exhibit how all three domains integrate to contribute to the central theme of this thesis: *Interorganisational New Service Development Capability*.

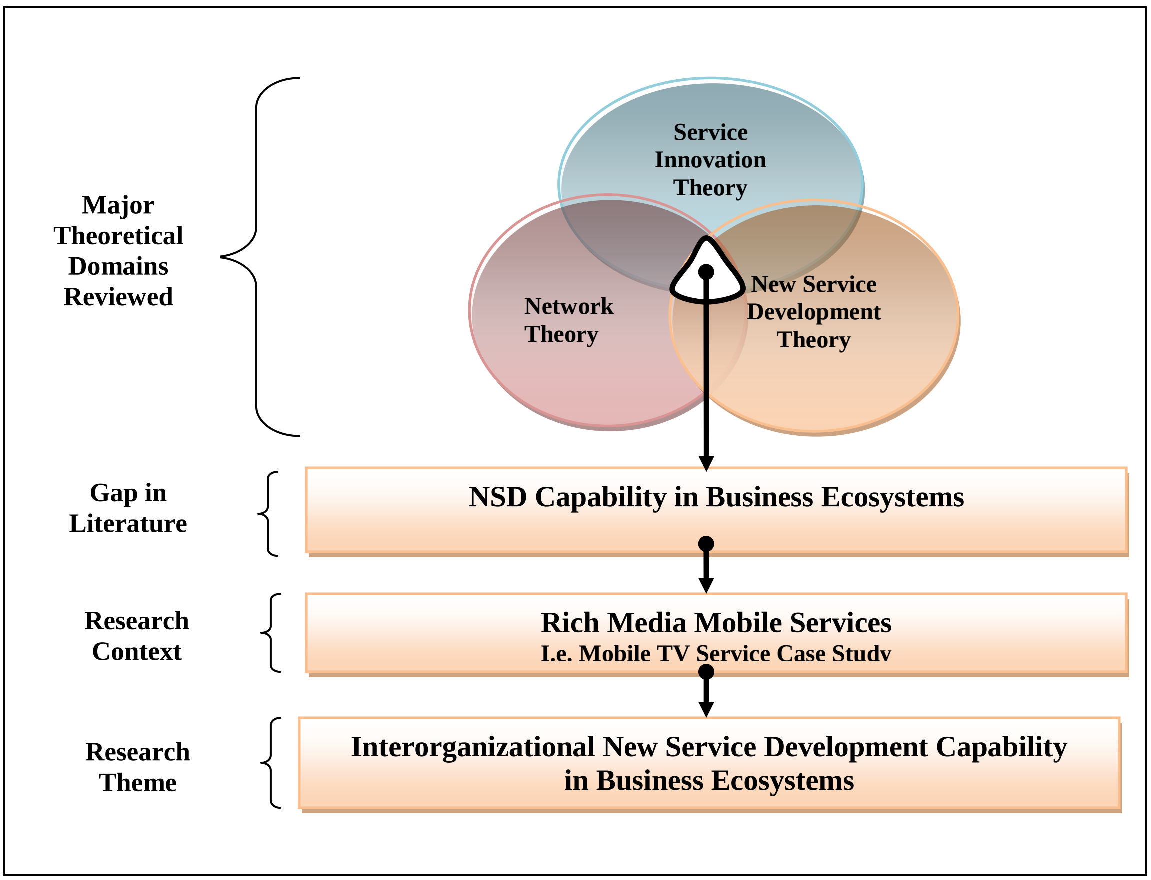
Figure 1.5: The Major Theoretical Domains of the Study



1.5. Positioning of the Thesis

These three otherwise independent streams of literature are concatenated to arrive at the central theme of Interorganisational New Service Development Capability. *Figure 1.6* illustrates how the literature gap emerges from the integration of these three streams of literature. This literature gap is then examined within the rich media mobile services research context. This then charts the path to its intended contribution to existing literature within the domain of New Service Development (NSD). In particular, this thesis extends the theory of interorganisational NSD capability by bridging these three theoretical domains (i.e. service innovation theory, network theory and new service development theory). The outcome of the research contributes to the understanding of how interorganisational NSD capability is affected in business networks.

Figure 1.6: Positioning of the Thesis



With the advancements already achieved in the digital media space, network organisations are expected to take the leading role in the creation of economic and social innovations within multidimensional value networks (MDVNs), such as business ecosystems (Möller et.al., 2005). In view of such advancements made in the digital media space, the developments in rich media mobile services is considered to be ahead of theory due to the rapid pace of emerging technology (Venkatesh 1998). This has left academic research lagging as service providers seek to drive their services to business markets as quickly as possible. Given such circumstances, academics need to capture and describe this activity in order to theorize and compare our understanding of practice in such a dynamic environment (Venkatesh, 1998).

In essence, this thesis provides a dual contribution in (a) probing and understanding the advanced developments of rich media mobile services in the mobile communications services industry and, subsequently, providing a theoretical framework to explain and guide the development of new rich media mobile services; and (b) by developing theory to allow the academic community to engage with practitioners in understanding the development of rich media mobile services as further progress is made within the realm of the mobile communications services industry. In so doing, this thesis identifies variables from business and academic literature and combines inputs from industry experts in developing a number of working propositions. The thesis then uses case study data to support, reject or update the working propositions into testable propositions (Gupta, Cadeaux and Woodside, 2005).

1.6. Structure of the Thesis

The first chapter explained the developments in the mobile telecommunications industry in the last decade. The chapter then proceeded to introduce a key concept defining the thesis – the business ecosystem. The concept of the business ecosystem is then defined and its relevance explained in the context of the developing rich media mobile services. The chapter subsequently identifies the theoretical domains that formed the foundation of this thesis without discussing the details of these theoretical domains (these theoretical domains are discussed in depth in chapter 2). The positioning of the thesis is then articulated from the three domains identified earlier in the chapter.

The second chapter discusses the framework of the study. Discussion of the contextual domain is followed by the detailed and constructive exposition of the theoretical domains underlying the thesis. From a theoretical perspective, the chapter draws on three theoretical domains and, in so doing, identifies a gap in the literature. The chapter concludes by identifying the overarching research question based on the theoretical domains discussed.

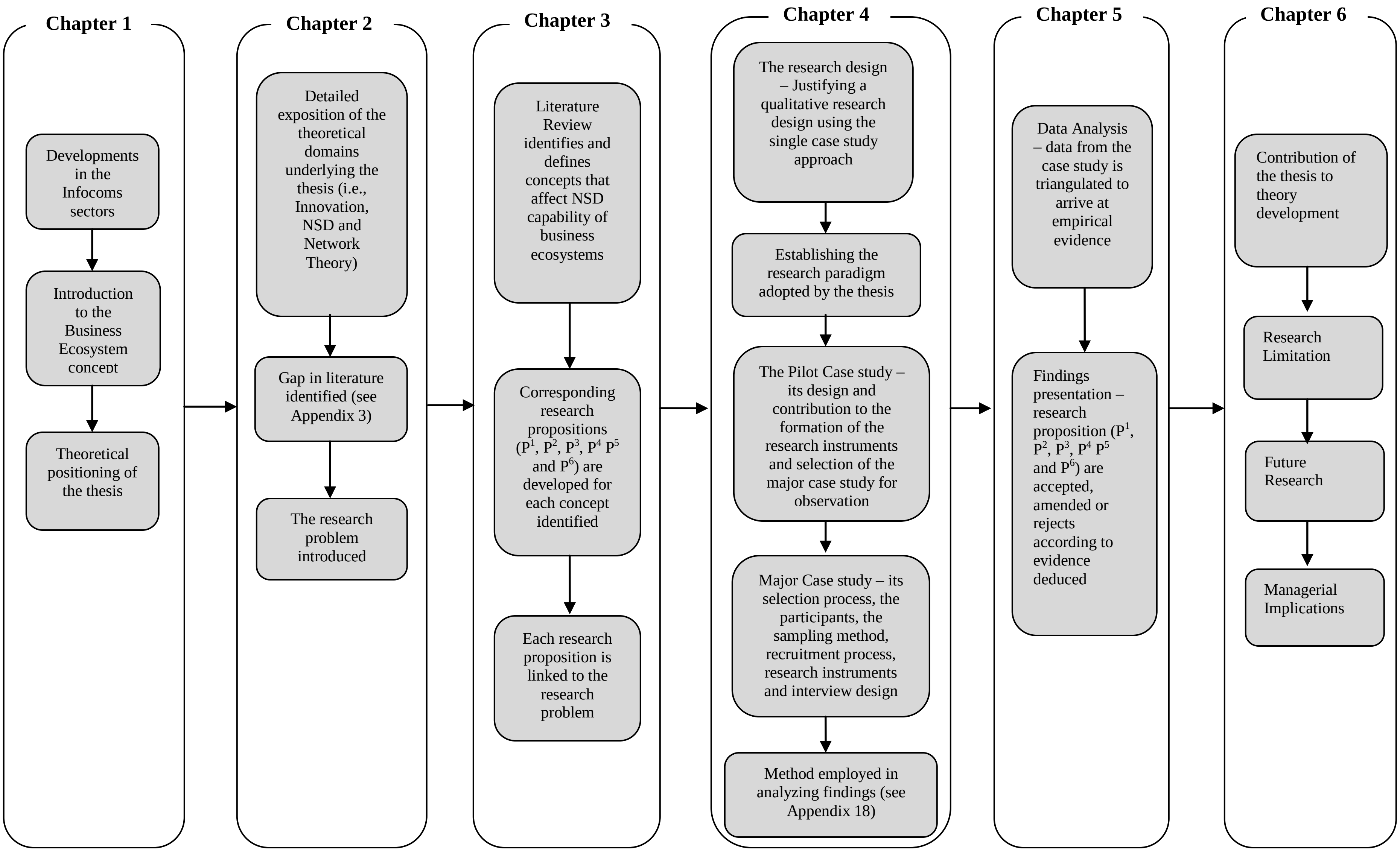
In the third chapter the variables that affect interorganisational new service development capability are developed and explored through an in-depth literature review. These variables build partly on the literature reviewed in chapter 2 in this thesis. The variables are based on the parameter that the types of networks under observation are essentially networks exhibiting predominantly multidimensional value networks (MDVNs) such as business ecosystems, with complex value system characteristics (Möller et.al. 2005). MDVNs such as business ecosystems are formed with a view to creating new technology platforms or new business concepts requiring the orchestration of several actors and the creation of new value activities. Each business concept developed is clearly defined. These business concepts are then articulated to explain their effects on rich media services new service development capability within networks.

In chapter 4 the research method is explained. Issues that concern the qualitative nature of the research and the research design, generally incorporating issues such as the case study methodology, the case study selection criteria, the research strategy, data collection, and data analysis as well as the study validity and reliability are discussed. A pilot case study was conducted as a pre-test. The pilot case study formed an integral part of developing the interview protocol; the 'play writing' process and setting the criteria for the selection of case studies for research observations. In explaining the data collection phase, elements such as the unit of analysis, the number of cases selected, types of respondent, interview protocols, the participant recruitment process, the sampling procedure, and documents used in the research are discussed in depth. In addressing issues concerning data analysis, this chapter explains the type of coding approach used, the type of qualitative software adopted to analyze the data obtained from the field, the data triangulation efforts made in analyzing the data, and the approaches taken to ensure the validity and reliability of the data analyzed.

Chapter 5 begins with a brief overview of the mobile TV business ecosystems. Although the mobile music case study was also completed and analyzed, the case study was however, not discussed in this thesis. In order to achieve the required depth in exploring and describing the phenomena that define the business concept developed through literature review, a single case study seemed more appropriate. The mobile TV case study is described briefly in terms of the respective services provided, the various actors in the ecosystem and the roles they perform. The case description also includes a general picture of the systems and processes involved in the development and the provision of the services associated with the case study. The chapter then proceeds to verify (i.e. accept, reject or amend) the propositions developed and discussed in chapter 3. Thematic coding was used based on the template analysis method to organize information gathered for each research concept (King, 1998). Pattern matching and triangulation of qualitative data is employed to test the research propositions. This chapter is organized according to the research propositions and their related research concepts. In verifying each concept and proposition, the properties characterizing each concept are examined against the mobile TV case study findings and finally evaluated at the end of the chapter according to the aggregated evidence.

Chapter 6 provides a conclusion of the research contribution of the thesis. The contribution is organized by research concepts and their impact on the NSD capability of the business ecosystem is summarized. Finally, the chapter concludes with the limitations, future direction of the research and managerial implications for marketers in general. Figure 1.7 below provides for a graphical illustration of the structure of the thesis.

Figure 1.7: Structure of the Thesis



1.7. Conclusion

The global mobile telecommunication industry has grown from traditional voice based services to include the provision of what is known today as rich media mobile services. The development and delivery infrastructures of such services have experienced a remarkable shift – moving from linear systems of value chains to a complex system of value networks, which is represented as a business ecosystem in this thesis. This marked change in the infocoms sector has provided the motivation to inquire particularly about the new services development dynamics of the rich media mobile services business. The thesis explores the business concepts that provide the capability of these networks to develop new services within the context of the rich media mobile services domain.

The business ecosystem concept, a core concept defining the thesis is developed and its relevance to the changing mobile services landscape is explained. A business ecosystem consists of a large number of participants, which can be business firms and other organisations (Iansiti and Richards, 2006). They are interconnected in the sense that they have an effect on each other. The essence of their interconnectedness enables various interactions between the members to be explored in their effort to develop end-to-end inter-industry-based services (Iansiti and Richards, 2006).

The nature of interactions between the various organisations that comprise the business ecosystem can be both competitive and cooperative. The interdependent nature of their relationship means that the members are dependent on each other, and failures of one firm can result in failures in other firms (Moore, 2006).

The common platform that exists to integrate otherwise independent vertical value systems in a business ecosystem is very often seen as the hub of the business ecosystem – a platform usually provided by a focal organisation (Iansiti and Richards, 2006). The aim of such organisations in business ecosystems is to drive innovations and commercial success and hope to best utilize the capabilities, competencies and resources of other members in the process of driving innovation (Moore, 2006, 1996). This is challenging since a business ecosystem is coupled to its environment, which may change rapidly and unpredictably. Thus, a business ecosystem is fundamentally a dynamic structure that evolves and develops over time.

Based upon the concept of the business ecosystem, the thesis then draws upon literature from three major theoretical domains including services innovation theory, network theory and new service development theory. It positions itself to contribute to the gap in literature by understanding new service development capability within complex network structures such as business ecosystems. It contributes to the field of new service development theory by developing testable propositions through deductive literature reviews and inductive industry inputs within the rich media context. In examining the development of these services in the context of a business ecosystem, the research contributes to the understanding of the concepts that ultimately affect and define the business ecosystem's capability in developing new rich media services in the market place.

Chapter 2
The Framework of the Study

2.1. Introduction

This chapter explains the contextual domain prior to discussion of the theoretical domains defining the thesis. The chapter begins by discussing how the telecommunications industry has evolved from a purely vertically integrated system to a more complex system featuring both vertical and horizontal characteristics and its relevance to the thesis. Following the discussion describing the evolution facing the telecommunications industry, this chapter then proceeds to define and discuss the theoretical domains of network, new service development and innovation literature. The thesis draws on these three streams of literature in providing the framework for the study. Innovation literature has been used to explain innovations that are enabled by emerging digital technologies leading to rich media services. The new service development literature is used to discuss the service aspect of rich media services, while network theory threads the notion that end-to-end rich media services are developed in network. The chapter concludes by framing an overarching research question.

2.2. The Transition of the Telecoms Industry

In the mid-1980s, most of the developed world, including Japan, Western Europe and North America, decided to end the monopolies of their telecommunications industries. This resulted in the entry of new firms into the market. A classic example of such a new entrant into the traditionally tightly guarded market of the incumbent network operators would be WorldCom in the United States and such companies went on to pose a significant threat to incumbent network operators. WorldCom began life as a reseller of the newly-divested AT&T's network capacity in 1984, before making the key strategic decision to become a facilities-based operator (Fransman, 2002).

By the end of the millennium WorldCom had capped a string of mergers and acquisitions with the takeover of MCI and Sprint, the two main long-distance competitors to AT&T in the US. The takeover meant that WorldCom had the world's best global telecoms network, posing the most serious threat to the "Big Five" incumbents in the global telecommunications industry – AT&T in the US, BT, Deutsche Telecom and France Telecom in Western Europe, and NTT in Japan (Fransman, 2002).

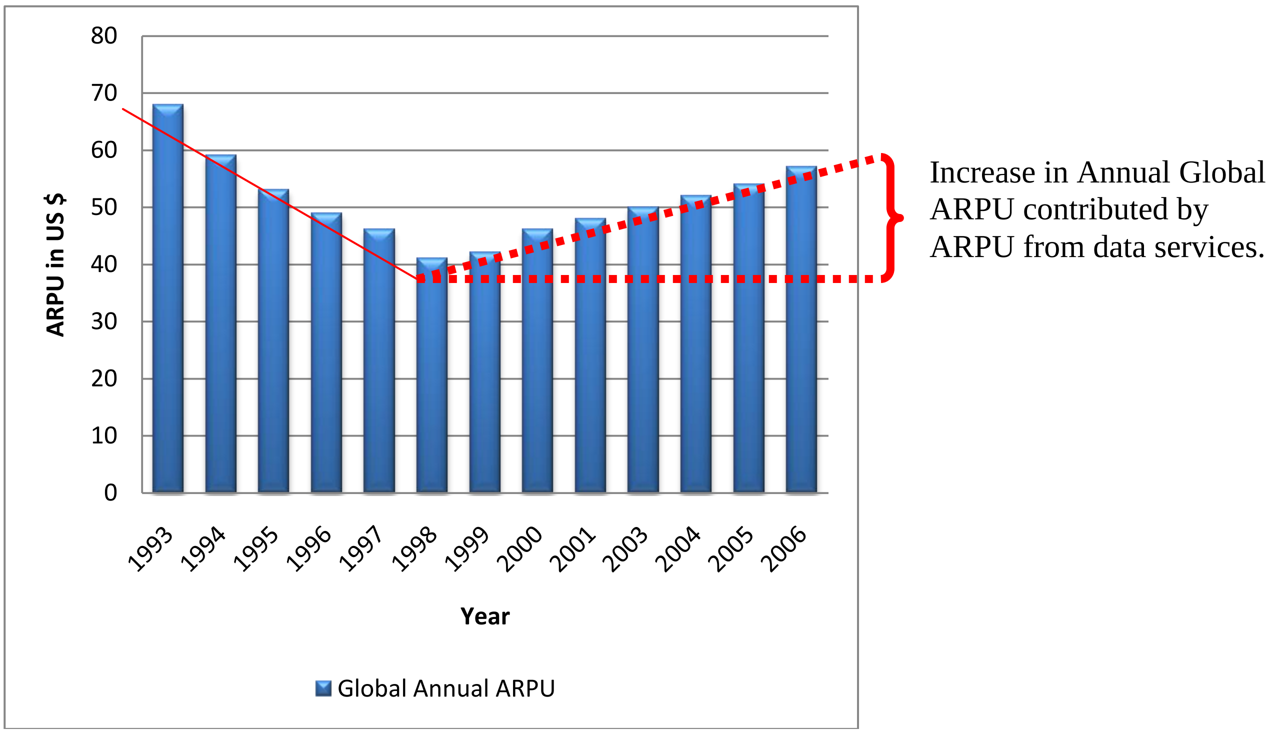
By the early 1990s, as deregulation continued, vicious price competition had begun. Both mobile and fixed network operators had embarked on price cutting measures to sustain market share. Incumbent network operators found themselves under pressure from the tremendous price cutting measures of the new entrants to gain market share (Fransman, 2002). This ultimately forced ARPU[7] (Average Revenue Per User) of mobile network operators to reduce (see *Figure 2.1*).

The downward pressure on ARPU experienced by the global mobile telecommunications market was particularly evident during the mid to late 1990s

[7] ARPU is a powerful and extremely useful indicator of just how well a telecommunications company is accessing its customers' revenue potential. ARPU is commonly calculated in standard mathematical fashion, dividing the aggregate amount of revenue by the total number of users who provide that revenue. In mobile telephony, ARPU includes not only the revenues billed to the customer each month for usage, but also the revenue generated from incoming calls, payable within the regulatory interconnection regime between mobile operators (http://en.wikipedia.org/wiki/ARPU).

(Fransman, 2002). It was only at the turn of the century that mobile operators worldwide experienced an upward trend in their ARPU (see *Figure 2.1*). This upward trend in ARPU was contributed predominantly by the introduction of data services, particularly SMS (short messaging service).

Figure 2.1: Price Competition Driving Decline in Global Annual ARPU and Revenue Per Minute of Major Mobile Network Operators

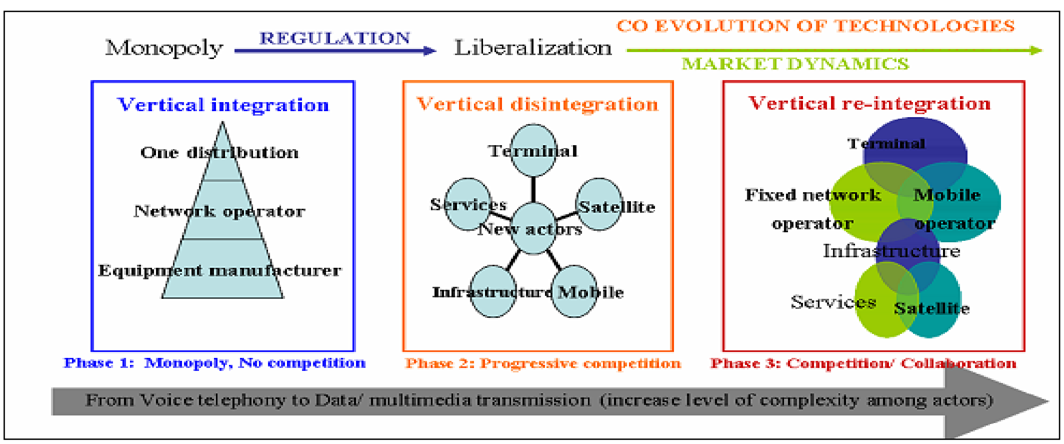


Source: *2007* Global Mobile Communications - Statistics, Trends & Forecasts *http://www.marketresearch.com/map/prod/1459995.html, Accessed on 15th November 2008.*

However, even the threat of new entrants did not pose as big a threat as Internet Protocol (IP). IP was a new communications paradigm based on *packet switching*, a major technological move away from *circuit switching* and offering a radically new approach to the communication of both data and voice (Fransman, 2002). In 1968 virtually all interactive data communication networks were circuit switched. By 1978, however, virtually all new data networks being built throughout the developed world were based on packet-switching, a remarkable rate of diffusion for a radically new technology (Roberts, 1978).

While the telecommunications industry was in ignorance of the environmental developments, particularly the technological developments surrounding its very existence, the industry was, nevertheless, experiencing a process of deconstruction and subsequent reconstruction. As exhibited in *Figure 2.2*, network operators were finding their vertical value systems slowly disintegrating to form more complex business networks in the development and provision of new services to the marketplace (Srivastava and Finger, 2005; Business Week, July 15, 1996, pp 38-44.)

Figure 2.2: Evolution of the European Telecommunication Industry Structure

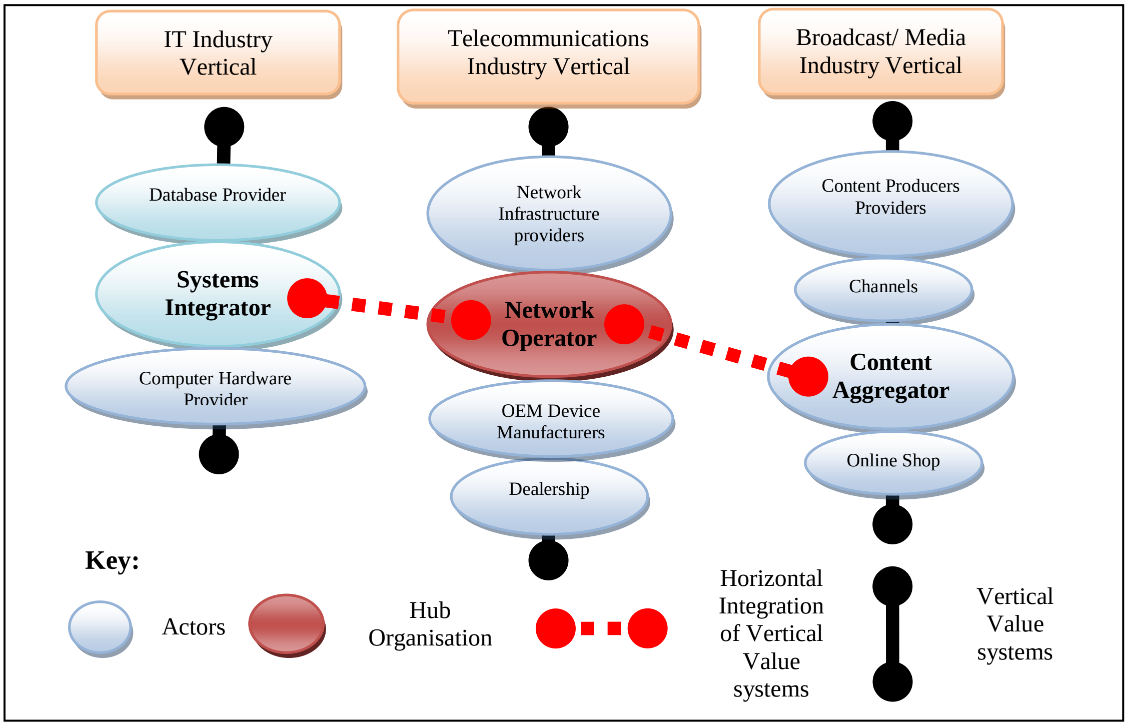


Source: Srivastava, V. J. and Finger, M. (2005) Industry boundaries in times of Change: How do firms strategize?, MIR - REPORT 2005-007, EPFL, Lausanne, http://cdm.epfl.ch/pdf/working_papers/WPMIR07.pdf, Access on 20th November 2008.

Incumbent telecommunications network operators such as AT&T in the US, BT, Deutsche Telecom and France Telecom in Western Europe, and NTT in Japan were preoccupied with interpreting the relationship with their business partners as vertical systems (Fransman, 2002; Möller et.al. 2005). Their service development initiatives were focused upon increasing efficiency in stable vertical value systems. This included incremental initiatives such as the expansion of dealer networks within their vertical value system. However, the telecommunications industry in the mid 1990s was anything but stable, as represented by the entry of WorldCom, an organisation with predominantly IT-centric capabilities, into the fold of the telecommunications services space (Fransman, 2002; Möller et.al. 2005: Peppard and Rylander, 2006).

Network operators increasingly found themselves involved in several overlapping strategic networks, both vertical and horizontal in nature (Fransman, 2002; Möller et.al. 2005). As illustrated in *Figure 2.3*, network operators with their vertical partners within the telecommunications verticals were increasingly confronted with the necessity to be able to coordinate and mobilize the value activities generated in other industry verticals (i.e. IT and the Media Industry verticals).

Figure 2.3: Horizontal integration of Industry Verticals to form Multidimensional Value Networks



Complex integration between vertical industry value systems emerged as the way forward in creating value within the telecommunications industry. For example, alliances forged between former competitors that improved access to and development of capabilities and resources, such as channels, and networking forums with actors in other industry vertical value systems emerged as peculiar features in the way value was generated through innovations. One well-known initiative was the "I-mode" service introduced first in Japan in the late 1990s by NTT Docomo, the Mobile division of NTT in Japan. During its initial launch I-mode encompassed various services such as email, sports results, weather forecasts, games, financial services and ticket booking. Content was provided by specialized firms with content development expertise, including mainstream news and weather channels, banks, gaming software producers and ticketing agencies. Such strategic decisions went beyond merely improving the operational efficiency of vertical networks. Now there was a need for "hub" organisations such as network operators like NTT Docomo to not only improve the leverage of existing capabilities but also to go even further in developing bonāfidē new capabilities (i.e. through the development of new service development platforms for a new generation of services such as rich media mobile services based on technology platforms with IP capabilities). This signaled the start of the shift in the telecommunications industry dependence on voice services. The trend was to develop capabilities that allowed mobile network operators to develop data services in which content becomes a much valued resource. Mobile network operators such as NTT Docomo achieved this through participating in complex networks such as business ecosystems displaying complex muti dimentional value characteristics in their quest to source much needed content capabilities to develop the next generation of mobile services (Loeser, 1999; Möller et.al. 2005).

The structural shifts triggered by environmental developments, forced network operators in particular to acknowledge the need to create new technologies, complex business models, or new business concepts (Möller et.al. 2005; Peppard and Rylander, 2006). Network operators and other actors within the telecommunications industry space, including device manufacturers, found themselves at the dynamic end of the value-system continuum. This required the ability to orchestrate actors from several formerly distinct fields. In other words, it demanded a 'network-visioning' capability, which involved identifying technological development paths, including the formation of service development roadmaps based on the technological platforms adopted as a result of the technological development paths pursued by network operators.

Given their network-visioning capability, network operators found themselves in an important role, in seeking and qualifying actor based on their specialty skills, competencies and resources in the media and IT industries to realize the next generation of new services (i.e. rich media mobile services). They found themselves increasingly deciding on the suitability of actors in the systematic formation of strategic networks such as business ecosystems through strategic actor evaluation programs. Network operators and, to a certain extent, other key actors such as the mobile device manufacturers like Nokia, Sony Ericsson and Samsung were catapulted into creating strategic direction through agenda setting, coordination and control of the strategic networks such as business ecosystems. What subsequently emerged from the formation of such value systems is known today as the “Infocommunication” sector (Barnes 2005; Kärrberg and Liebenau, 2005; Fransman, 2002).

The transformation experienced by the network operators through the redefinition of industry boundaries coupled with the advent of IP technologies emerged more as a threat than an opportunity, simply because of the market disposition of the network operators caused by their over dependence on voice services as a revenue generator coupled with their dated network infrastructure based on non-IP technology. Neither the traditional product portfolio structure nor the network infrastructure of the telecommunications industry was prepared to respond adequately to the timely threats caused particularly by IP technologies (Eduarado and Sato, 2008).

With the emergence of IP technology as the new “de facto” standard for the provision of voice services, non-traditional service providers from the wider Internet industry such as Google, Yahoo and Skype, swiftly moved into the voice services market to capture a significant portion of the market share traditionally held by the telecommunications network operators. Google, Yahoo and Skype essentially threatened a significant portion of the revenue stream enjoyed by the incumbent network operators from the early 1900s. By 2006 they created a significant dent in the revenue stream of network operators with the provision of their free VoIP (Voice over Internet Protocol) services (Rao, Angelov and Nov, 2006; Eduarado and Sato, 2008). VoIP is essentially an IP telephony service delivered through the Internet or other packet switched networks. Skype in particular implemented the notion that it is possible to make a long distance voice call with good quality for free or for a very small fee, compared to traditional methods. This in effect changed the rules of the mainstream telecommunications industry. In essence, VoIP services were built on the growth of IP technology and its impact on the mainstream telecommunications industry was significant. The new rules of IP technology as the platform superseded the old rules of the telecommunications industry, bringing about "disruptive innovation" (Christensen, 1997).

Not only had voice services generated the largest portion of the total revenue of network operators during the last 20 years, voice services were also the product line that provided the highest 'unit margin' compared to any other services available in the product mix of a typical network operator (Rao, Angelov and Nov, 2006). VoIP services were anticipated to grow at an astounding tenfold between the year 2006 and 2010 (The Age, 2006). Although VoIP service providers remain small they were, nevertheless, taking away network operators' revenue at a rate of five times the revenue that VoIP service providers themselves generated (The Age, 2006). The presence of companies such as Google, Yahoo and Skype and their substitution service offerings such as VoIP are more likely to be a permanent feature of the emerging "Infocommunication" sector (Eduarado and Sato, 2008). These non-traditional service providers will increase the pressure on network operators by forcing prices down and challenging existing business models (Fransman, 2002; Rao, Angelov and Nov, 2006; Eduarado and Sato, 2008).

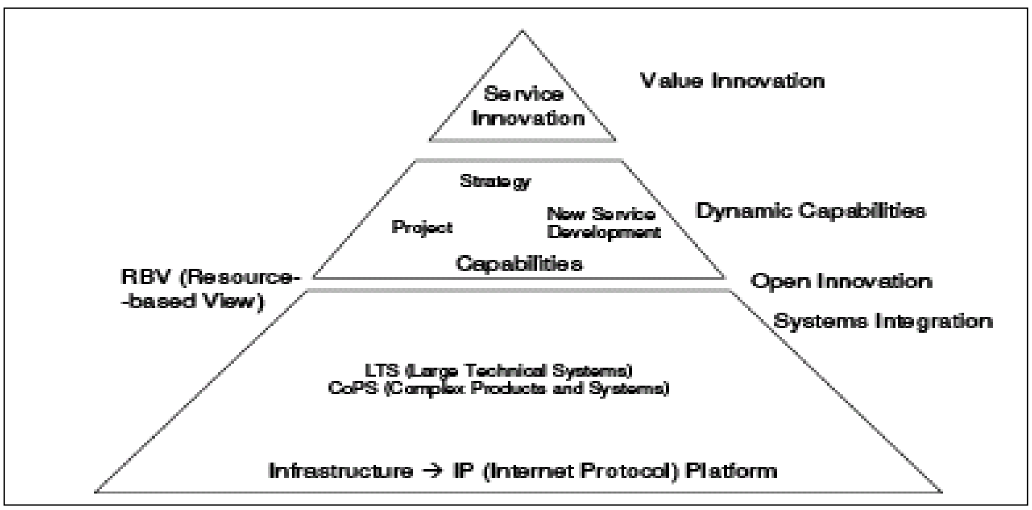
This change to the industry forced traditional network operators to make significant investments in their network infrastructure through deploying IP-enabled systems and equipment commonly referred to in industry as the Next Generation Network (NGN). The emergence and adoption of NGNs based on IP technology has had a direct impact on how traditional network operators innovate, in that it positions the network operator "as a flexible factory of innovative services" (Eduarado and Sato, 2008, p.6).

2.2.1. The Investment in Next Generation Network (NGN)

From the infrastructure perspective, the transition to NGN of telecommunications networks may be viewed as the development of Large Technical Systems (LTS) (see Hughes 1983, 1987, and 1992), whose main components would be Complex Products and Systems (CoPS), such as defined in Miller, Hobday, Leroux-demers, and Olleros (1995), Davies (1997) and Hobday (1998). NGN infrastructure has enabled network operators to develop and deliver a whole new category of services, shifting their dependence from voice based services to rich media services. More importantly, the NGN infrastructure has allowed network operators to create new technologies and integrate them with complex business models. With the acquisition and deployment of NGN infrastructure, network operators are now able to identify, engage and orchestrate actors from several formerly different fields (e.g. Media/ Information Technology). Through the NGN infrastructure, network operators are able integrate vertical value systems to develop new services.

In analyzing the innovation of services in the telecommunications industry from the network operators' perspective, the model (*Figure 2.4*) introduced by Hull and Tidd (2003, p. 139) best describes the importance of service innovation to network operators in the changed business landscape of the telecommunication industry.

Figure 2.4: Framework of analysis combining service, value and open innovation.



Source: Hull, F. M. and Tidd, J. (2003), The Organisation of New Service Development in the USA and UK. in Tidd, J. and Hull, F. M. (Eds.) Service Innovation: Organisational Responses to Technological Opportunities and Market Imperatives. London: Imperial College Press. (p. 139)

Figure 2.4 shows the reason for the prominence of service innovation in the telecommunications industry during the last decade. With the acquisition of such IP based NGN platforms, network operators effectively positioned themselves as a provider of a platform for open innovation. Through systems integration initiatives with third-party service providers, network operators were able foster innovation at a business network level. Through open innovation, network operators were able to leverage their investments in IP based technologies in harnessing the value generating potential of other vertical systems in the infocoms sector. This ultimately enable network operators to respond to the competitive pressures and eroding margins in their voice service portfolios through offering higher value added services, including rich media services through business networks.

Through the formation of complex business ecosystems, network operators are today positioned as innovation factories in developing new services at a rate never seen before. Network operators are now able to leverage such technology platforms within their control in conjunction with capabilities that lie with other actors within the context of the business ecosystem. In so doing, network operators are able to harness the innovation generating potential of various actors from other vertical systems making up the business ecosystem of which the network operator themselves are seen as the “hub” organisation. Given the competitive pressures faced by network operators globally in their traditional service domain (i.e. voice services) and the IP based technologies that provide the platform for actors from otherwise distinct vertical value systems to collaborate in developing new services, the prospects for innovation within the context of mobile services business ecosystems have never been more compelling.

2.3. Theoretical Underpinning

As explained earlier in the preceding chapter, the three theoretical domains from which literature are drawn (i.e. Innovation Theory, Network Theory and New Service Development Theory) form the basis of the theoretical streams that will be examined in this chapter. The streams of literature from each of these theories are identified and discussed in this section in order to arrive at a theoretical underpinning that clearly defines the course of this thesis.

2.3.1. Innovation

The issue of innovation has been well cited in the academic literature (see Gopalakrishnan and Damanpour, 1997; Hauser, Tellis and Griffin, 2006). Innovation from a macro perspective is about a process of change and renewal and is argued to be fundamentally about the process of constant improvement in products, services, processes or organisational structures (Kasper, Helsdingen, Gabbott, 2006; Hauser, Tellis and Griffin, 2006). Organisations undertake innovation efforts primarily to bring new products and services to market (Hauser, Tellis and Griffin, 2006) and, in the process, develop better resources and knowledge that contribute to their competitive advantage (Kasper, Helsdingen, Gabbott, 2006).

The literature in many disciplines of study, including sociology, engineering, economics, marketing and psychology has been preoccupied with the role of innovation as a primary means of adapting to change. Common to all disciplines is the definition that an innovation is something new or novel (Burgelman and Sayles, 1986; Gopalakrishnan and Damanpour, 1997). One might assume that because all innovation research addresses the notion of 'newness' (Burgelman and Sayles, 1986), studies from different fields would be interconnected. However, there has been instead a proliferation of innovation studies and theories with no real connectedness (Gopalakrishnan and Damanpour, 1997). Researchers within each discipline conceptualize innovation differently, and have quite different views of its impact on an industry or a firm's productivity, survival, growth, and performance. Thus, the theoretical and practical value of research from one field is not entirely transferable to another because of differences in research focus and variations in the way innovation is defined (Hauser et.al, 2006; Gopalakrishnan and Damanpour, 1997).

In analyzing the notion of innovation, this thesis does not include studies that focus on creativity or individual innovativeness (Basadur and Finkbeiner, 1985) because in these studies, the individual is the frame of reference for evaluations of innovativeness. Some of the innovation studies from marketing literature where the emphasis is on innovation diffusion among individual consumers were also not included for the same reason (e.g. Mahajan, Muller, and Bass, 1990). However, innovation studies from marketing literature that focused on innovation at the organisational level were included in the review (e.g. Gatignon and Robertson, 1989; Capon, Farley, Lehmann, and Hulbert, 1992). This thesis addresses innovation as it is manifested in organisations in a B2B (Business-to-Business) context. The literature review in this thesis focuses on innovation in industries, organisations and organisational sub-units as the frames of reference (i.e. the research context). Drawing on the approach taken by

Gopalakrishnan and Damanpour (1997), this thesis first analyses the literature of innovation from a macro level and then progressively moves towards a more clearly delineated definition of innovation. In adopting this approach, this thesis is then positioned to explain how innovation literature has developed over time and to identify the emerging literature gap concerning innovation that this thesis is positioned to examine and redress.

2.3.1.1. Dimensions of innovation

In one of the earliest reviews of innovation research, Gopalakrishnan and Damanpour (1997) identified key dimensions in which innovation literature has developed. These dimensions include *stages* of innovation, *types* of innovation, and the *level of innovation.* Of the three dimensions introduced by Gopalakrishnan and Damanpour (1997), the latter two dimensions in particular will be examined to identify the literature gap in innovation theory.

A) Types of Innovation

Gopalakrishnan and Damanpour (1997) define ***types of innovation*** as made up of subcategories such as products versus processes, radical versus incremental, and technical versus administrative. Product innovations are outputs of the organisation, either physical or non-physical (i.e. service) products or a combination of both physical and non-physical. For example, the development of a Mobile TV enabled mobile handset would represent a physical product innovation for a mobile device manufacturer like Sony-Ericsson or Nokia; and the development of a Mobile TV service such as a short National Geographic documentary clip delivered via the mobile network would represent a service innovation (i.e. non-physical product innovation) for a mobile network provider. Such product innovations are distinct from process innovations, which are defined as tools, devices, and knowledge in throughput technology that mediate between inputs and outputs and are new to an industry, organisation, or sub-unit (Utterback, 1994). For example, the development or the modification of the phases or stages involved in the development of the process concerning the delivery of the short National Geographic documentary clip to mobile devices for final consumption would represent a process innovation.

A technical (or technological) innovation is directly related to the production of products and technologies used to produce products or render services directly related to the basic work activity of an organisation. For example, a new chemical process, a new item of software, or an upgraded computer system can be classified as a technological innovation. An administrative innovation relates to management-oriented processes such as structure, human resource management, and accounting systems. These innovations are indirectly related to the basic work activity of the organisation and are more directly related to its management (Gopalakrishnan and Damanpour, 1997).

Innovation can be described on a continuum from incremental to radical according to the degree of change required to implement the innovation (Cooper 1998). Incremental innovations are merely marginal departures from existing practices in that they mainly reinforce the existing capabilities of organisations (Dewar and Dutton, 1986). On the other hand, radical innovations produce fundamental changes in the activities of an organisation or an industry and represent clear departures from existing practices. An example of a radical innovation in the home entertainment industry would be the move from the Video Home System (VHS) format based on magnetic tape technology (i.e. the original innovation platform) to the Compact Disk (CD) format based on optical laser technology (i.e. the newly emerged innovation platform). In identifying platform innovation, Johne and Storey (1996) acknowledge the work of Meyer and Zack (1996) in addressing the notion of 'platforms of services'. Johne and Storey (1996) highlight the emerging importance of platform innovation and how platforms of services "might be invoked in order to provide customers with standardized service components which are then added to in order to provide a more comprehensive yet still seamless service experience" (p.223). Johne and Storey (1996) proceed to further extend this argument by suggesting the potential for platform services to be "a very exciting area for further research, because robust platforms of services can facilitate the type of 'expeditionary marketing' propounded by Hamel and Prahalad (1994, p. 223)".

The developments experienced by the telecommunications industry can in fact be categorized as a platform innovation. As Eduardo and Sato (2008) explain, the transition of the telecommunications industry from legacy stove-pipe infrastructures to IP based NGNs in service delivery architecture is a reference to platform innovation. The major investments made in NGN infrastructures is in fact testimony to the transition the industry as a whole is undergoing from the former legacy stove-pipe infrastructures such as PSTN (Public Switch Telecommunications Network) technologies (i.e. the old platform) to IP based NGNs (i.e. the new platform). This heralds the introduction of a new category of services that depart from the traditional voice services typically associated with former infrastructures such as PSTN (Public Switch

Telecommunications Network) technologies with the introduction of rich media services, which are developed and distributed on the capabilities provided by an entirely new platform, the IP based NGN.

It can then be concluded that the transformation experienced by the telecommunications industry that is driven by the IP based NGNs technology, enabled network operators to integrate horizontally and harness the innovative capabilities of actors in other vertical value systems, has had a direct impact on how traditional telecommunications operators innovate. The NGNs based on IP technology is a platform that provides the network operator with an infrastructure in the form of "a flexible factory" for the development of a new category of innovative services, including rich media services (Eduarado and Sato, 2008).

B) Levels of Innovation

Innovation can also be observed from different ***levels***. Gopalakrishnan and Damanpour (1997) suggest that innovation can be studied at a national, industry, organisational, or organisational sub-units level or at the level of the innovation itself. Each level can affect the conceptualization of innovation.

In the volume of existing literature in innovation theory, there seems to be evidence to suggest that there is yet another new and emerging dimension to innovation theory – ***systems theory*** – a branch perspective emerging from the intraorganisational-interorganisational level of innovation theory. As Amabile (1988, p. 163) states:

> "The organization (innovation) process occurs at the level of a system: a large number of individuals working together in different units on different aspects of the very general problem of implementing a new idea".

A system is a group of sub-units that work with one another as an integrated whole (Briggs 1992), and the systems perspective organizes the components contributed by the various organisations that comprise the system as inputs, internal processes and outputs, and studies the relationships between them (Vecchio, Hearn and Southey, 1998). The application of the systems perspective of innovation in the context of this thesis is directly relevant to the transformation experienced by the telecommunications industry in general and by the network operator in particular. The newly emerged Infocoms sector consisting of organisations from various vertical value systems including telecommunication, computing and the broadcasting industries certainly constitute a system. This is in fact a system relying on the IP based NGN platform for the provision to the market place of systems based products (i.e. products based on the collective effort of all system members). This is fundamentally where the system theory applies to the notion of innovation in the context of this thesis.

The General Systems Theory was developed in the 1950s by Ludwig von Bertalanffy, a German biophysiologist, (Hatch 1997). Bertalanffy's theory was an attempt to unite the sciences to explain scientific phenomena from a single atom to a society – all related through a hierarchy of systems (Hatch 1997). Each higher level system is composed of lower level systems (Cummings and Worley 1997). An organisation, for example, is a system residing in a super-system of a whole industry and is composed of sub-systems such as divisions and departments. Each of these levels are interrelated and interdependent, interacting with and influencing each other.

Drawing from the same General Systems Theory, authors such as Lewin (1999), Iansiti and Richards (2006), Iansiti and Levien (2004) and Moore (2006) build the concept of a business ecosystem. Iansiti and Levien (2004) argue that a business ecosystem is a higher-level system composed of lower-level systems consisting of a number of participants, which can be business firms and other organisations. They are interconnected in the sense that they have an effect on each other. Iansiti and Levien (2004) argue that the business world is similar to biological organisms, where organisations operate within a rich network of interactions. However, the critical difference between a business ecosystem and a biological ecosystem is that the former's core objective is to drive "innovation" while the latter's reason for existence is "survival" (Lewin, 1999; Iansiti and Levien, 2004; Moore, 2006).

Lewin (1999) claims that "businesses do not merely *resemble* natural ecosystems; rather, they share some fundamental properties" (pp. 198-199) that are common to the ecosystems that sustain biological organisms. Moore (2006) argues that business ecosystem/s are "intentional communities of economic actors whose individual business activities share in some large measure the fate of the whole community" (p. 34). Moore (2006) suggests that mastering these challenges, of what might be called "distributed creativity," is the aim of the ecosystem organisational form.

The business ecosystem (as discussed in chapter 1) is in fact a model based on open innovation systems (Moore, 2006; Briggs, 1992). Authors such as Tang (1998), Cooper (1998), Padmore, Schuetze, and Gibson (1998), Klein and Sorra (1996) and Burgelman (1983) have all contributed to the domain of linear and stage or process models of innovation. However, in recent times, there has been an emerging interest among researchers in exploring more open systems in innovation literature (Chesbrough, 2003). Consistent with the knowledge contributed by systems theory, researchers have now realized the importance of understanding innovation from a more systems-based perspective (Briggs, 1992; Chesbrough, 2003).

The Open Systems Model is an organisational model based on systems theory that depicts the organisation as a system that affects, and is affected by, its external environment, or super-systems. A critical element that differentiates Open Systems innovation models to that of previously discussed linear and stage or process models of innovation are the feedback loop. Briggs (1992) suggests this indicates that Open Systems innovation models supersede older linear models and create non- linear models that receive constant feedback from their environment, which can substantially impact on future outputs. This notion of innovation in open systems and the function it performs in bringing to prominence non-linear innovation models suggest the emerging importance of networks in innovation theory. The notion of the increasing prominence of non-linear innovation models in understanding innovation within the context of networks has reinforced the need for academic literature to further develop along these lines. The transformation experienced by the telecommunication industry in particular, being the main reference industry in this thesis, suggests that systems theory in particular and open innovation systems such as the business ecosystem in general are linked to the notion of innovation.

Kline and Rosenberg (1986) suggest that the degree of dynamism and the changes occurring in the environment in the last decade or so have required organisations to incorporate the changed nature of technology and focus on the learning process within, and between, firms and other organisations. As innovation networks grow even more complex, the innovation strategies of firms have begun to embrace the ‘new imperative’ for creating and profiting from the advantage provided by technology through open innovation. In the 'open innovation model' firms adapt their business model in favor of research and development (R&D) activities and technical changes that take place outside the firm. As such, innovation becomes increasingly distributed among various partner organisations (Von Hippel, 1988).

Chesbrough (2003) sees the well established 'closed' innovation models for managing industrial R&D eroding and gradually being replaced by an 'open' innovation model that is better suited to today's highly dynamic environments. Open innovation is a paradigm that assumes firms can and should use both external and internal ideas, and internal and external paths to market, as they look to advance their technology (Chesbrough, 2003). Chesbrough (2003) defines open innovation as an environment in which ideas are allowed to flow beyond the boundaries of their originating organisation into the wider network to wherever they can be efficiently handled at each stage of the innovation process. These ideas may return back again to the originating organisation to be scaled up and marketed. In other instances the idea may emerge in joint venture initiatives or simply be licensed. However, in each circumstance, the ideas should reach their market more quickly and more efficiently than would otherwise be possible, because collaboration between actors in the open network increases the access to markets (Chesbrough, 2003). This also implies that the key for these organisations is to: a) first identify and understand missing components in the innovation mix; b) then to gain access to these necessary missing components that should be internally supplied; c) and finally to decide on how best to integrate both internal and external components together into systems and architectures for the best open system innovation outcome (Chesbrough, 2003).

In line with the emergence of systems theory and the subsequent introduction of Open Systems innovation models in innovation literature, the concept of ‘distributed innovation’ rises to prominence. Recent research on the dynamics of innovation characterizes innovation as far more multidimensional and distributed, involving ecology of technologies, organisational practices and idiosyncratic learning interactions over a given period of time spanning industries as diverse as IT, engineering and construction (Van De Ven, Polley, Garud, and Venkatraman, 1999; Boland, Lyytinen, and Yoo, 2007). The more ubiquitous use of information and communication technology (ICT) in the innovation process has enabled radically distributed forms of innovation (von Hippel 2005a). For example, through the rich media value network, innovations co-exist in the network through: (1) the work of content providers investing in equipment to ensure that the content formats are compliant with the resolutions requirements of mobile devices; (2) mobile network operators investing in IP based NGNs and assembling business processes that enable rich media services to be delivered through these IP based NGN infrastructures to mobile devices; and (3) mobile device manufacturers in turn are constantly enhancing the capabilities of mobile devices to ensure that the devices provide a good customer experience in their consumption of rich media services (Peppard and Rylander, 2006). As a result of distributed forms of innovation, organisations are now able to draw on knowledge resources and other forms of resources and capabilities that are globally distributed using Information and

Communication Technologies (ICT)[8]. Project-based structures are frequently used to identify and mobilize resources, expertise and capabilities (Davies and Brady, 2000; Yoo, Boland, and Lyytinen, 2006). In the case of open source software development, firms are able to distribute innovation activities throughout their value network by using ICT in a way that was not possible before (von Hippel 2005b). Increasingly more powerful computing tools such as 3D visualization tools and web-based collaborative systems that directly aid innovation processes enable disruptive products and services that were, until recently, impossible to develop (Boland et al. 2007; Lyytinen and Rose 2003; Swanson and Ramiller 2004).

As organisations seek to leverage emerging ICT in their innovation efforts, they will need to find a way to reconfigure the way they organize innovation activities. This effort will necessarily involve heterogeneous actors who come from diverse industries and communities bringing along with them the access to knowledge, resources and capabilities. These actors are likely to be more autonomous than the traditional researchers and engineers in an R&D department of an organisation, as they may belong to different organisations or not belong to any organisations at all (Boland et al. 2007; Van De Ven 2005; von Hippel 2005a). Therefore, innovations that are enabled by emerging digital technologies are likely to be more distributed and more multidimensional (Yoo et al. 2006).

This thesis is positioned to examine innovation in relation to the concept of ‘distributed innovation’. The thesis develops an understanding of how organisations capture distributed resources in the form of knowledge, know-how, assets and critical

[8] See Appendix 12 for a brief description.

competencies within a wide network of actors (users, manufacturers, suppliers, research centers, and others) to provide innovation solutions. The stream of innovation literature from within systems theory (Cummings and Worley 1997; Hatch 1997; Von Hippel, 1988; Briggs, 1992; Chesbrough, 2003) and ultimately open systems innovation (Briggs, 1992; Chesbrough, 2003) depicts the scope of this thesis as concerning the particular theoretical dimension of innovation studied - 'distributed innovation'. In reference to systems theory, open systems models and distributive innovation as the fundamental literature streams leading this inquiry, this thesis is then positioned to examine New Service development (NSD), which is often referred to interchangeably in marketing literature as the generic equivalent of New Product Development (NPD) (Johne and Storey, 1998).

2.3.2. New Service Development (NSD)

In the physical goods industries, New Product Development (NPD) has been widely studied and research in this area continues to be adapted to the constantly changing environment of NPD (Wind and Mahajan, 1997; Fitzsimmons and Fitzsimmons, 2000). The differences between the development of physical goods and services are clear and pronounced. Services characteristics such as intangibility and heterogeneity, for example, makes the application of NPD models to NSD (New Service Development) activities inadequate. NPD as an approach to service development makes no distinction between the types and forms of products, particularly the distinction between a predominantly physical product and a service product (Fitzsimmons and Fitzsimmons, 2000).

Given the inherent differences between the production of goods and services, the application of NPD models (e.g. Booz, Allen and Hamilton, 1982) may not be best suited to understanding how services are developed (Bitran and Pedrosa, 1998). The development of NSD literature stemming from NPD has been "driven from the recognized need for a systematic new services "product" development process, and is largely descriptive rather than prescriptive" (Fitzsimmons and Fitzsimmons, 2000, p. 2). During the mid 1980s, a sizeable body of specialist literature was accumulated that focused on the development and marketing of services as distinct from physical products. As a result, NSD as a distinctive theoretical domain stemmed from NPD literature and began to establish a new literature stream in its own right (Johne and Storey, 1998).

In their analysis of factors affecting market position and performance for service organisations Matear, Gray, and Garrett (2004) concluded that new service development capability of firms was a fundamental source of advantage for service organisations to attain both cost-effectiveness and market positional advantages such as market leadership. There is substantial literature suggesting that the changes in the forces of technology, economy, competition and ever greater demands from customers are requiring service firms to innovate merely to survive (see Easingwood and Storey, 1996). This argument highlights the importance of developing new services to ensure the longevity of firms through a healthy flow of innovation as part of their services portfolio offering to the marketplace.

Published literature in the area of NSD until the turn of the century has been preoccupied with the development of new financial services (Johne and Storey, 1998).

However, attention concerning the development of the wider span of services industries in the business market has been limited. Nevertheless, further examination of literature on NSD reveals that, apart from financial services, other services sectors including transportation (Nijhof et al., 2002), telecommunications (Hellström and Hellström, 2002) and wholesale (Hart and Service, 1993) have gained an increasing share of research attention in the domain of NSD.

Definitions of NSD are a common issue and an ever-present problem in NSD literature. Johne and Storey (1998), for example, have highlighted the fact that the phrases "new service development" and "new product development" are often interchangeably referred to in literature concerning NSD. The increasing attention given to NSD literature both in the European and North American journals are indicative of the relatively recent interest in the research of New Service Development (NSD) activity in both corporate and academic circles. In light of the diversity of NSD definitions, Johne and Storey (1998) suggest that in order to draw a clearer perspective between New Product Development (NPD) and NSD, NSD can be basically defined as "the development of service products which are new to the supplier" (p. 185). For the purpose of this thesis, the definition of NSD provided by Johne and Storey (1998) is adopted.

In developing their definition of NSD, Johne and Storey (1998) examined the work of Booz, Allen and Hamilton (1982), which is associated with the development of predominantly physical products, and the work of Lovelock (1984), whose work was specifically directed toward the development of predominantly service products. In reference to NPD as suggested by Booz, Allen and Hamilton (1982), Johne and Storey

(1998) highlighted the span of innovative activities involved in pursuing NSD. These activities included product development, process development, product augmentation, market development and new style product development (Johne, 1994). Product development concerns both minor improvements and radical alterations to service performance attributes. In contrast, process development involves re-engineering the service delivery process with the goal of increasing productivity and efficiency in the process of delivering services. Product augmentation involves the packaging of the core service offered to include additional value that contributes to customer satisfaction. Market development is concerned with the presence of an organisation offering its service in a mix of market segments. New style product development as suggested by Johne (1994) is market oriented in that it looks at how to exploit the true potential of a market and is less preoccupied with meeting internal performance hurdles such as a targeted rate of return.

The work of Scheuing and Johnson (1989) has also been recognized as contributing to our understanding of the NSD process. Scheuing and Johnson (1989) developed one of the earliest models of NSD process with reference to the financial industry. The model, however, portrays the NSD process as one that is sequential in nature without taking into account the possibility that the process structure could be simultaneous or concurrent. In examining NSD in a simultaneous service design environment, Ching-Chow (2007) suggested that service firms should adopt the approaches taken by firms producing mainly physical products in promoting simultaneous product designs in service development initiatives. The application of product development methodologies such as Critical Path method and Design for X

(DFX) are examples of method that could benefit NSD projects by better reflecting the realities and dynamics facing the service development initiatives of the future (Ching-Chow, 2007). This is particularly critical in open systems models where distributive innovation settings are dominant in new service development projects. In such settings organisations capture distributed resources in the form of knowledge, know-how, assets and critical competencies within a wide ecology of actors to provide concerted innovation solutions. This calls for components of the service development project to be managed in parallel, based on the distribution of resources and capabilities available to each actor in the network and subsequently aggregated to complete a network level new service solution (Boland et al. 2007; Van De Ven 2005; von Hippel 2005a).

The model by Scheuing and Johnson (1989) makes an important distinction between the design of the service and the design of the delivery process. Authors like Cowell (1984) and Lovelock (1996) in the domain of NSD have to date seen the NSD process as consisting of two main parts. As one of the first authors to examine the NSD process, Cowell (1984) stressed the need to first define the core service attributes (i.e. the service design) and thereafter to define the service delivery system, which involves the convergence of the people, processes and other resources of the organisation to achieve the NSD program objectives. NSD process has also evolved to incorporate the "molecular modeling" approach that stresses the significance of "blueprinting" the operational process of the NSD process in a diagrammatic form to instill discipline in the service development process (see Shostack, 1981, 1987). The notion of blueprinting the service development process makes clear to the development team the tangible and the intangible elements of the service that are to be incorporated into the final offer. This in turn enables organisations to deduce the concepts that contribute to the capability of firms in developing new services – a central theme in the research problems leading this inquiry.

However, researchers in the area of NSD encompassing various domains as discussed above seem to have a peculiar weakness. Prominent scholars in the domain of NSD (Shostack, 1981, 1987; Cowell, 1984; Lovelock 1984; Scheuing and Johnson, 1989; Easingwood and Storey, 1996; Fitzsimmons and Fitzsimmons, 2000) all seem to be preoccupied with NSD from a uni-organisational lens (i.e. a single organisational perspective). A network approach to development has emanated only since the mid 1990s from the physical product domain (see Biemans, 1995). Product development studies in the 1980s and early 1990s positioned the manufacturer as the active actor in the product development process, which suggests that it is exclusively the role of the manufacturing company to undertake new product development (Biemans, 1995). A network perspective on the development process has been adopted in the area of physical product development, particularly in organisational markets (Hart, 1995; Biemans, 1992, 1995) but has had limited exploration in the NSD domain (Biemans, 1992; Hakansson and Snehota, 1995; Bruce and Biemans, 1995; Hart, 1995; Syson and Perks, 2004). In attempting to take account of the complex range of inputs in the innovation process, the shift in viewing service development projects from a uni-organisational perspective towards a network perspective has fuelled a new body of research (Syson and Perks, 2004).

Network literature is primarily concerned with the interaction process as an integral part of a service offering (Johne and Storey, 1998). The interaction process has been identified as a critical process in NSD, although it has received little explicit research attention (Storey and Easingwood, 1998; Johne and Storey, 1998). Johne and Storey (1998) suggest that enlightened companies now use networks of appropriate shapes and forms for achieving specific types of product developments. In providing the example of IBM's first PC as a point of new product success, Johne and Storey (1998) argue the importance of "self-managing" networks in addressing major opportunities. In view of these developments in new service development in both business and literature, Johne and Storey (1998) further suggest that "research is now required into the types of network arrangements which are best suited for completing specific NSD tasks" (p. 222).

There has been emerging interest in both corporate and academic circles of the increasing importance of new products and services developed within interorganisational network contexts. For example, studies conducted by researchers including Wynstra, Van Weele, and Weggeman (2001), Moenaert, Caeldries, Lievens, and Wauters (2000), Tushman and Katz (1980), Syson and Perks (2004), Bruce et. al, (1995) and Heikkinen, Mainela, Still and Tähtinen (2007) address, amongst other issues: (1) issues concerning problems leading to unsuccessful collaborative projects; (2) the significance of the degree of interconnectedness between product development team members and key external parties, with communication being the prerequisite for the success of projects of such nature, and; (3) to the issue of the roles played by various actors in the service development network. However, with the exception of Heikkinen, et. al. (2007), no other scholars have specifically addressed the issue of NSD process within a complex network context. For example, while the work of Syson and Perks

(2004) contributes a conceptual model in interorganisational NSD literature, their contribution is limited to only networks exhibiting predominantly vertical value system characteristics. In contrast, Heikkinen, et.al. (2007) takes the contribution a step further in explicitly examining networks with a higher degree of horizontal characteristics within the rich media services context. However, their contribution to NSD is limited to merely exploring the roles played by actors in NSD projects.

Having examined these emerging issues within the domain of NSD projects, this thesis attempts to address these evolving dynamics in NSD projects through the lens of the Infocoms sector, in particular the rich media mobile services business ecosystem. According to current literature, the Infocoms sector exhibits the hallmarks of a business sector that is experiencing significant changes in competitive structures, value creation processes and the service delivery infrastructure, which all have a significant impact upon the future landscape of NSD projects (Barnes 2005; Kärrberg and Liebenau, 2005; Möller et.al. 2005; Peppard and Rylander, 2006; Heikkinen, et. al., 2007). Such developments bring to the fore the significance of examining NSD projects within the context of interorganisational networks – a context of service development that is of much more relevance to recent developments in industry. By understanding NSD projects from an interorganisational network perspective, this research argues for the emerging significance of customers in contributing towards the success of interorganisational networked NSD projects. The research examines the integrating role of customers, evolving from a passive contributor to the value creation process into a significantly major contributor to the final outcome of a service delivery process of NSD programs. This is consistent with the arguments in current literature that suggest that the landscape of NSD programs in some industries are on the verge of experiencing a significant shift in the way that NSD project capabilities are understood; that is, from a network perspective.

Drawing on systems theory, open systems models and distributive innovation as the fundamental literature streams leading this inquiry, this thesis is then positioned to examine New Service development (NSD) from a network perspective. This thesis views NSD within a systems perspective by adopting a perspective on the distributive innovation dimension. Through the notion of distributive innovation, this thesis examines how heterogeneous actors coming from different vertical value systems and communities bring with them the access to knowledge, resources and capabilities that involve ecology of technologies, organisational practices and idiosyncratic interactions in their pursuit of the development of rich media mobile services.

2.3.3. Network Perspective to NSD

The origins of network thinking can be traced back to the early 20th century (Wilkinson 2001). The increasing significance of business networks has resulted in the growth of research efforts among several fields (Easton and Araujo, 1996). The reviews of extant network studies identified more than 20 different approaches or schools of thought in interorganisational networks (see Brass et al., 2004; Easton and Araujo, 1996; Grandori and Giuseppe, 1995; Gulati, Nohria, and Zaheer, 2000; Oliver and Ebers, 1998). The great diversity in network research has produced important new knowledge about the functions of various types of organisational networks but has at the same time unfortunately resulted in conceptual confusion and a weak description of the core phenomenon characterizing such networks (Easton and Araujo, 1996; Brass et al., 2004).

In reference to the ongoing discussion about the ontological character of business networks, network literature seems to be focused on studies drawing on economic sociology and the social networks tradition (Powell, Koput, and Smith-Doerr, 1996). Scholars within the industrial network approach have been noted for their tendency to emphasize the historical, evolutionary and embedded character of business networks (Håkansson and Ford, 2002; Håkansson and Snehota, 1995). This view describes networks as borderless, self-organizing systems that emerge in a bottom-up fashion from local interactions. In contrast to the industrial network approach, scholars representing the strategic management perspective and the Resource Based View (RBV) in organisational network literature argue that organisational networks – commonly referred to as 'strategic networks' or 'value nets' – are more intentionally created and contain a specific set of organisations with agreed roles and embedded positions (see Brandenburger and Nalebuff, 1996; Gulati and Sytch, 2004; Möller and Svahn, 2003).

Organisational sociologists have typically viewed network formation as driven by exogenous interdependencies, such as the distribution of technological resources or the social structure of resource dependence (Pfeffer and Salancik 1978; Burt 1983). Given the circumstances driven by these exogenous factors, organisations create ties to manage uncertain environments and to satisfy their resource needs, in the process entering into relationships with other organisations that have resources and capabilities that can help them cope with these exogenous constraints (Gulati and Gargiulo, 1999). Over time, these "embedded" relationships accumulate into a network that becomes a growing repository of information on the availability, competencies, and reliability of prospective partners (Granovetter 1985; Gulati and Gargiulo, 1999).

The current understanding of marketing, purchasing, and innovation management domains (to name the most prominent areas), within which interorganisational interaction processes have been pioneered, has been to a large extent associated with the work of the Industrial Marketing and Purchasing (IMP) group (see, for example, Håkansson, 1982). The academic discussion as well as a growing importance and acceptance of networks in practice has facilitated the growing numbers of both authors and papers at the annual IMP conference exploring domains such as interactions, relationships, and networks (Gemünden, 1997). Since the introduction of IMP research in the 1990s, the business world has evolved to acknowledge the importance of networks and the changes they effect on businesses (Rittera and Gemünden, 2003). These changes include the trend towards outsourcing in procurement practices, R&D initiatives being arranged jointly between organisations, and the emergence of the 'virtual organisation' that reflects a tendency towards flexible project-oriented cooperation between firms (Rittera and Gemünden, 2003). 'Virtual organisation' is understood as the product of a network of organisations that co-operate in bringing their own core competencies into play for a temporary period of time in order to exploit some emerging market opportunities. Any additional resources not already available that are required to exploit the emerging opportunities are sourced outside the existing network. This is the 'virtual' part of the network and it is dissolved after the project is completed (Piercy and Cravens, 1995). The important aspect in the virtual network is that experiences, learning, and ideas remain in the existing network, and the knowledge gathered from the projects can be accumulated and utilized in the future (Piercy and Cravens, 1995).

With the passage of time, the focus of research has moved from the individual dyadic relationships towards a wider network structure. In his seminal paper, Achrol (1997) suggested that one of the fundamental shifts in the 21st century is from a dyadic perspective (see Granovetter, 1973; Achrol, Reve, and Stem, 1983) of interorganisational exchange relationships towards a network perspective of value creation involving different types of network organisations (see also Achrol and Kotler, 1999). This is due to the notion of connectedness, which acknowledges that relationships do not exist in isolation or independently from each other (Rittera, and Gemünden, 2003). Cook and Emerson (1978) argue that "two exchange relations are connected to the degree that exchange in one relation is contingent upon exchange (or non-exchange) in the other relation" (p. 725). The generalized connectedness of business relationships implies the existence of an aggregate structure, a form of organisation referred to as a 'network' (Häkansson and Snehota, 1995). A network may be defined as all the linkages between actors in a system (Rogers and Kincaid, 1981).

2.3.3.1. Complex Business Networks

According to Brown (1994) business networks are essentially complex systems. Brown (1994 p. 419) describe complex systems as essentially containing "many relatively independent parts which are highly interconnected and interactive". Ecological systems, the brain, the Internet and the global economy are all examples of complex systems (Brown 1994; Cowan 1994).

The notion of complex system is rooted in Systems Theory first developed in the 1950s by Ludwig von Bertalanffy, a German biophysiologist, (Hatch 1997). As discussed earlier, in the context of this thesis, systems theory is adapted to explain the concept of the business ecosystem. Apart from being a system, business ecosystems also exhibits another key feature – *complexity*. "Complexity builds on, and enriches systems theory by articulating additional characteristics of complex systems and by emphasizing their interrelationship and interdependence" (Mitleton-Kelly 2003, p. 25). A complex system like the business ecosystem is one whose properties are not fully explained by an understanding of its parts (Lewin, 1999). Rather than reducing an entity (e.g. business ecosystem) to the properties of its parts or elements (e.g. organisations), systems theory focuses on the arrangement of and relations between the parts which connect them into a whole. Thus, the same concepts and principles of organization underlie the different disciplines (physics, biology, technology, sociology, etc.), providing a basis for their unification. This view emphasizes the idea that reductionist approach can not reveal the dynamics which arise from the interaction between the parts of a complex system. This implies that in any research on complex systems, one should not study the parts without understanding the whole. According to Lewin and Regine (1999), understanding organizational dynamics within companies and in the web of economic activity among them is one of the most important avenues of study in the field of complexity science.

The notion of complexity within business ecosystems is manifested by concepts such as self-organisation, emergence and co-evolution (Peltoniemi and Vuori, 2004; Peltoniemi, 2005a; Peltoniemi, 2005b). Peltoniemi and Vuori (2004), describes self-organization as a process in which novel structures or features arise in a system without the intervention of an outside or inside controller. Self-organization appears in business ecosystems very perceivably. The formation of a business ecosystem is a process, where participants are gathered voluntarily with little influence from external or internal leaders. This evolvement is continuing, new connections are created all the time and old ones are dissolved.

The emergent characteristic of complex business networks such as business ecosystems is expressed as “properties, qualities, patterns, or structures, arising from the interaction of individual elements; they are greater than the sum of the parts” (Mitleton-Kelly 2003, p. 40). Complex systems such as business ecosystem are seen to have the potential to create new order as it evolves (Mitleton-Kelly 2004). For example, the development of rich media services as discussed in chapter 1 is the result of interactions between different actors within the business ecosystem to provide end-to-end services such as Mobile TV or Mobile Music. These are examples of services, which no one organization could produce by itself. This is especially visible in NSD projects, where services are developed by the joint contribution of many organizations.

The notion of co-evolution is defined as a process in which interdependent organizations evolve in an endless reciprocal cycle in which changes in organization A set the stage for the natural selection of changes in organization B and vice versa (Moore, 1993). In short, co-evolution is the evolutionary mutual changes of organizations that interact with each other. Co-evolution appears in business ecosystems as the evolution of one company affecting the evolution of other companies. An illustration of this in practice is the classical case of microprocessors and software. When microprocessor manufacturers develop more efficient processors, the software producers are then able to make use of the new hardware processing power present in computers to develop and commercialize software which require higher capacity microprocessors for application. Hence, strategic changes of one company trigger a co-evolutionary effect on other companies in its ecosystem.

Therefore, in better understanding complex business networks like the business ecosystem, the complexity exhibited by that network should be appreaciated. The complexity of complex business networks can be better articulated and understood if keys dimensions that define its complexity – i.e. self-organisation, emergence and co-evolution – are examined and explained (Peltoniemi and Vuori, 2004). A complex system like the business ecosystem is one whose properties are not fully explained by an understanding of its parts. Rather than than taking a reductionist approach in understanding the properties of its parts or elements, system theory focuses on the arrangement of and relations between the parts in understanding the activities and resources which connect them into a complete whole.

2.3.3.2. The IMP View of Complex Business Networks

An overview of the body of literature on interorganisational relationships and networks within the Industrial Marketing and Purchasing (IMP) group domain reveals some descriptive characteristics. Håkansson and Johanson (1992) suggest that networks can be described in terms of *actors*, *activities*, and *resources*, which is more commonly referred to as the *ARA framework*. *Actors* include individuals, groups and organisations. As suggested by Håkansson (1989), the *actors* are “defined by their performance of activities and their control over resources” (p. 16). The way a company is organized and the types of products and services they offer largely depend on the type of relationships a company has developed with its suppliers and its customers. In taking a closer look at actor relationships, Håkansson and Snehota (1995) suggest that the bonds help to bridge the actor limitations. Bonds arise when there is an environment of mutual trust in which the level of commitment can grow. Actor bonds are not only useful in their organisational role but are also conducive to extending an actor's capabilities, which are used to attract the attention and resources they need. The strength and quality of the individual bonds between actors in networks are rooted in the level of commitment, trust and knowledge exchange (Håkansson and Snehota, 1995). Actors with strong bonds work together through complex and challenging situations building mutually satisfying relationships in networks.

Resources, on the other hand, are controlled by actors and their value is determined by "the activity in which they are used" (Håkansson 1989, p. 17). Resources include input goods, financial capital, technology, personnel and marketing (Håkansson 1989). Håkansson's (1989) analysis of resources requirements in networks addresses the issue of the resources demand of the network. The network determines what is desirable according to what is needed. This orientation is about creating a "heterogeneous constellation of resources that complement one another" (Håkansson and Snehota, 1995, p. 136). This constellation of resources within networks allows actors the benefit of economizing the resources used in the pursuit of providing resources for others. It also acknowledges the networks' key advantage – the heterogeneity of its actors and their resources. For example, in the context of a rich media mobile business ecosystem, the heterogeneous constellation of resources can be explained by the telecommunications network operator having ownership of the NGN technology platform, a technology resource that is highly necessary for the provision of rich media mobile content to consumers via their mobile devices. On the other hand, channels (in the case of Mobile TV services) or record labels (in the case of Mobile Music services) possess the right to rich media content resources (e.g. documentaries, movies, news, music tracks etc.), which is a cornerstone component for network operators in completing the development of end-to-end Mobile TV or Mobile Music services. In essence, a Mobile TV or Mobile Music service is not complete without one or the other (i.e. rich media content or NGN delivery infrastructure). In such circumstances, the constellation experienced by actors, which otherwise originate from different organisations, is explained by their complementary resource profiles. This complementary resource profile facilitated by a common platform for service development (i.e. NGN technology platforms that enable integration of actors from different value systems – see *Figure 2.3*) creates totally new business opportunities. For example, through the embedded relationship that exists between network operators and content aggregators in the rich media mobile services business ecosystem, as exhibited by the investments made by both actors in developing IT system integration interfaces, resources such as rich media content are seamlessly mobilized from the content aggregator to the network operators for subsequent repackaging and marketing to customers (Peppard and Rylander, 2006).

Håkansson (1989) also gives prominence to *relationships* between actors in networks as critical in the movement of resources across organisational boundaries. Resources confined within the boundaries of the various actors within the network will serve no substantial constructive purpose for the initiation and the development of networks. Håkansson (1989) argues that relationships are fundamental in facilitating the movement of resources across organisational boundaries to reside in relationships. Thus, Håkansson (1989) also defines relationships in his argument as a resource. While it is difficult to qualitatively measure or define relationships, they are probably the most valuable resource since the exact qualities of the relationship are the most difficult to replicate (Pillai, 2006). The quality of certain relationships in a network contributing towards its inimitability can thus be argued to be a unique resource in the context of the network.

What is created, produced and exchanged constitute *activities*. Activities are therefore the "process whereby resources are used and refined by actors" (Håkansson, 1989, p. l7). Activity links between actors is therefore responsible for generating ideas that can improve the operations between actors in networks. Scholars argue that:

> "Activity-links between companies are valuable because they give both the companies the chance to rationalize some of the operations that are important for their success, but are beyond their own boundaries and within their customers and suppliers" (Ford, Gadde, Håkansson, Lundgren, Snehota, Turnbull and Wilson, 1998, p.42).

Each activity in the network is interdependent with the next so to isolate them for the purpose of articulation can be slightly problematic (Ford, et.al, 1998). The key aspect to highlight is that each activity is about creating reciprocal value propositions in order to support and sustain a firm's competitive advantage (Ballantyne and Varey, 2006). For example, the movement of rich media content from the content aggregator to the network operator and the reverse flow of revenue from the network operator to the content aggregator is an obvious example of activities that illustrate the resource cycle between these two actors.

In summary, the ARA framework allows exploration and analysis of business relationships as they are conceptualized within the markets-as-networks approach to industrial marketing (Hakansson, 1982; Hakansson and Snehota, 1995; Ford, 1998). The framework enables the identification and integration of relevant resources from across the organisation and its wider environment (Freeman, 1991; Biemans, 1992; Hart, 1995; Bruce and Biemans, 1995; Ford, 1998). It also allows the dynamic nature of such networks to be examined in greater depth (Syson and Perks, 2004). Together the *actors*, *activities*, and *resources* elements influence each other. Actors perform activities and control resources, activities transform resources and are used by actors to achieve goals, and resources give actors power and enable activities (Håkansson and Johanson, 1992).

2.3.3.3. The Resource Based View of Complex Business Networks

A prominent feature of the ARA approach in its application to NSD is the unique role of resources within the network and their relationship based exchanges between actors in realizing a NSD outcome (Syson and Perks, 2004). In circumstances where relationships drive resource exchanges, actors are positioned to access each other's resources to gain value from the exchange process. The stream of literature adopting a resource-based-view (RBV) posits that the inimitability of resources is a key underlying characteristic of value associated with each resource in a network context (e.g. Brandenburger and Nalebuff, 1996; Gulati and Sytch, 2004; Möller and Svahn, 2003; Collis and Montgomery, 2008). For example, Collis and Montgomery (2008) argue that:

> "Resources cannot be evaluated in isolation, because their value is determined in the interplay with market forces. A resource that is valuable in a particular

> industry or at a particular time might fail to have the same value in a different industry or chronological context" (p. 143).

Collis and Montgomery (2008) define inimitability by building their argument around resources that have at least one of the following four characteristics – *physical uniqueness*, *path dependency*, *causal ambiguity* and *economic deterrence*. Physical uniqueness is a characteristic that, by definition, cannot be copied. This is usually manifested in the form of a location in cases of a property or patents in cases involving pharmaceutical products (Collis and Montgomery, 2008). As referred to by economists, path dependency simply implies that these resources are unique and, therefore, scarce because of all the accumulation that has happened along the path in getting the resource in question to its form. As a result, competitors cannot go out and procure these resources instantaneously. Instead, they must be built over time in ways that make its formation difficult, if not impossible, to accelerate (Collis and Montgomery, 2008). Brands for example, would typically fall into this category. Causal ambiguity refers to organisations that could be competitors who are thwarted by the impossibility of disentangling either what the valuable resource is or how to re-create it. Organisations can draw up lists of possible reasons for the success of another admirable organisation. However, in the final analysis, it would be next to impossible to actually duplicate the success of that specific organisation. Causally ambiguous resources often involve organisational capabilities. These exist in a complex web of social interactions and may even depend critically on particular individuals within an organisation (Collis and Montgomery, 2008). Finally, economic deterrence occurs when an organisation preempts a competing firm by making a sizable investment in an asset that is both scale incentive and specific to a market. The competitors do have the option to replicate the resource but, because of limited market potential, choose not to in view of the risks involved (Collis and Montgomery, 2008).

Apart from inimitability of resources, resource mobility is the other key underlying characteristic that defines value associated with each resource within the context of organisational networks. As Syson and Perks (2004) have argued, resource mobility is to a large extent affected by firm-specificity:

> "Resources may be embedded in firm-specific skills and organizational routines, making their acquisition difficult unless replication or transfer of such accompanying routines occur" (p. 257).

Resources may have less value if removed from their context or split from a combination of resources (Ford, et.al, 1998). This argument in itself manifests the significance of relationships in terms of the mobility of resources across organisational boundaries to form relationships without losing the context in which their optimum value is realized. By connecting and bonding actor with resources, it can then be argued that relationships play an instrumental role in the development of the network resources that ultimately build network-level capabilities in its relation to the marketplace.

In the light of recent conceptual work conducted by Peppard and Rylander (2006) and the empirical work of Heikkinen, et. al., (2007), the complex business network perspective seems to have set a new precedent in NSD literature. Empirical evidence is emerging to support a strong case for an in-depth study of NSD in the context of networks with more complex characteristics, broadening the scope of inquiry to include both cooperating and competing organisation dynamics in networks (Johne and Storey, 1998; Möller et.al. 2005; Peppard and Rylander, 2006). In order to gain a better insight into the difficulties and challenges facing interorganisational NSD programs of the future, this study explores the benefits of applying a complex business network approach to NSD. This study formulates an argument for recognizing the significance of complex interorganisational NSD settings in the current NSD landscape and explores the business concepts that affect the NSD capability of such networks.

In exploring NSD capability of such complex networks, this research applies the IMP ARA framework in defining the various actors that comprise the network and the roles they perform; the resources these actors bring to the network; the relationships between actors that define the network and the movement of resources across organisational boundaries to reside in relationships; and the activities that emerge out of the relationships that define the network. For example, based on the IMP ARA framework in networks, this research considers network operators and content aggregators as central actors or focal actors (as represented in Figure 1.4). Other actors in the network such as content providers, systems integrators and OEM device manufacturers share their resources and activities in supplying the various components of rich media services to central actors. For the purpose of this thesis, network operators are actors whose task is to facilitate the roles played by the non-central actors, channeling the resources they bring to the forefront of the network and integrate the specialist activities within non-central actors into the activities of the wider network to realize the end-to-end development and delivery of the rich media mobile services.

Through this in-depth inquiry, the business concepts that define NSD capability in a complex business network will be more precisely articulated in order to explain the largely unexplored phenomenon of NSD activities within the context of business ecosystems. The outcome is expected to benefit both practitioners and academics alike. These real-world benefits will be constituted by indentifying new ways in which alliances between both complementary and competing organisations are forged in NSD activities within complex business networks.

2.4. The Research Problem

The literature within the domain of NSD indicates that concerns are raised from a uni-organisational perspective. Almost all aspects of NSD activities have largely ignored an interorganisational or systems perspective of NSD activities (Biemans, 1992; Hakansson and Snehota, 1995; Bruce and Biemans, 1995; Hart, 1995; Syson and Perks, 2004). Conventional new service developers are increasingly confronted with new approaches to NSD such as ‘new style product development’ (Johne and Storey, 1998). There is increasing recognition that organisations that are willing to engage in rule-breaking approaches to NSD may ultimately be able to reshape market boundaries and, in the process, gain a distinct competitive advantage (Johne and Storey, 1998).

Having taken into account the gap in NSD literature through theoretical triangulation (as exhibited in *Appendix 3*), this thesis is therefore confronted with the following overarching research question:

What factors affect interorganisational NSD capability?

Appendix 3 illustrates the underlying importance of this study. It triangulates the available literature informing the three theoretical domains that underlie the essence of this thesis and, in the process, identifies and articulates the overarching research problem confronted in this research. It draws attention to the need to further explore and describe NSD projects in business ecosystems in business sectors such as Infocoms. In acknowledging the changing nature of NSD landscapes of the future, the contribution of this thesis to understanding the dynamics and business concepts affecting NSD projects in business ecosystems can be appreciated both academically and professionally from a contextual perspective.

In order to develop a better understanding of the principal research question, the following secondary research questions are posed to more effectively guide the scope of this thesis:

RQ1: What are the concepts that define the notion of 'network interconnectednesses' in NSD activities between actors within business ecosystems?

RQ2: What are the concepts that define the nature of 'collaboration' in NSD activities between actors within business ecosystems?

RQ3: What is the nature of 'customer involvement' in NSD activities within business ecosystems?

This study contributes significantly to the domain of complex business networks or business ecosystems as referred to in this thesis (Möller et.al. 2005; Peppard and Rylander, 2006). It has been recognized in literature that the emphasis seems to be skewed towards the examination of NSD issues from a uni-organisational perspective (Johne and Storey, 1998). This research is therefore anticipated to be a prelude towards a stream of literature in the future that contributes towards a deeper understanding of the influence of business ecosystems in NSD program arrangements.

Current literature reveals that theory development in interorganisational NSD has been hindered by a lack of clearly defined business concepts that could guide research initiatives in complex interorganisational NSD program arrangements (Möller et.al. 2005; Peppard and Rylander, 2006). Therefore, this research is specifically designed to contribute to the development of theoretically sound business concepts that will assist in defining NSD capability in business ecosystems.

The research also contributes to understanding the significance of management consideration for the systematic review of *current* organisational structures, capabilities and resources against the *future* organisational structures, capabilities and resources profile required for meeting the demands of the NSD programs of tomorrow.

In particular, this thesis provides an understanding of how actors, activities and resources can be used to develop NSD capability in networks. It provides managers within the telecommunication, broadcasting media and computing industries with an appreciation of the significance of the level of interconnectedness of their organisations with other actor organisations within a business ecosystem. Managers will evolve in their thinking to appreciate the full value creating potential of business ecosystems through harnessing industries as diverse as telecommunication, broadcasting media and computing by means of complex integrations facilitated by common platforms such as NGN technology platforms. The emergence of complex networks such as business ecosystems as the contextual settings for the new services development activities facing these industries testifies to the rapidly evolving NSD landscape of the future. These developments force management to rethink their new service development models, and align organisational structures, capabilities, skill sets and resources to better reflect an agile ability to develop new services in business networks to achieve future NSD program objectives.

2.5. Conclusion

This chapter has examined the streams of literature in all three main theoretical domains (i.e. Innovation Theory, Network Theory and New Service Development Theory) and in so doing, identified the overarching research problem. Systems theory, a branch perspective emerging from the intraorganisational-interorganisational level of innovation theory advocated by authors such as Amabile (1988), Briggs (1992), Hatch (1997) and (Cummings and Worley (1997) distinguishes itself as a branch from which this thesis draws its arguments. Systems theory in innovation literature then brings forth the analogy of a business ecosystem as a complex business network, a concept in business literature advocated by authors such as Lewin (1999), Iansiti and Richards (2006), Iansiti and Levien (2004) and Moore (1993, 1996, 1998, 2006).

The work of groups such as the Industrial Marketing and Purchasing (IMP) group has certainly brought the network dimension to prominence in marketing literature (Håkansson, 1982; Rittera and Gemünden, 2003). The development of the *ARA framework* has similarly brought about a more systems-oriented perspective to the concept of networks within marketing literature (Häkansson and Snehota, 1995; Rogers and Kincaid, 1981). Literature review indicates that there has been practically no real attempt made in applying network theory within the marketing domain to recognize complex business networks in understanding NSD.

The vast majority of literature within the domain of NSD seems to have been preoccupied with understanding NSD activities within industries (Wynstra, Van Weele, and Weggeman, 2001, Moenaert, Caeldries, Lievens, and Wauters, 2000, Tushman and Katz, 1980, Syson and Perks, 2004, Bruce et. al, 1995). At the time this thesis was undertaken, the work of Heikkinen, Mainela, Still and Tähtinen (2007) was the only exception, in which they examined a complex network of organisations and the roles these organisations perform within the context of a NSD project (see *Appendix 3*).

In the light of the literature review conducted within the above mentioned three theoretical domains, the theoretical underpinning guiding this thesis is centered on NSD in a complex business network environment. Based on the positioning and the theoretical underpinning of the thesis, this project undertakes research in NSD within the context of a business ecosystem. The research examines how NSD projects are affected within the context of a business ecosystem. The research ultimately seeks to understand the variables that affect a business ecosystem's capability in developing new services within the context of the rich media mobile services setting.

Chapter 3

Understanding Business Ecosystems and NSD

3.1. Introduction

This chapter reviews (discusses, evaluates and critiques) scholarly work in literature from three major theoretical domains as explained in chapter 2. These theoretical domains are service innovation theory, network theory and NSD theory. This chapter explores the research literature and then identifies the concepts derived from these three theoretical domains affecting new service development capability in networks that exhibit complex business network characteristics, in other words a business ecosystem. In identifying the gap in literature and the variables relevant to understanding new service development capability of business ecosystems, this chapter goes on to develop the research propositions related to each concept identified, and subsequently arrives at a research model guiding this thesis.

3.2. Interdependence

Chapter 3 illustrated how rich media mobile communications services are being developed and delivered in business ecosystems. In the context of the development and delivery of rich media mobile services, business ecosystems are acknowledged to be fundamentally made up of various actors and characterized by an underlying interdependent technological architecture (Camponovo and Pigneur, 2003; Peppard and Rylander, 2006; Iansiti and Richards, 2006). This horizontal interdependent technological architecture functions as a common platform, in other word performing the function of a 'hub' that holds the business ecosystem together (Moore, 2006, 1996; Iansiti and Richards, 2006). The question that then emerges is how value is generated within the context of a business ecosystem. The key to value creation in the networked economy lies in understanding how value is created in interdependent relationships (Blankenburg, Eriksson, and Johanson, 1999; Anderson, 1995; Peppard and Rylander, 2006). When viewed from a business ecosystem perspective, relationships can be seen as part of a larger whole – a network of interdependent relationships (Andersson, Hakansson, and Johanson, 1994). As discussed earlier in this thesis, these relationships are 'interconnected' in that the link between actors in the business ecosystem is exhibited in the technologies they share, the products they jointly develop, and the consumers they seek to collectively serve (Iansiti and Richards, 2006). For example, content aggregators in a business ecosystem will invest in computer server technologies that allow them to aggregate and store music or video content (digital content) prior to ingesting these content into the network operator's network infrastructure. This imples that the technology interface that is present between the content aggregator and the network operator to make the transfer of digital files possible electronically exhibits the interconnectedness between the two actors. This also implies that what happens in one relationship may have a positive or negative effect on others (Peppard and Rylander, 2006). An action by one participant in the network can influence other network members. In addition, an action by one participant may require further actions by other participants to be effective – due to nature of actors within the business ecosystem being interconnected. This observation highlights a fundamentally important characteristic of the business ecosystem – *interdependence* (*see* Aiken and Hage, 1968; Pfeffer and Salancik, 1978; Aldrich, 1979; Galaskiewicz, 1982; Burt, 1976). Hence, it could be argued that by actors being interconnectedness between each other in the wider context of the business ecosystem, the notion of interdependence between these actors thrives.

Interdependence is arguably the most common explanation used for the formation of interorganisational cooperative ties such as those present in business ecosystems. Scholars have suggested interdependence as the primary reason for organisations to form ties with other organisations in response to the challenges posed by the interdependencies that shape their common environment (*see* Aiken and Hage, 1968; Pfeffer and Salancik, 1978; Aldrich, 1979; Galaskiewicz, 1982; Burt, 1976).

Galaskiewicz (1985) argues that the formation of strategic networks is usually focused on the issue of environmental dependence and concerns two sets of considerations: *resource procurement* and *uncertainty reduction*. Organisations engage in strategic networks to form cooperative ties to access strategic *capabilities* and *resources* that are essential to pursue their goals that are at least in part under the control of other organisations in their environment (Galaskiewicz, 1985).

Gulati and Sytch (2004) have noted the tendency of available literature in the area of interorganisational relationships to be typically characterized by a lack of emphasis on balanced dependence relationships. The research work in this domain tends to be skewed towards analysis of *dependence asymmetry* within the majority of interorganisational network relationships (Gulati and Sytch, 2004). This analytical bias has governed subsequent research on organisational interdependence (Gulati and Sytch, 2004). While some scholars have argued the necessity for further research to be developed within the domain of symmetrical relationships they have, nevertheless, conceded that interorganisational relationships are more realistically portrayed in terms of asymmetrical dependence (Aldrich, 1979; Cook, 1977; Pfeffer and Salancik, 1978).

As a result of the dominace of asymmetrical dependence in most business networks, the 'logic of power' was frequently cited in research as the key driver underlying exchange relationships between organisations and had been associated with the existence of a negative relationship between asymmetric dependence and performance in dyadic economic exchanges (see Gundlach and Cadotte 1994; Lusch and Brown 1996). Authors in the area of bilateral deterrence theory have argued that deterrence from the use of power fails to occur in conditions of unequal dependence as both partners increase the use of power and punitive tactics. Thus, the stronger (less dependent) actor increases the use of power to decrease the fear of retaliation, whilst the weaker (more dependent) actor increases the use of power due to an increased expectation of attack (Ford and Blegen 1992; Lawler 1986; Lawler 1992; Lawler, Ford, and Blegen 1988; Michener and Cohen 1973).

Gulati and Sytch (2004) argue that an increased use of power by any actor in the network, including punitive and coercive tactics, permeates asymmetrically dependent relationships. According to Gulati and Sytch (2004), the use of power results in tensions, frictions, and other forms of detrimental engagement between the partners. This perpetuates the adversarial nature of the bargaining tactics and, as a consequence, impedes the development of more positive relational behavior and thereby undermines the cooperative orientation of the relationship and diminishes the efficiency of interorganisational exchanges (Jacobs 1974; Lawler and Yoon 1993; 1998; Lusch and Brown 1996).

In response to authors such as Aldrich (1979), Cook (1977), and Pfeffer and Salancik (1978) who advocate a shift from the perspective of asymmetry dependence that is based on a view of the concentration of power within the confines of focal actors, Gulati and Sytch (2004) have argued for the application of the concept of *joint dependence*. This thesis argues that joint dependence is important in promoting positive relational behavior among the actors populating a given network. Through joint dependencies, the tendency to use power is downplayed in order to discourage negative relationships between actors. Instead, the promotion of a logic of embeddedness among actors in the network would increase positive relational behavior, such as bilateral commitment and mutual forbearance (Gulati and Sytch, 2004).

3.3. Joint Dependence

The concept of joint dependence is not new to network theory. Gulati and Sytch (2004) first formulated the concept in their effort to explore the relationship between the notions of embeddedness and power. It is argued that while dependence asymmetry invokes the logic of *power*, joint dependence brings attention to the logic of *embeddedness* (Gulati and Sytch, 2004). Polanyi (1957) was one of the earliest scholars that used the concept of embeddedness to describe the social structure of modern markets. The notion of *embeddedness* was then adopted by other scholars in interorganisational network theory (Granovetter, 1985) to reveal its robust effect on economic action, particularly in the context of inter-organisational networks (Uzzi 1997). As the levels of joint dependence in exchange relationships increases, these relationships are less impacted by the underlying dynamics of power, but also become infused with higher levels of mutual commitment and a stronger relational orientation that underlies a logic of embeddedness (Uzzi 1997). This in turn has performance implications for those interorganisational exchanges (Gulati and Sytch, 2004).

Marsden (1981) suggests that the structural parameters of the relationship between various actors in the network, subsequently change the dispositions of actors within these relationships. Marsden (1981) argues this to be the consequence of each actor giving a higher degree of attention to the responses and attitudes of the other, resulting in the quality of the relationship being the main determinant of a satisfactory business relationship. Parallel to the arguments presented by Marsden (1981), research work in the domain of social psychology conducted by Murray, Holmes, and Griffin (1996) further reinforces the suggestion that parties who depend heavily on a relationship are more likely to interpret ambiguities in their partners' behaviors in a positive rather than in a negative light.

Similarly, the work by Marsden (1981) and Murray, Holmes, and Griffin (1996) has demonstrated that an actor's high level of dependence on another may produce a high degree of mutual empathy[9] and bilateral commitment[10] to the relationship. This

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[9] For the purpose of this thesis, mutual empathy i**s** based on the mutual capacity of actors to receive, accept and understand the other as they are, allowing the other's perspective or views to considered.
[10] For the purpose of this thesis, bilateral commitment is defined as the mutual obligation of actors to act in the in common interest of the other to ensure joint success in the long-term horizon.

orients the relationship towards joint success in adopting a long-term horizon for the relationship, which is exhibited in actions such as effective conflict resolution and the willingness of actors in the network to forego immediate self-interest for the benefit of the entire business ecosystem (Kelley 1979; Rusbult, Verette, Whitney, Slovik, and Lipkus, 1991).

As a result of increased levels of solidarity and empathy, and the desire to avoid the higher costs associated with disruptions, highly dependent relationships may instill a sense of encouragement among actors and a preference for non-coercive relational tactics as opposed to coercive strategies (Gundlach and Cadotte, 1994). Raven and Kruglanski (1970) suggest that the diminishing use of punitive actions in conjunction with reliance on non-coercive rules of engagement facilitates the development of a stable business relationship, which in turn fosters its continuity.

Based on the research by Gulati and Sytch (2004), this thesis adopts the concept of joint dependence in arguing that joint dependence can lead to a higher degree of interconnectedness between actors in the business ecosystem through the logic of embeddedness perpetuating increased solidarity and cooperation among actors within the ecosystem. As argued by Gulati and Sytch (2004), the interests of actors in interorganisational networks are increasingly likely to affect, and be affected by, the interests of other actors within the network as they begin to develop a shared understanding of the utility of mutually beneficial behavior (see also Lawler, Thye, and Yoon 2000; Lawler and Yoon 1996; Marsden 1981; Uzzi 1997).

Since highly dependent relations lead to partners' amplified identification with each other, this in turn results in the convergence of their values, attitudes, and goals (Mizruchi, 1989; Turner, Brown, and Tajfel, 1979). Furthermore, as a result of their increased dependence and joint involvement, partners may converge toward not just *attitudinal* but also to *structural* congruence (DiMaggio and Powell, 1983). Attitudinal convergence makes communication and negotiations in the relationship less conflictual, while structural congruence reduces some of the operational frictions, further helping actors in the business ecosystem to avoid unnecessary transaction costs (Gulati and Sytch, 2004).

Attitudinal and structural congruence among the various actors within the ecosystem also underscores the relational view espoused by Dyer and Singh (1998). It can be argued that attitudinal and structural convergence enables organisational relationships to generate network-level competitive advantages. Extending the argument provided by Dyer and Singh (1998), Pillai (2006) explains that competitive advantages in organisational networks are achieved through investments in relation specific assets; substantial knowledge exchange; and combining complementary resources and capabilities in unique ways. Investments made in such relation-specific assets result in the joint creation of unique new products and services. As a result of such capabilities for creating unique joint new products and services, actors within the ecosystem experience lower transaction costs and develop capabilities over and above those afforded by arm's length exchanges (Dyer and Singh, 1998). Research has suggested that an organisation's alliance partners are, in many cases, the most important source of new ideas and information that result in performance enhancing technology and innovation (von Hippel, 1988).

However, it is critical that structural and attitudinal convergence is also viewed from a temporal dimension (Pillai, 2006). Using the concept of 'market age', Pillai (2006) argues the longer the relationship between actors in a network exists, the higher the degree of maturity that will be manifested in the relationship. Shared norms of behavior and explicit routines of interorganisational knowledge sharing emerge as important characteristics that signal a higher level of maturity in relationships between actors (Uzzi, 1997). Shared norms of behavior are likely to discourage opportunistic acts, particularly in mature relationships compared to less mature relationships in which norms are still evolving (Pillai, 2006). In more established network relationships, organisations are likely to foster familiarity and mutual forbearance, hence, similarly discouraging these organisations from engaging in opportunistic acts (Jayachandran et. al. 1999).

Familiarity is defined as the extent to which tacit coordination of firms in networks is enhanced by their awareness of the capabilities and actions of other firms (Jayachandran et. al. 1999). Familiarity between firms in networks is likely to influence the extent to which firms engage each other with actions and reactions (Chen and Miller, 1994; Chen, 1996). Jayachandran et. al. (1999) defines mutual forbearance as a tacit collusion resulting from the competitive dispositions of firms in networks such as markets. This ultimately leads to these same firms finding themselves involved in a web of interdependence. Tacit collusion, as opposed to direct collusion is a situation in which two firms understand each other's motives and strategies and implicitly coordinate to avoid competing intensely (Jayachandran et. al. 1999). Therefore, the outcome of familiarity and mutual forbearance is the notion of a more stable relationship between actors in networks. As mature relationships tend to be more stable, opportunities for information asymmetries are relatively uncommon compared to less mature interorganisational relationships (Pillai, 2006).

As the sacrifice of future exchanges resulting from current opportunistic behavior would be prohibitively expensive, maturity in relationships promotes continuity in network relationships (Gulati and Sytch, 2004; Pillai, 2006; Uzzi, 1997; and Jayachandran et al., 1999). Maturity and market age have been shown to enhance the levels of cooperation within networks (Heide and Miner 1992; Lawler et al. 2000; Stinchcombe 1986). This results in joint dependence that sets the stage for an increased level of network interconnectedness between the actors in the ecosystem (Gulati and Sytch, 2004; Pillai, 2006; Uzzi, 1997; and Jayachandran et al., 1999).

Network interconnectedness is the cornerstone concept that underpins the essence of relationships between the various actors in the rich media mobile services ecosystem. This thesis argues that the key to value creation capabilities in new service development (NSD) programs in business ecosystems is the degree to which complex business networks to provide a truly interconnected environment in which the development of end-to-end rich media mobile services thrives. This thesis further argues that the underlying factor that creates these interconnected relationships is the level of joint dependence between the various actors that comprise the business ecosystem. Joint dependence enables actors within the business ecosystem to strategically leverage other actors' strategic capabilities and resources, in their collective attempt to mitigate the uncertainty generated by that dependence within the business ecosystem (see *Figure 1.2* and *Figure 2.3*).

Based on the arguments provided above, it can be concluded that new service development in a business ecosystem is enhanced by positive relationships between the actors. These actors from various specialized organisations participate by adding value, in essence, developing rich media services on standardized platforms. This thesis argues that in order to develop rich media services in a business ecosystem, joint dependence rather than network interconnectedness potentially enhances the new service development capability. This leads to the following proposition:

P^1: Joint dependence in business ecosystems rather than network interconnectedness potentially enhances new rich media services development capability.

Commentary: This working proposition claims that even though the notion of power is associated with relationship dynamics in asymmetrical interorganisational arrangements, the notion of embeddedness supersedes the rationale of power in explaining the dependence dynamics between actors in business ecosystems. In order to develop rich media mobile services, actors from specialized organisations may seek to work together in developing new services on a shared platform. This requires a sense of acknowledgement among the actors that each actor is uniquely embedded, as reflected by their capabilities and the resources they contribute; and the roles and functions they perform in the development of an end-to-end rich media service within the context of the business ecosystem. This acknowledgement facilitated by the existence of a shared service development platform provides the means for the formation of interconnected relationships among actors within multidimensional value networks (i.e. business ecosystems). Actors from otherwise different vertical value systems (i.e. industries, see *Figure 2.3*) find themselves interconnected in a complex network of actors in developing new rich media mobile services through the presence of a shared platform. Joint dependence as manifested by the notion of embeddedness; mutual dependence; structural and attitudinal congruence; and mutual forbearance facilitates the flow of skills, resources and capabilities within and between vertical value systems in business ecosystems. With the concept of joint dependence, members of the business ecosystem are able to arrive at a consensus that no single organisation or vertical value system (i.e. industry) can proceed independently in developing such end-to-end rich media mobile services.

3.4. New Service Development Platform (NSDP) in Ecosystems

Central to the emergence and coherence of the business ecosystem is the concept of a '*platform*': "a set of tools or components that provide building blocks for application providers" (Iansiti and Richards, 2006, p. 81). Platforms perform a critical role in an ecosystem. They make available consistent and reliable components that enable other niche organisations such as application providers greater efficiency in developing applications (Iansiti and Richards, 2006). The tools and building blocks that are made available through these platforms for the other ecosystem members make it easier for these members to create powerful applications that in turn benefit end-users (Iansiti and Richards, 2006).

The final benefit often associated with platform innovations is the concept of 'product family'. Product family is a group of related products that share common features, components, and subsystems, and satisfy a variety of market niches (Meyer and DeTore, 2001). Scholars (Wheelwright and Clark, 1992; Rothwell and Gardiner, 1990; Sanchez , 1995, 1999, Sanchez and Collins, 2001; Laurie, Doz, and Sheer, 2006) have applied concepts such as 'platform projects', 'robust designs', 'modular product and process architecture' and 'new growth platforms' as a means to generate a series of different products within a single product family.

While a *product platform* can be defined as a set of parts, subsystems, interfaces, and manufacturing processes that are shared among a set of products, *product family* comprises of products that exhibit a set of common variables, features or components that is identifiable to a given product platform (Meyer and Lehnerd, 1997; Meyer and DeTore, 2001). The design of platform-based product family has been linked to an efficient and effective means to realize sufficient product variety to satisfy a range of customer demands in support for mass customization (Kotler, 1989; Meyer and DeTore, 2001). The basic rationale of a family of products or multi-product approach based on a common innovation platform is to develop the largest set of products through a standardized set of base components and production processes (Meyer and DeTore, 2001).

Meyer and DeTore (2001) in illustrating the notion of platform innovation provide examples such as Boeing with its 777 aircraft and Black and Decker in their effort to revolutionize the way power tools are developed. In providing the example of the Boeing 777 aircraft, Meyer and DeTore (2001) explain how passenger, longer-haul, shorter-haul and cargo planes (i.e. the product variants intended for different market segments) are manufactured based on the same design platform and generally adopt the same components in the development of the final aircraft. In the case of Black and Decker, Meyer and DeTore (2001) illustrate how the company categorized common component such as motors, armatures, power cords and switches as its product development platform. They (Meyer and DeTore, 2001) explain how the company with over 120 different motors for its power tool products, managed to streamline its product requirements to a single universal motor based on the product platform concept adopted by the company.

In their latest paper on organisational growth through innovation, Laurie, Doz, and Sheer (2006) have taken a fresh look at the strategic importance of platforms for innovation and its contribution towards organisational product/service development capability for the longer term. Laurie, Doz, and Sheer (2006) examined how executives of twenty-four successful companies achieved organic growth over time through ‘new growth platforms’ (NGPs). They suggest that the possibilities for forming NGPs are facilitated by the forces of change, such as new or converging technologies, changing regulatory environments, or social pressures, which in turn creates a whole new window of opportunity to satisfy some unmet or latent customer need.

When a corporation identifies a potential NGP, it can then calculate and assemble the right portfolio of capabilities, business processes, systems, and assets that are required to deliver products and services that satisfy these customer needs (Laurie, Doz, and Sheer, 2006). It is this mix of capabilities, business processes, systems, and assets that eventually forms the basis for generating streams of new products and services based on the common platform concept (Laurie, Doz, and Sheer, 2006). In the process, the platform facilitates the release of a whole new window of opportunity for organisational growth.

Meyer and DeTore (2001, pp.189) have argued the notion of product or service platform from two key perspectives. The first perspective acknowledges a service platform as *"common architectures spanning multiple products that are implemented with common subsystems and subsystem interfaces"*. The second perspective instead recognizes that the major subsystems (i.e. service/product components) and the interfaces between these subsystems (i.e. interfaces between service/product components) as being the service platform for innovation. The former perspective acknowledges the existence of a single organisational framework that can be applied to multiple service families across multiple service market segments through service feature reduction or increment initiatives (e.g. as applied by Boeing with the 777 product platform). On the contrary, in the circumstances surrounding the latter perspective, it is argued that the major subsystems and the interfaces between these subsystems within larger organisational innovations framework forms the basis of a service platform. The second perspective to service innovation platforms is therefore more consistent to *modular approach to service platform innovation* as advocated by Sanchez (1995, 1999) and Sanchez and Collins (2001).

The modular approach to service platform innovation essentially acknowledges that the complexity in many industries make it extremely difficult if not impossible for any single organisational innovation framework to emerge as the only service innovation platform driving service innovations. Most organisations are in most circumstances structured in a decentralized service/product market manner, where each SBU (Strategic Business Unit) is responsible for a certain category of service-market requirements (Meyer and DeTore, 2001). Therefore, the major subsystems (as referred to by Meyer and DeTore, 2001) of a service innovation platform are essentially modules as defined by Sanchez (1995, 1999) and Sanchez and Collins (2001).

A subsystem in the context of this paper is defined as a *"logical unit of technology delivering a specific functionality required in the overall system"* (Meyer and DeTore, 2001, pp. 190). As much as subsystems are seen as modules, a subsystem can also be equated to a *building block (BB)*. A service innovation platform specifically tailored for representation of a service family architecture essentially consist of key building blocks underlying the service development platform which consistently provides variety in the breadth and depth of a given service family (Zha, Sriram, Fernandez and Mistree, 2008).

Through the concept of a service family, the organisation's ability to efficiently deliver large service variety is seen to have profound implications for the future of service development activities within organisations. The objective of organisations pursuing the concept of a family of services or multi-service approach in having such modular service innovation platforms is to obtain the largest set of services through a standardized set of base components (i.e. subsystems, modules or BBs) in service development processes. An effective platform for a service family can allow a variety of derivative services to be created more rapidly and easily (i.e. resulting in costs and time savings), with each service providing the features and functions desired by a particular market segment (Meyer and DeTore, 2001; Sanchez 1995, 1999; Sanchez and Collins, 2001; Zha, Sriram, Fernandez and Mistree, 2008).

Sanchez and Collins (2001) argue that in creating modular service development architectures, organisations may pursue either *closed-system* or *open-system* service development strategies. In a closed-system strategy, the objective of an organisation is to create a proprietary service platform architecture intended to accommodate only component variations available to the organisation through its immediate value system (i.e. its supply chain system) (Meyer and DeTore, 2001; Sanchez 1995, 1999; Sanchez and Collins, 2001). In contrary, an open-system service development strategy requires that the organisations disclose its subsystem interface specifications of its NSDP so that other organisations both within the immediate value system and in the wider business ecosystem can develop additional components (i.e. subsystems) to further augment the its existing service development architecture (Sanchez and Collins, 2001).

Adopting a modular architecture in an *open-system* service development environment is a watershed event at both the organisational and industry level. This is so because a modular service development architecture creates a well-defined and relatively stable technical infrastructure, in an otherwise turbulent and dynamic environment such as in complex business networks (i.e. the business ecosystem). This encourages organisations and their suppliers to be constantly vigilant of "capability bottlenecks" in developing subsystem variations compatible with the New Service Development Platform (NSDP) of the wider business ecosystem. In identifying "capability bottlenecks" that are currently limiting a business ecosystem's options for creating new services, organisations that consists the ecosystem can then proceed to translate these particular “capability bottlenecks” into capability needs for focused strategic learning and capability development. These capability developments may require the acquisition of certain resources or competencies from both within and without the value systems familiar to members of the business ecosystem. In attempting to close the “capability bottlenecks” through the open-system approach, organisations that create new end-to-end[1] services can then draw upon an ever growing array of new and improved modular components in configuring a stream of service variations within service families.

Senior managers in most organisations are preoccupied with incremental approaches to innovation and product/service development. Senior managers hardly ever look at their capabilities with a view to creating a whole new portfolio of products or services to meet customer needs that the organisation has never before addressed (Laurie, Doz, and Sheer, 2006). Arguing along similar lines, Johne (1994) stresses that organisations have been more comfortable with conventional approaches to competitive strategies when considering NSD in competitive manoeuvers for business growth, primarily because of the lower level of risk associated with this sort of competitive approach.

Rarely does an organisation not have to concern itself with cost reduction issues (Johne and Storey, 1998). As a consequence of competitive market pressures, most service organisations focus on productivity in their service delivery systems, generating new services complementary to the existing lines at the peril of developing a more strategic approach to new service development capability (Johne and Storey, 1998).

With the advent of contemporary service development processes, service development activities have become increasingly collaborative involving organisations not only within industry boundaries, but more importantly across multiple industries (Achrol and Kotler, 1999; Gossain and Kandiah, 1998; Ancarani and Shankar, 2003; Möller, Rajala and Svahn, 2005; Peppard and Rylander, 2006; Rao, Angelov and Nov, 2006; Eduarado and Sato, 2008). It is therefore pertinent to argue the importance of innovation from the perspective of common platforms in developing new services in business ecosystems.

A fundamental reason for the existence of the business ecosystem is to facilitate and to deliver innovations (Iansiti and Levien, 2004). The focus of organisations in most business sectors has progressed from competing on grounds of efficiency and effectiveness to competing on the basis of continuous innovation (Moore, 2006). As organisations have accelerated innovation in their own business domains, they have discovered it would be a daunting task if not impossible to drive innovation independently at the same pace indefinitely (Iansiti and Levien, 2004; Moore, 2006). With every advance made in their specific business domains, there are complementary innovations that must be integrated for the total innovation system to be able to deliver the sum of its parts (Iansiti and Levien, 2004; Moore, 2006).

A business ecosystem is able to channel resources, competencies and skill sets that are not specifically limited to a single organisation but are provided and shared by all member organisations, representing the advances made in their respective industry. These contributions are channelled through the common platform that essentially holds the business ecosystem together irrespective of the role the actors play in the ecosystem (Iansiti and Levien, 2004; Moore, 2006). This in turn enables the business ecosystem to develop new products and services that never existed prior to such interorganisational arrangements, ultimately enabling the end-users or the consumers to benefit in terms of consuming single products and services with an end-to-end development and delivery quality (Peppard and Rylander, 2006). This leads us to a subsequent argument that the kind of platform that is critical for the very existence of the business ecosystem in sustaining its existence could also be seen in its own right as a more significant platform for new service development within the context of the business ecosystem.

This thesis attempts to empirically examine the business ecosystem's NSD capability along the lines of innovation based on a new 'platform' in the rich media mobile services business ecosystem. This thesis argues that a new platform is fast emerging and taking shape in the rich media mobile services ecosystem. It is a technology that has been in its formative phase for the last five years or so. This new platform is formed by the major technologies enabling the delivery of the rich media mobile communications services and is known today to the communications industry as the Service Delivery Platform (SDP) (Peppard and Rylander, 2006).

3.4.1. The Service Delivery Platform (SDP)

The third generation of radio access technologies, commonly known as the third generation (3G)[11] standard in the communications industry, has come a long way since its debut in 1998. In the late 1990s, observations and requirements within the industry

[11] See Appendix 12 for a brief description of 3G.

motivated major efforts and studies in the International Telecommunication Union (ITU) and other regional standardization groups to define and harmonize a common set of specifications for new International Mobile Telecommunications standards referred to as International Mobile Telecommunications-2000 (IMT2000) systems to further develop the 3G standard (Barnes, 2002).

The IMT-2000[12] systems upon which the 3G standard is based, are associated with three rival protocols, namely the *Universal Mobile Telephone System (UMTS)*[13] in Europe, *Code Division Multiple Access (CDMA)*[14] 2000 in the US, and *Wideband-CDMA in Japan* (Barnes, 2002)[15]. Nevertheless, these systems have all in the past been organized on the basis of *proprietary delivery mechanisms*, which rely on *proprietary telecommunications protocols* (Barnes, 2002). A proprietary delivery mechanism provides a set of dedicated components to realize only the specific service they support, independent and unrelated to other service-related infrastructure. This simply means there are no shared components that are used in the development and delivery of services.

IMT-2000 systems adopted by the major telecommunications organisations are currently reorganizing architecturally to incorporate a new platform that builds on the existing 3G standards (Kärrberg and Liebenau, 2005). This has resulted in a large number of industries now being supported by a single shared platform (Symonds, 1999). This is consistent with the trend in the communication industry, as future success in the

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[12] International Mobile Telecommunications-2000 (IMT-2000), better known as 3G or 3rd Generation, is a family of standards for mobile telecommunications defined by the International Telecommunication Union.

[13] See Appendix 12 for a brief description of UMTS.

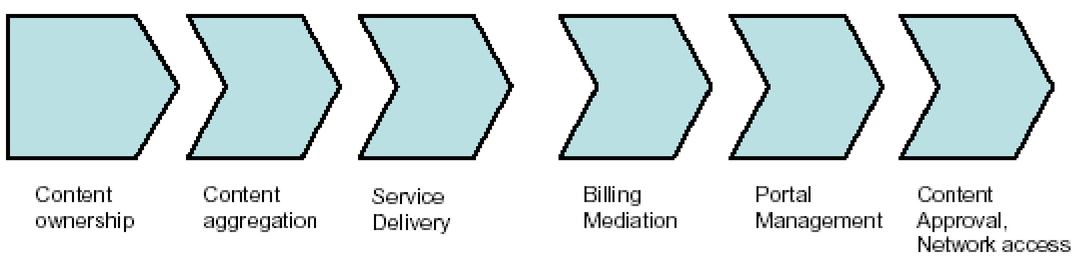
[14] See Appendix 12 for a brief description of CDMA.

[15] See Appendix 12 for a brief description of Wide-CDMA.

communications industry is dependent on inputs from diverse industries such as broadcasting, entertainment and information technology that have only been peripherally related in the past (Tapscott, 1995).

Such developments have led to the emergence of Service Oriented Architectures (SOAs)[16] like the Service Delivery Platform (SDP) in the rich media mobile communications services industry. The SDP based on an all-IP (Internet Protocol) platform, is an abstract technology platform that has come to prominence only in the last five years or so, and is formed by the major technological components enabling the mobile Internet (Kärrberg andand Liebenau , 2005). These technologies include the interfaces between infrastructure networks, handsets, and service (or content) delivery systems (Kärrberg and Liebenau , 2005). These interfaces or, as they are more commonly referred to, mobile service delivery activities, are represented in a diagrammatic flow in *Figure 3.1*:

Figure 3.1: The Activities involved in Mobile Service Delivery



Source: Source: Kärrberg, P., and Liebenau, J., (2005), Mobile Service Delivery Business Models in Europe and Japan: The shift from "wherever and whenever" to "right here and now" The 18th Annual IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC'07), http://stuff.carstensorensen.com/mobility/PIMRC07-IEEE-DeliveryBusinessModels.pdf, Accessed on 20th May 2008.

[16] See *Appendix 12* for a brief description of SOA.

A more detailed explanation of the technologies underlying the SDP, as argued by Kärrberg and Liebenau (2005), is attached in *Appendix 2*.

In summary, the service delivery platform (SDP) is fundamentally a core element of the rich media mobile communications business ecosystem. It contains many elements, very often interdependent with one another, working in concert, enabling the distribution of services from end-to-end (i.e. from its source to the end-user) (Kärrberg and Liebenau, 2005).

The SDP is yet to achieve a degree of standardization within the telecommunications industry. Generally the components that form the SDP are grouped by the type of functions they are designed to perform. Some of these components provide interfaces with basic network infrastructure functions. Some provide common interfaces to subscriber information, provisioning of service, content management, business systems and other functions that help coordinate services and content delivery. Yet others execute logic and control content delivery, or act as gateways to services and content outside the operator's own network. Collectively, these components form the Service Delivery Platform (SDP), and a business ecosystem might contain several SDPs working in concert (Kärrberg and Liebenau, 2005).

A distinctive feature of the rich media mobile delivery activities is the fact that these activities exhibit complementary characteristics between them (Peppard & Rylander, 2006). Assuming that each activity required to successfully deliver a particular service is performed by an independent organisation with specialized competencies, it can then be argued that the SDP essentially facilitates the interconnectedness of these independent organisations in the process of delivering the service to the end-user, which none of these organisations could otherwise have achieved independently. The SDP can be argued to represent the platform that is critical for the very existence of the business ecosystem and, in sustaining its existence, could also be seen as an underpinning platform in its own right for new service development within the context of the business ecosystem. It makes available consistent and reliable components (i.e. subsystems) and interfaces that ensure the other niche organisations such as content and application providers are able to more efficiently develop applications. The tools and building blocks that are made available by the network operator for the other ecosystem members through such platforms as the SDP make it easier for these ecosystem members to collectively create powerful end-to-end applications that in turn benefit the end-users (Barnes, 2002; Tilson and Lyytinen, 2006; Peppard and Rylander, 2006).

Based on the technology life cycle characteristics presented by authors like Utterback (1974), Abernathy and Utterback (1978), Klepper (1996) and Sood and Tellis (2005), this thesis argues that the SDP is currently at the early growth stage of its technology life cycle. This is reinforced by the fact that a dominant standard concerning a common technological platform is still in the process of emerging within the rich media mobile communications industry (Kärrberg and Liebenau, 2005). At the same time, some of the key interest groups that have made the necessary effort to ensure that the SOAs such as the SDP gain adequate research attention include the UMTS Forum, ITU (International Telecommunications Union), ETSI (European Telecommunications

Standards Institute), GAA (GPRS Applications Alliance), WAP (Wireless Application Protocol) Forum and others (Barnes, 2002).

The telecommunications, information technology and media industries have come to realize the potential of the SDP and are now allocating increased resources to participate in the SDP upsurge (Kärrberg and Liebenau, 2005). The leading suppliers for mobile network infrastructure equipment and systems integrators (i.e. Ericsson, Siemens, Nokia, Motorola, Lucent Technologies, IBM and Accenture) have developed and are continuing to develop solutions for mobile data, internet and mobile commerce based on the SOA-type platforms such as the SDP (Kärrberg and Liebenau, 2005). The innovative capabilities of these companies are driving the next wave of technological developments (Durlacher Research, 1999). Mobile network operators such as Sonera, AT&T, NTT, DoCoMo, Telia, Orange, Telstra and Vodafone, are now leveraging their infrastructure advantages and concentrating their research attention in data transport towards internet enabled mobile services, delivery support and market creation (Durlacher Research, 1999).

Based on the arguments presented in this section, it is clear that the concept of a new service development platform (NSDP) is central to the interconnectedness between actors populating the rich media mobile services business ecosystem. The concept of the NSDP in the context of the thesis is represented by the SDP. However, this thesis is not concerned particularly with identifying the technical specificity of the so called 'NSDP', a shared platform in the context of the ecosystem. It is acknowledged that the technical specificities of the NSDP are constantly and dynamically evolving, and may change with the services or products in question; the geographical, legal, technological and other business constraints that affect the ecosystems; and the time period within which the ecosystem is observed. Based on the literature review, the SDP emerges at this point in time as the technology that best represents the NSDP of the rich media mobile services business ecosystem. Hence, it is argued that a new service development platform (NSDP) like the SDP may evolve with time and that, in some circumstances, its subsystems (i.e. components) may even be replaced by other emerging alternative technology. The objective here should be instead to recognize that a common or shared platform is critical to new service development activities of the rich media mobile services business ecosystem, regardless of the technology upon which that platform is based. This shared platform, which is conceptually defined in this thesis as the new service development platform (NSDP), in effect provides the means to integrate otherwise independent value systems (i.e. industries) into complex business networks or, in the context of this thesis, the rich media mobile services business ecosystem. Through subsystems and interfaces that characterize the SDP, the SDP provides the platform for members of the rich media mobile services business ecosystem to develop new services. Thus, guided by the preceeding arguments, this thesis suggests the following proposition:

> P^2: The SDP is the new service development platform (NSDP) that contributes to new rich media service development capability in business ecosystems.

Commentary: This working proposition claims that, in order to develop rich media mobile services, a shared platform is critical to the rich media mobile service development process. This common platform is referred to in this thesis as the new service development platform (NSDP). Actors from otherwise independent value systems (i.e. industries) find themselves interconnected through the means provided by the NSDP in developing new rich media mobile services. The NSDP provides the means to channel the flow of skills, resources and capabilities within and between value systems in a business ecosystem. At this point in time, the literature seems to indicate that the SDP (Service Delivery Platform) best represents the concept of the NSDP. The SDP is seen to be the abstract technological layer that connects otherwise independent vertical value systems (i.e. industries) to form the service development stage of the business ecosystem. The SDP is in fact a piece of network infrastructure facilitating the flow of skills, resources and capabilities across organisational boundaries and value systems, on to the service development stage of the business ecosystem. This flow of skills, resources and capabilities facilitated through the SDP (i.e. the NSDP) enables the development of end-to-end rich media services within the context of the business ecosystem.

3.5. Network Centrality

Complex business networks such as business ecosystem as suggested by Peppard and Rylander (2006) are composed of *complementary* nodes (i.e. actors) and links. The crucial defining feature of networks is the element of complementarity that, in the first instance, causes the network to develop its nature of interdependence between the various nodes and links (Peppard and Rylander, 2006). The concept of the business ecosystem is based on a set of relatively autonomous units that can be managed independently (Peppard and Rylander, 2006). The formation of the specific business ecosystem in question, the mobile communications ecosystem, is based on a framework of common principles and service level agreements (SLAs)[17].

Actors that form networks such as business ecosystems are essentially autonomous entities in a number of aspects, including administration, finance and , operations. In this respect, the actors that form the business ecosystem are relatively independent from their partners with regard to the achievement of their individual organisational objectives. However, at the same time these same actors within the ecosystem exhibit a degree of interdependence from an economic and/or legal perspective (Peppard and Rylander, 2006). The economic reason for such interdependence has been discussed earlier in this thesis in terms of resource procurement and uncertainty reduction while the legal dimension is argued to be closely associated with the nature of the SLA. This thesis argues that the business ecosystem is configured on the basis of the interdependent dynamics emerging from the economic and/or legal relationships between these actors.

An organisation in a network exhibiting 'recurring ties' with other organisations in that same network characterized by trust, open communication and joint problem solving can be said to be strongly embedded within that network (Noorderhaven, Koen, Beugelsdijk, 2002). Conversely, an organisation is said to be weakly embedded if it has relatively few ties with these three characteristics (Noorderhaven, Koen, Beugelsdijk, 2002).

[17] A service-level agreement (SLA) in the context of this thesis can be defined as an informal contract between the network infrastructure operator and the other main actors that form the Value Network. There may be multiple SLAs between multiple actors within a single network. The SLA basically defines the terms of the actors' responsibility to other actors within the same network. Among other things, the SLA maintains the type and extent of remuneration and/or penalties if those responsibilities are not met.

Interorganisational networks are uniquely structured in that organisations in these networks are embedded in a variety of ways, depending on the unique roles played by each member of the network (Gulati and Gargiulo, 1999). Specific network mechanisms that shape the creation of newly embedded interorganisational ties are realized in the form of *relational*, *structural*, and *positional* embeddedness (Gulati and Gargiulo, 1999). Gulati and Gargiulo (1999), define relational embeddedness as the effect of cohesive ties between actors on subsequent cooperation between those actors. The cohesive ties between two organisations provide the means through which each actor can learn about the competencies and the reliability of the other. This builds trust and diminishes the uncertainty associated with future partnerships between the same actors and in the process may also prompt organisations to become aware of new opportunities for cooperation that would be difficult to identify outside of a cohesive relationship.

Structural embeddedness captures the impact of the structure of relations around actors on their tendency to cooperate with one another (Granovetter, 1985). The frame of reference shifts from the dyad to the triad, while the focus of analysis shifts from direct communication between actors to indirect channels for information and reputation effects (Gulati and Gargiulo, 1999). This argument is sub-derived from network models of structural equivalence (see Lorrain and White 1971; Burt 1976). Organisations tied to a common partner can utilize reliable information about each other from that partner. When two organisations share common ties, it can also indicate that both are regarded as suitable and trustworthy by the same organisations. Also, sharing common ties with a potential partner may signal that the partner can cooperate with the same kind of organisations with which the focal organisation has been cooperating (Gulati and Gargiulo, 1999).

The concept of positional embeddedness captures the impact of the positions that organisations (i.e. actors) occupy in the overall structure of the alliance network (Gulati and Gargiulo, 1999), going beyond dyadic and triad relationships. Positional embeddedness is rooted in network models of equivalence and centrality that capture the 'roles' actors occupy in a system, irrespective of the specific stages involved in playing those roles (Winship and Mandel 1983; Faust 1988; Borgatti and Everett 1994).

Of particular relevance to this thesis is the concept of *positional embeddedness*. Positional embeddedness goes beyond proximate direct and indirect ties, beyond dyadic and triad relationships and highlights the certain benefits that ensue from particular positions in the network (Gulati and Gargiulo, 1999). This thesis argues that the position an organisation occupies in the network can substantially determine its ability to influence the degree of interconnectedness of a specific network arrangement via its *visibility*[18] and *attractiveness*[19] for other organisations throughout the network, regardless of whether it is directly or indirectly related to these other organisations in the network.

The concept of positional embeddedness brings to light the related issue of *network centrality*, a recurrent theme in network analysis first introduced by Freeman (1979). A highly central organisation is connected to more organisations within a given

[18] For the purpose of this research "visibility" of an actor is defined by the degree to which an actor is central in a given inter-organisational network, and is therefore visible to the rest of the actors in the network.
[19] "Attractiveness" in the context of this research is defined by the resources and capabilities that an actor brings and contributes to the network in ensuring its success.

network than a less central organisation within the same network (Noorderhaven, Koen, Beugelsdijk, 2002). Hence, the centrality of a specific organisation may be crucial to the overall structure of the network and provide benefits for the well-being and future prospects of the network (Freeman, 1979).

Centrality evaluates an actor's prominence or power in relation to other actors in the network (Brass and Burkhardt, 1993). The three most common types of centrality discussed in the literature are *degree*, *closeness*, and *betweenness* (Pillai, 2006). Degree centrality refers to the number of ties that the focal firm has with other actors in the network (Pillai, 2006). Closeness centrality defines an actor's ability to independently access all other members of the network (Pillai, 2006). Betweenness centrality is similar to closeness centrality, but it is based on the viewpoint of an intermediary actor who is positioned between other actors (Freeman, 1979). In this thesis 'degree centrality' is given greater prominence in measuring the centrality of an actor within a given network because this concept is better placed to clearly identify the central actor(s). Given the time and resource constraints facing the researcher, identifying central actor(s) using the concept of degree centrality enables the researcher to identify one or at most two actors that have the highest degree of centrality within the observed business ecosystems. This allows the participant recruitment process to utilize the snowball sampling approach during the data collection stages of this research (see chapter 4).

In defining the business ecosystem, Iansiti and Levien (2004) introduced the concept of 'roles' that are associated with the various organisations that compose the business ecosystem. There are four different types of roles for organisations in business ecosystems (Iansiti and Levien, 2004). This section focuses predominantly on the central actors in a business ecosystem, which are the kind of organisations that serve as enablers and have a great impact on the whole system (Iansiti and Levien, 2004; Moore, 1996; Moore, 2006). The interests of central actors align closely with the overall interests of the rest of the ecosystem. Similar to the argument provided by Pillai (2006) on central actors within networks, central actors in business ecosystems are in fact connected to more participants than are any other actors in their ecosystem (Iansiti and Levien, 2004; Moore, 1996; Moore, 1998; Moore, 2006). This strategically positions central actors as the 'hubs' of the business ecosystem (Iansiti and Levien, 2004; Moore, 1996; Moore, 1998; Moore, 2006). This strategic positioning also provides these actors with the ability to significantly influence the health of an entire business ecosystem; specifically, in terms of the ecosystem's interconnectedness through promoting efficiency, robustness and innovation (through niche creation) (Iansiti and Levien, 2004; Iansiti and Richards, 2006).

As argued earlier in this thesis, the notion of a common platform for the existence of the business ecosystem is paramount. Through the availability of a common platform, an asset is made available to others in the ecosystem in the form of services, tools, or technologies that offers solutions for the development of new rich media services in the business ecosystem. The central actors play a critical role in business ecosystems as they improve the overall health of their ecosystems by providing a stable and predictable set of common assets (Moore, 1996, 1998; Iansiti and Levien, 2004). In most cases, this involves the provision of a common platform of tools that other actors can use to contribute their specific service or product components to complete the sum of the parts of the business ecosystem (Moore, 1996, 1998; Iansiti and Levien, 2004;

Iansiti and Richards, 2006). Central actors can increase ecosystem productivity by simplifying the complex task of interconnecting network participants to one another or by making the creation of new products by third parties more efficient through making the common platform accessible to other members of the business ecosystem (Moore, 1996; Iansiti and Levien, 2004). Central actors can enhance the robustness of an ecosystem by systematically incorporating technological innovations consistent with the platform's evolution needs and by providing a reliable point of reference that helps participants respond to new environmental conditions (Moore, 1996; Iansiti and Levien, 2004).

The central actors are crucial enablers in creating new niches[20] within the business ecosystem (Iansiti and Levien, 2004; Iansiti and Richards, 2006). These central actors are able to create new services by attracting new niche actors from unique business domains through offering innovative technologies to a variety of third-party organisations (Iansiti and Levien, 2004; Iansiti and Richards, 2006). The central actor's importance to the health of the ecosystem is such that, in many cases, "its removal will lead to the catastrophic collapse of the entire network" (Iansiti and Levien, 2004, p. 73). Citing the example of the collapse of WorldCom in the United States, Iansiti and Levien (2004) illustrate how the removal of a central actor within a business ecosystem can

[20] For the purpose of this thesis, a niche in a business ecosystem is defined as a category of actors (i.e. organisations) that specialize in a technology or a market segment and thrive on the efficiency of their segment focus. Niche actors constitute the main body of the business ecosystem (Iansiti and Levien, 2004). Most niche actors take a highly specialized strategy and have a natural dependence on central actors and others in the business ecosystem (Iansiti and Levien, 2004; Iansiti and Richards, 2006). So only by relying on other actors' resources can niche actors thrive in the business ecosystem to find their room in a differentiated way. Therefore, the existence of a great number of niche actors is the embodiment of a diversified ecosystem and the foundation of a healthy and prosperous business ecosystem.

have severe negative repercussions for the entire ecosystem of suppliers of telecommunications equipment.

A central actor within the business ecosystem is seen as critical in the creation of value through the provision of a common platform. The central actor leaves the vast majority of value creation to other organisations in the ecosystem (Iansiti and Levien, 2004). However, what they do through the creation and maintenance of a common platform for the rest of the ecosystem is crucial to the innovation success and survival of the business ecosystem community (Moore, 1996, 1998, 2006). Apart from the creation of value in the ecosystem, the central actors also have to equally recognize the importance of *sharing* the value accumulated in the context of the business ecosystem (Iansiti and Levien, 2004; Moore, 2006). The success of central actors is reliant on appropriately sharing throughout the ecosystem much of the value they have created, balancing their generosity with the need to keep some of that value for themselves (Iansiti and Levien, 2004). Achieving this balance may not be as easy as it seems. Central actors must make sure that the value of their platforms, divided by the cost of creating, maintaining, and sharing them, increases rapidly with the number of ecosystem members that use them (Iansiti and Levien, 2004; Davenport, Leibold, Voelpel, 2006). This allows "keystone actors to share the surplus with their communities" (Iansiti and Levien, 2004, p. 75). This culture of sharing the value derived from being a central actor with the rest of the ecosystem members is argued to also better foster the level of interconnectedness among actors within the business ecosystem. This ensures that the business ecosystem thrives in a sustainable way (Iansiti and Levien, 2004).

Previous studies conducted within the domain of network analysis have also suggested that central actors are more representative of the existing network as they have a macro view of the ecosystem given the visibility provided by their central position (Krackhardt 1990). Central organisations are recognized as being associated with a more significant power base within the confines of a network, hence lowering their level of uncertainty about partnerships (Gulati and Singh 1998; Powell, Koput, and Smith-Doerr 1996). Central organisations in interorganisational networks are also frequently characterized as having more access to sources of information than organisations that are peripheral to the network (Davis, 1991; Haunschild and Beckman, 1998). Central organisations are often argued to have access to and control over resources (Knoke and Burt, 1983; Wasserman and Faust, 1994), and thus, are likely to be highly associated with innovation, as access to and control over information and resources are associated with innovation (Becker, 1970; Powell, Koput, and Smith-Doerr, 1996; von Hippel, 1988).

Central organisations are also considered to be in a better position to get a more complete picture of all the options available in the network than the peripheral organisations. These central organisations enjoy a broad array of benefits and opportunities unavailable to those actors on the periphery of the network (Brass, 1992; Ibarra, 1993). Due to the fact that central organisations are very strategically positioned and are extensively involved in their networks (Freeman, 1979; Wasserman and Faust, 1994), it is argued that these actors have significantly better knowledge about the innovative efforts of the other actors from various industries or vertical value systems (Becker, 1970). It can be argued that the central role as manifested by the central organisation's involvement in its network gives the central organisation the privilege to compare information across sources and assess its accuracy. Organisations with multiple information sources are more likely to absorb vital information as multiple information sources provide multiple channels to discover new information. This provides the capability for central actors to then transform this advantage to combine information and other forms of resources in novel ways to generate innovation (Bell, 2005).

Brass (1992) suggests that network centrality has commonly been associated with a significant source of power for the actors that occupy this position in a given network. Ibarra (1993) argued that network centrality projects a high position in a status hierarchy. Central organisations have great control over relevant resources and command great potential for influence by creating asymmetrical resource dependencies (Pfeffer and Salancik, 1978). The degree to which they are able to freely make decisions and pursue their own goals is a benefit for organisations that maintain a central structural position, independent of other positions in terms of information and resources central organisations control (Burt, 1976; Floyd and Wooldridge, 1999).

While dependence asymmetry invokes the logic of power, it is joint dependence – a central concept discussed in this thesis – that brings to attention the logic of embeddedness (Gulati and Sytch, 2004). It is argued that embedded relationships are not merely impacted by the underlying dynamics of power, but also become infused with the higher levels of mutual commitment and the stronger relational orientation that underlies a logic of embeddedness (Gulati and Sytch, 2004). This is further reinforced by the arguments put forward by Iansiti and Levien (2004) who suggest that the significance of central actors sharing the value derived from that position with the rest of the ecosystem members could be argued to also foster better levels of interconnectedness among the actors within the business ecosystem. As a result of the dynamics of joint dependence, a high degree of mutual empathy and bilateral commitment towards the relationship amongst network members (including central organisations) creates the conditions for joint success. Joint success facilitates the adoption of a longer-term horizon for the relationship. This is exhibited in actions such as effective conflict resolution, and the willingness of actors in the network to forego immediate self-interest for the collective benefit of the entire network (Kelley 1979; Rusbult et al. 1991).

In light of the above-mentioned arguments, this thesis determines that central organisations are positioned at the cross-roads of the flow of diverse information and resources. This position allows for central actors to provide a common platform for new service development. This can be argued to be significant to the capability of a given network in developing new services. This is so, especially considering the necessity for a coordinated effort to orchestrate the level of interconnectedness to infuse the network with a better sense of concerted direction in its innovation endeavor. While cognizant of the power dynamics favoring their central position, the central actors are nevertheless fully aware that their success is reliant on how they share value throughout the ecosystem (Iansiti and Levien, 2004). The actions and decisions made by the central actors must reflect their acknowledgement that a substantial amount of value is in fact created by niche actors (Iansiti and Levien, 2004: Iansiti and Richards, 2006). Keeping this in mind, central actors play a delicate yet crucial role in providing a sense of direction for the entire ecosystem, sharing value with other actors in the business ecosystem and simultaneously balancing their generosity with the need to keep some of that value for themselves (Iansiti and Levien, 2004)

One can argue that the more central the position of an organisation in a network, the more likely it is to have a high level of influence over the degree of interconnectedness in the business ecosystem. Thus, this thesis suggests the following proposition:

P^3: Network centrality in a business ecosystem contributes to new service development capability through the provision of a common direction for the other actors in the ecosystem.

Commentary: This working proposition claims that central actors play a critical role in providing the platform, leadership direction in innovation, and sharing the value created through innovation with other members of the business ecosystem. The platform in the first instance provides the central actor with the privilege of being the most strategically positioned organisation in the business ecosystem. The platform also provides the means to integrate otherwise independent vertical value systems in the context of the business ecosystem. Through their centrally located position within the business ecosystem, central actors shoulder the responsibility of leading and providing strategic direction in major technology investment decisions, niche creation and, ultimately, the decision on the types of new services to be created. In the meantime, while providing leadership direction to the rest of the business ecosystem, central actors recognize that due to the interdependent nature of their relationships with other actors in the business ecosystem, they will have to provide the environment for other actors to coexist in the development of new services. This is particularly critical in the case of niche actors, who make up the largest number of actors in the business ecosystem and generate the highest degree of value in the creation of new end-to-end rich media services in the business ecosystem.

3.6. Structural Differentiation

In the process of forming a new network, organisations also contribute to the shape of the network structure that determines the future architecture of the newly formed alliance (Gulati and Gargiulo, 1999). When observed over time, this dynamic between embedded organisational action and the network structure propels the progressive *structural differentiation* of the particular interorganisational network (Gulati and Gargiulo, 1999).

Gulati and Gargiulo (1998) define structural differentiation as “an emergent systemic property that captures the extent to which actors (organisations) come to occupy an identifiable set of network positions, each of them characterized by a distinctive relational profile” (p. 1450). Gulati and Gargiulo (1998) argue that the unique position an organisation occupies in a given alliance network suggests that the organisation’s position in the network is a signal of its willingness, experience, capability and ability to enter an alliance.

Iansiti and Levien (2004) have argued that developing niches in the ecosystem is critical to the health and vitality of the business ecosystem. The majority of actors that comprise the ecosystem are in fact niche actors and their aim is to develop specialized capabilities that differentiate it from other companies in the business ecosystem (Iansiti and Levien, 2004). By integrating and leveraging complementary resources from other niche actors or from a central actor, the niche actor can focus all its energies on enhancing its narrow domain of expertise. When the niche actors that represent the bulk of the ecosystem are allowed to thrive in such an interconnected network they become responsible for most of the value creation and innovation. As Iansiti and Levien (2004) have noted, the continued co-existence of niche actors in the ecosystem depends crucially on the innovations they introduce in the ecosystem: "innovation - at the core of their strategy of specialization and differentiation - is critical to their success" (p.77).

According to Adamides (2009), industry has come to terms with the importance of facilitating the development of niches in ecosystems. Drawing on the work of Kemp, Schot, and Hoogma (1998), Adamides (2009) proposes a concept of Strategic Niche Management (SNM). SNM involves a strategy of policy driven regime transition based on the creation of niches / niche roles that are protected from market forces. The creation of protected spaces is fundamentally about the creation of niches for the development, production and use of new technologies. Protected niches are formed around innovative technologies to act as sites of experimentation and learning about the desirability of the innovation, their direction for future development and the ways to accelerate their diffusion within the business ecosystem. Kemp et. al. (1998) suggests that the need to protect newly emerging technology niches within ecosystems is due to their fragile development in the initial stages of their life cycle. This is largely based on their tendency to be prone to failure as a result of the 'trial and error' path of development associated with niche creation of new technologies.

In accordance with the choice of the appropriate policy instrument, niches can be created in three principal ways. The first involves intentional central planning by the central actor within the ecosystem. The second involves a bottom-up market oriented development that is spearheaded by local authorities (e.g. government policy) by influencing the behavior of organisations with instruments such as incentives and tax deductions. The third is the formation of alliances with potential network actors based on the technology, resources, skill sets and competencies they possess, which may position them to play a significant role in the innovation process of certain business ecosystems (Adamides, 2009). Kemp et al. (1998) distinguish five steps in the creation of niches. The process commences with the choice of a promising candidate technology and continues with the selection, implementation and scaling of the experiment(s). This is followed by the dismantling of protection so that the specific socio-technical system learns to respond successfully to the forces of competition.

The SNM approach pays particular attention to those contextual factors that play a significant role in the success or failure of the niche. First, there must be a number of preconditions that must be present for these factors to be able to affect the success or failure of niches in business ecosystems. These preconditions include: availability of protected spaces for incubation; the possibility for continuous evaluation and incremental improvement of the experiment(s); the ability of the technology for capturing learning economics in that it must have an inherent learning-by-doing capability with financial returns (although, the technology should still be open for development in diverse directions); and the technology (in its present form) should already reflect its potential to be developed (and used) for certain applications.

Secondly, there must be an appropriate external environment that stimulates experimentation. In such an environment there may be a dominant regime with inherent instabilities that indirectly favors the development of new technologies (e.g. an appetite for new technologies to satisfy a certain application need). In addition to a broad support base, the creation of new niches requires sufficient organisational support (from central and other critical actors within the ecosystem), actor skills, and the availability of knowledge and techniques in the existing regime (Adamides, 2009).

As suggested by Peppard and Rylander (2006), the value network concept based on the notion of a business ecosystem is built on the theory that value is co-created by a combination of actors in the network and is thus, argued to be composed of complementary nodes and links. The grouping of expertise (i.e. willingness, experience, capability and ability) within organisations will not be the same as depicted in the context of a value chain. The grouping of expertise within each organisation or actor that form the network will be uniquely different from one another and yet are complementary when viewed from the perspective of the business ecosystem in its totality (Iansiti and Levien, 2004; Peppard and Rylander, 2006). Each organisation's grouping of expertise will differ depending on its location or functional role within the business ecosystem, the organisation and the business model it has chosen to develop (Peppard and Rylander, 2006). It is argued that the fragmentation of this very same grouping of expertise when fully integrated into the business ecosystem results in the highest degree of value creation (Iansiti and Levien, 2004). It can be then argued that despite the fragmentation contributed by the unique qualities characterizing the various actors that form the business ecosystem, it is precisely this that requires clever integration. It is these fragmented but unique and diverse qualities of the various actors that will ultimately contribute towards the interconnectedness between the various participating actors in the business ecosystem in order to deliver innovative end-to-end service solutions to customers.

As Niche actors constitute the main body of the business ecosystem (Iansiti and Levien, 2004), it can be argued that they also by their very existence and participation in the development of the business ecosystem contribute to the ecosystems new service development capability. Through making their highly specialized skill sets, technologies and resources available to other actors, niche actors augment the new service development capability of the central actor in particular and the business ecosystem in general. Through their dependency on the central actor to survive in the wider business ecosystem, niche actors make available niche capabilities which further contribute to the wider new service development capability of the business ecosystem in general (Lewin, 1999; Iansiti and Levien, 2004). Therefore, it can be argued that the existence of a great number of niches and niche actors populating these niches is the embodiment of a diversified ecosystem and the foundation of a business ecosystem which has a higher propensity to develop new services.

This thesis argues that increased structural differentiation of a network makes it easier for organisations to distinguish themselves from other organisations within the same network in terms of their relational profiles. This therefore results in a higher degree of interdependency within the network, mainly emerging from the unique and complementary characteristics of organisations in terms of the grouping of expertise that is contributed by each actor within the network (Peppard and Rylander, 2006). Hence, while a network in which all or most organisations have a similar relational profile would offer a low degree of network interconnectedness, the opposite case of a network in which each organisation has a truly unique and complementary relational profile would therefore contribute to a higher degree of network interconnectedness. Thus, the preceeding arguments lead to the following proposition:

P^4: Structural differentiation contributes to niche creation within a business ecosystem and in the process, positively promotes new service development capability.

Commentary: This working proposition gives prominence to the role of niche actors in the business ecosystem. As acknowledged in the literature, niche actors are critical in generating value in business ecosystems based on their highly specialized role and capabilities in the development of services and applications. Due to the unique and specialized area of competencies of niche actors, their propensity to create innovative services and applications based on the common platform offered by the central actors is highly valued by the business ecosystem as a whole. This then promotes the necessity for the business ecosystem to constantly seek out such niche actors both within and external to the business ecosystem to ensure the vitality and the capability of the business ecosystem in creating new rich media services.

3.7. Coopetition

As argued by Dyer and Singh (1998) in their analysis of interorganisational dynamics, an emerging view of strategic alliances, particularly in terms of the relational perspective in interorganisational dynamics, suggests that strategic resources are now increasingly crossing formerly distinct organisational and industry boundaries to reside in organisational relationships within networks. Dyer and Singh (1998) posit that competitive advantage might lie in interorganisational resources and routines, such as relation specific assets, knowledge sharing routines, complementary resources/ capabilities, and effective governance.

The relational view advocated by Dyer and Singh (1998) maintains that an organisation's critical resources may extend beyond the boundaries of the organisation, particularly when organisations combine resources in unique ways to realize an advantage over competing firms who are unable or unwilling to do so. Thus, idiosyncratic interorganisational linkages may be a source of relational rents and competitive advantage. Relational rents are possible when organisations combine, exchange or invest in idiosyncratic assets, knowledge and resources/capabilities. In developing idiosyncratic assets, knowledge and resources/capabilities, organisations employ effective governance mechanisms that lower transaction costs or permit the realization of rents in developing network level competitive advantage (Dyer and Singh, 1998).

In defining some of the characteristics of business ecosystems, Iansiti and Levien (2004) mention the dynamics between *competition* and *cooperation* that exist in ecosystems. For example, Iansiti and Levien (2004) argue that "[d]espite the best, highly specialized strategies, niche actors usually find that they come into conflict with other niche actors, keystones, and especially dominators" (p. 77). Ecosystems base their success on both competition and cooperation (Moore, 1993). Part of the complexity of interactions that define the interorganisational dynamics in an ecosystem is not limited merely to cooperative interactions but also competitive interactions (Lewin, 1999). Ecosystem leadership is seldom uncontested in the various observations made by Moore (2006). Therefore, when interactions between organisations are examined in the context of an ecosystem, the entire complexity of interactions will have to be taken into consideration to obtain a better understanding of the competition and cooperation phenomena (Lewin, 1999).

A bourgeoning amount of literature in interorganisational dynamics increasingly acknowledges a paradoxical relationship that may emerge when two or more organisations concurrently *cooperate* in some activities in a strategic alliance context, while simultaneously *competing* with each other in other activities (Bengtsson and Kock, 2000). This phenomenon is called 'co-opetition' (Bengtsson and Kock, 2000).

Co-opetition involves two varying logics of interaction very often seen from the perspective of two different ends of a single continuum. At the competition end of the continuum, there is potential hostility due to conflicting interests and, at the cooperative end, it is necessary to develop trust and mutual commitment to achieve common aims (Bengtsson and Kock, 2000).

The term co-opetition was first coined in the strategy research conducted by Brandenburger and Stuart (1996) and Brandenburger and Nalebuff (1996). The term 'co-opetitors' was originally used to include five different kinds of actors: the firm, its customers, its competitors, its suppliers, and its complementors – all of whom constitute the so called 'value net' – i.e. a structure of multiple relationships (Brandenburger and Nalebuff 1996). The notion of value nets proposed by Brandenburger and Nalebuff

(1996) is consistent with the notion of multidimentional value nets (MDVNs) as advocated by Möller et.al. (2005) in which vertically intergrated value systems (i.e. industries) are linked to form what are essentially business ecosystems.

The contribution of Brandenburger and Nalebuff (1996) in developing the concept of co-opetition has enabled authors such as Dagnino and Padula (2002) to better conceptualize dynamic interdependence between firms. The very essence of co-opetition is in fact rooted in the substance of inter-firm interdependence, wherein co-opetition is seen as a way of defining a complex structure of organisational interdependence in terms of both cooperation *and* competition – two paradoxical concepts, simultaneously present and intertwined, forming an integrative theoretical bridge which leverages to connect these two contrasting perspectives (Dagnino and Padula, 2002).

The competitive perspective of co-opetition (Porter, 1980; Barney, 1986) emerged from the domain of strategic management and transaction cost economics of Williamson (1975; 1985). The notion of competition is built on the assumption that organisational interdependence in complex networks is based on the individual interest concept (Dagnino and Padula, 2002). Therefore, in such interorganisational circumstances the inclination to behave opportunistically is rather tempting among organisations that comprise the business ecosystem (Dagnino and Padula, 2002). Such behavior is commonly observed in a rent-seeking behavior that prevails through value-appropriation approaches among organisations in interorganisational networks (Dagnino and Padula, 2002).

The alternative *cooperative* perspective of coopetition gives prominence to the element of interdependence among organisations pursuing convergent interests and deriving mutual benefits within the context of interorganisational settings (Dagnino and Padula, 2002). The market is no more an atomistic structure based on instant exchange, but rather evolves into a system of interactive and continuous relationships in which the organisations progressively strengthen their reciprocal commitments and realize a process of mutual adaptation and joint value creation through an interaction based on mutual dependence between the various participants that form the context of the interaction (Borg, 1991). The significance of joint value creation implies a mutual dependence structure that acts as a strong antidote to the risk of competitively motivated opportunistic behavior governing the relationship and, as a consequence, is a powerful incentive to adopt a collaborative orientation (Dagnino and Padula, 2002).

The coopetitive concept provides a hybrid view of a competitive and a cooperative perspective (Dagnino and Padula, 2002). The coopetitive perspective stems from the acknowledgment that, within interorganisational interdependence, both processes of value creation and value sharing take place, giving prominence to a "partially convergent interest (and goal) structure" in circumstances where the presence of both competitive and cooperative dynamics are "simultaneously at work and strictly interconnected" (Dagnino and Padula, 2002, p. 9).

Coopetition is considered to be crucial for success in emerging industries, particularly in relation to industries associated with emerging technologies such as biotechnology, information communications technology, electronics, and semiconductors (Brandenburger and Nalebuff, 1996; Gomes-Casseres, 1996; Harbison and Pekar, 1998). Emerging technologies have often been associated with an increased level of uncertainty in terms of market opportunities and the technology adoption rate. Organisations involved with such emerging technologies have a tendency to take measures to mitigate the affects generated by such uncertainties by cooperating with competitors through *shared platforms* with the objective of sharing resources and spreading risk for the collective benefit of members that make up the interorganisational network (Brandenburger and Nalebuff, 1996). These shared platforms initially constitute the basis upon which strategic alliances are formed, for the purposes of R&D collaborations, and subsequently evolve to form the actual infrastructure for the delivery of services to end consumers (Iansiti and Levein, 2004; Iansiti and Richards, 2006).

In the context of this thesis, it can then be argued that the service delivery platform (SDP) is essentially a shared platform for the effective delivery of content and services for the rich media mobile communication services, transcending vertical value systems (i.e. industries) as diverse as media, computing and communication. Benni, Hjartar and Laartz (2003) have suggested a fresh perspective that recognizes cooperative relationships and alliances in regard to emerging technologies such as the service delivery platform (SDP). The SDP can be seen as a unique type of interdependent technological architecture, providing the means to integrate actors in the context of a business ecosystem. The SDP is an example of a shared infrastructure strategically designed to accommodate not merely short-term R&D projects, but the very fundamentals of the entire service delivery functions to the end consumers for vertical value systems such as media, computing and telecommunications (Benni, Hjartar and Laartz, 2003). This fundamentally acknowledges the *mutual dependence* of actors through interaction facilitated by interdependent technological architectures in providing end-to-end rich media mobile services such as Mobile TV and Mobile Music (Jayachandran, 1999; Benni, Hjartar and Laartz, 2003).

In providing a typology of organisational coopetition, Dagnino and Padula (2002) introduce two basic forms of coopetition: *dyadic* and *network* coopetition (illustrated in *Figure 3.2*). Dyadic coopetition applies to either simple two-firm relationships or organisational dyads (Dagnino and Padula, 2002). The first type of dyadic coopetition relates to cooperative relationships between two competing organisations along one single level of the value chain (e.g. strategic consortia such as R&D consortia), also commonly referred to as '*simple* dyadic coopetition' (Dagnino and Padula, 2002). The second type of dyadic coopetition relates to cooperative relationships between the two competing organisations along several levels of the value chain (Dagnino and Padula, 2002). For example, a number of organisational dyads in the automobile industry that cooperate on automotive R&D and/or production and compete in automobile distribution, constitute dyadic relationships that are commonly referred to in terms of '*complex* dyadic coopetition' (Dagnino and Padula, 2002).

Figure 3.2: Matrix Representing the Typology of Coopetition

		Level of Value Chain Activities	
		Single	Multiple
Number of actors	Two	**Simple Dyadic Coopetition**	**Complex Dyadic Coopetition**
	More Than Two	**Simple Network Coopetition**	**Complex Network Coopetition**

Source: Garraffo, F. (2002), "Types of coopetition to manage emerging technologies," in European Academy of Management 2nd Annual Conference: Innovative Research in Management. Stockholm, Sweden. http://www.ecsocman.edu.ru/images/pubs/2002/12/12/0000017416/types_co-opetition.pdf, Accessed on 26th August, 2006.

Network coopetition concerns a structure of complex relationships between more than two organisations simultaneously (Dagnino and Padula, 2002). The first type of network coopetition is associated with cooperative relationships among multiple competing organisations along one single level of the value chain (Dagnino and Padula, 2002). An example of this kind of coopetition behavior can be observed in the likes of buyer-supplier relationships known as ‘parallel sourcing’, also commonly referred to as ‘*simple* network coopetition’ (Dagnino and Padula, 2002). The second type of network coopetition relates to cooperative relationships among multiple competing organisations along several levels of the value chain (Dagnino and Padula, 2002). Dagnino and Padula (2002) attempt to illustrate this type of coopetition by providing the example of 15 industrial districts, organisational clusters and multilateral agreements, a relationship also commonly know as ‘*complex* network coopetition’.

The research context of this thesis requires an examination of the contribution of coopetition dynamics to network interconnectedness. Having established the element of mutual dependence that permeates the interdependent nature of actor relationships in networks, it is argued that the type of coopetition that prevails in the context of this research to a large extent relates to simple network coopetition.

The operation of simple network coopetition is clearly discernible in the case of a number of recent alliances in certain industries. The ICT and the mobile communications industry in particular has exhibited alliances in the likes of ‘Symbian’, a joint-venture between organisations which include Nokia, Sony-Ericsson, Ericsson, Matsushita, Motorola, and Psion (Ancarani and Shankar, 2002). The primary objective of such alliances is setting the standard for open mobile wireless operating systems (OS) in third generation (3G) mobile information communication services. In the process, a mass market for the Symbian version of the open mobile wireless operating systems (a single level of value activity) in Wireless Information Devices was created (Ancarani and Shankar, 2002; Ancarani and Shankar, 2003). Nokia, Sony-Ericsson and Motorola are leading competitors in the mobile handset market, and are also collaborators in the mobile wireless operating systems market (Ancarani and Shankar, 2002). Symbian took a direct stance in competing with the late market entrant, Microsoft, with its version of Smartphone 2002 mobile wireless operating systems known as the ‘Stinger’ (Ancarani and Shankar, 2002; Ancarani and Shankar, 2003)

There are three perspectives that provide a useful theoretical framework for the development of a syncretic[21] model of competition and cooperation (see Lado, Boyd, and Hanlon, 1997). These include transaction-cost economics, the resource-based view, and game theory (Park and Russo, 1996; Lado, Boyd and Hanlon, 1997). Consistent with the approach taken in this thesis, the resource-based view is adopted to analyze the effects of coopetition on the capability of actors within the business ecosystem in developing end-to-end new services.

The resource based-view of coopetition acknowledges that competitive advantage stems from organisations owning unique, valuable, inimitable, non-substitutable capabilities that allow the organisations involved in interorganisational arrangements to offer its customers better value than its competitors (Grant, 1991; Barney, 1991). Two fundamental assumptions underpin this approach: a) firms are heterogeneous with respect to their resource profiles, which is consistent with the assumption on which this research proceeds; and b) resources are not perfectly mobile across firms. Hence, sustained differences in firms' profits may be attributed to differences in resources.

An alternative view within the resource based-view of coopetition assumes a dynamic process and focuses on how asset stocks are centralized, mobilized, and deployed for the generation of a sustainable competitive advantage (Teece, Pisano and Shuen, 1997; Makadok, 2001). This approach takes the perspective that the strategy of accumulating valuable technology assets alone is often inadequate to support a

[21] Syncretic competition refers to the way in which firms can generate economic rents and achieve superior, long-run performance through simultaneous competition and cooperation (Lado, Boyd, and Hanlon, 1997).

sustainable competitive advantage. Companies need *dynamic capabilities*; that is, the capacity to renew competencies so as to achieve congruence with the changing business environment (Wang and Ahmed, 2007).

Parallel to such arguments is a growing acknowledgement among industry experts and academics that attention should be directed towards the formation of 'learning alliances' in the development of interorganisational networks (Moore, 1996). The formation of such networks should be based on the objective of increasing the knowledge endowment achieved through the relationships of the organisations that form these networks (Khanna, Gulati and Nohria, 1998).

Moore (1996) argues that through the formation of 'learning alliances' (see Khanna, Gulati and Nohria, 1998) in the development of interorganisational networks, the increasing recognition that interorganisational network dynamics has received in recent times serves as a clear indication that the traditional concept of industry (i.e. vertical value systems) as a measure of competitive boundary is being re-examined in the various contexts of competition and collaboration. Moore (1996) suggests that the concept of a business ecosystem provides a much more realistic vantage point from which to analyse competitive and collaborative dynamics. Firms that comprise the business ecosystem constantly *co-evolve*, working both in competition and in collaboration at the same time in their objective to generate new knowledge and continuous innovation (Moore, 1996). It is argued that from the competitive and collaborative dynamics experienced by organisations within these ecosystems, the concept of *coopetition* emerges.

For the basic reason that the sacrifice of future exchanges as a result of opportunistic behavior would be prohibitively expensive in network relationships with a mutual dependence orientation, such mutual dependence orientation in network relationships has been shown to enhance the levels of cooperation within networks. This mutual dependence orientation suppresses hyper-competitive behavior among otherwise competing organisations, thereby setting the stage for an increased level of network interconnectedness through a more productive balance of both competitive and cooperative behavior (Heide and Miner 1992; Lawler et al. 2000; Stinchcombe 1986; Gulati and Sytch (2004).

Thus, based on the arguments presented in explaining the concept of co-opetition in the context of the business ecosystem, this thesis suggests the following proposition:

P^5: The competitive and cooperative (co-opetitive) behaviors among actors promote new service development capability.

Commentary: This working proposition gives prominence to the coexistence of the dynamics of competitive and cooperative activities among actors in the business ecosystem. The notion of cooperation stresses the need for collaboration between actors; to share risk, resources, skills and know-how in exploiting market opportunities that otherwise could not be solely achieved by any single actor. However, competition also exists between these same actors. Competitive dynamics between the actors reduces inefficiencies that might otherwise occur in a business ecosystem that only displays cooperative relationship features. Competition promotes the leanness of the business ecosystem's capability in developing new services. This can be argued to contribute towards the ever evolving and dynamic capabilities of the entire business ecosystem, increasing its competitiveness in developing new rich media services.

3.8. Customer Collaboration

As the concept of the business ecosystem is discussed in the context of the various organisations (as actors), the customer as the primary actor responsible for the creation of value in the network cannot be discounted from analysis as the customer ultimately defines value (Prahalad and Ramaswamy, 2000). Adopting the business ecosystem approach in service delivery systems introduces a whole new dimension to how organisations should engage customers in the service delivery equation. As argued in the previous chapter, organisations in the business ecosystem focus not on the company or industry alone but on the entire value-creating system itself, within which different economic actors – supplier, partners, allies, and customers – work together to co-produce value (Prahalad and Ramaswamy, 2000). In such circumstances the customers are seen to be an integral part of the total value network and thus, their engagement in the service delivery system is transformed from a passive role to a more active engagement (Prahalad and Ramaswamy, 2000).

Wind and Mahajan (2002) suggest that organisations should be more engaged with the customer rather than the industry itself or the technology in converging industries. Customer-based assets are critical for achieving competitive advantage in these industries. Aaker (l996) extends this argument, suggesting that a customer-based resource like brand, which may not be industry specific, can be exploited across many related industries. This brings to prominence the concept of customer collaboration in which the customer is viewed as a partner in the value creating process within the business ecosystem, principally as a source of competence in the development of new services within networks such as business ecosystems (Prahalad and Ramaswamy, 2000).

Research focused on customer collaboration in NSD literature has particularly gained momentum in the last decade or so with studies addressing issues as diverse as: engaging customers as a means of increasing the likelihood of new product success (von Hippel, 2001); gaining access to ideas for future products that are perceived as being unique and of value (Khurana and Rosenthal, 1998), particularly those ideas that instigate and facilitate innovation within the organisation (e.g., Finke, Ward, and Smith, 1992); the ability of consumers to articulate their needs clearly in product development programs (von Hippel, 1986); the study of lead users in product development programs (von Hippel, 1986; Herstatt, C. and Von Hippel, E., 1992); and the application of specific user toolkits in innovation programs (von Hippel, 2001). Overall, the concepts of customer collaboration in these researches have been discussed from various angles ranging from exploration of business-to-business relationships to analysis of consumer markets.

3.8.1. Who Is The Customer?

The distinguishing feature of this research is that the interorganisational NSD capability, as the term implies, is not analyzed from a uni-organisational perspective. The focus of the research addresses interorganisational NSD capability consistent with the concept of business ecosystem. Having recognized the earlier research context and arguments presented in this thesis, it is therefore critical to define the term ‘customer’ within the context of this research.

Having taken a business-to-business (B2B) approach in discussing the business ecosystem from an angle that addresses the issues facing interorganisational new service development programs, this thesis attempts to analyze customer collaboration from the perspective of the network operators. These organisations, which are traditionally associated with the provision of relatively standardized network infrastructure equipment for the provision of mobile services, are now strategically positioning themselves in the emerging context of the business ecosystem to perform the function of a central ‘gatekeeping’ role between the other members of the business ecosystem and the end-users in service development and delivery initiatives (Ballon, Helmus, and Van de Pas, 2002, Fransman, 2002, Wehn de Montalvo et al., 2002). Consistent with the B2B context on which the design of this thesis is based, this research perspective views the business customer as the network operator.

Network operators are today in a key position after years of building up their subscriber base from their initial offering of ‘voice services’ to the current ‘data services’ to the mass market (Barnes, 2002). In the process of strategic acquisition and retention of their subscriber base most of these network operators have made the strategic decision of owning their mobile delivery channel as well as relationships with the end-users (consumers). Therefore it could be argued that the network operators strategic position within the business ecosystem of being proxy to critical end-user information renders their position as being the customer in the B2B context of the rich media services business ecosystem.

Value networks like business ecosystems are not collections of partners delivering value to one another, based on precepts of ‘next in line’ (Peppard and Rylander, 2006). As business ecosystems are essentially complex business networks, focusing exclusively on the next node in a business ecosystem could prove to be a severe restriction on the innovation capability of the business ecosystem (Peppard and Rylander, 2006). The notion of value based on the service delivery logic of a value chain is not applicable to the context of value networks such as business ecosystems (Peppard and Rylander, 2006). The technological platforms emerging for the delivery of rich media services and the co-creation of value needed for the optimum delivery of rich media mobile services in the context of a business ecosystem can only be fully realized if the network is genuinely open to innovation (Iansiti and Richards, 2006). Therefore, a clear understanding of the needs of the end-user for all other actors in the business ecosystem via the network operator (i.e. the business customer) is pivotal to the innovation capability of the business ecosystem (Iansiti and Richards, 2006).

This thesis defines the term ‘business customer’ to be a primary actor within the business ecosystem, playing a fundamental role in defining value through active engagement with other key and peripheral actors of the business ecosystem. This brings to prominence the role that business customers undertake in the development and delivery of rich media mobile services for consumption by end-users.

3.8.2. The Essence of Customer Involvement

The process of innovation has been described as one that begins with creative ideas (Amabile et al., 1996). The creation of new services through NSD programs is no exception in the case of innovation within organisations. The creative ideas that permeate innovation programs such as NSD projects in organisations have been cited in past research papers to be predominantly preoccupied with ideas that are conceived within the boundaries of the organisation (Peppard and Rylander, 2006).

However in more recent times, organisations are coming to appreciate the more fundamental reasons for the creation of new services, one of which is related directly to the very existence of the organisation itself – the customer (Jaworski and Kohli, 1993). There seems to be a concordant view among researchers and practitioners about the critical necessity to better align key activities within NPD projects with the needs of actual and potential customers in order to reduce the risk of NPD project failure (Jaworski and Kohli, 1993; Atuahene-Gima, 1995).

Customer involvement contributes to NSD project development in an interorganisational context. A strong customer orientation as in the case of uni-dimensional NSD project arrangements encompasses the systematic acquisition of information about customer needs (intelligence generation), the dissemination of that information across all critical functional areas like marketing, R&D and production (intelligence dissemination), and the translation of the information into marketable products and services (responsiveness) (Kohli and Jaworski, 1990). Building on the observations of Kohli and Jaworski (1990) it can be further argued that, in interorganisational NSD project arrangements such as business ecosystems, it is critical that the acquired information about customer needs is disseminated by the business customer across organisational boundaries to include the various actors in the business ecosystem involved in the NSD activities.

Organisations are coming to terms with the fact that the idea generation processes for a new service should be articulated to represent an entirely new way of responding to previously unfulfilled customer needs in a profitable manner (Jaworski and Kohli, 1993). But the question that emerges is: does the intensive integration of customers into the fuzzy front-end of NSD programs involve the same set of activities concerning similar kinds of circumstances, regardless of the type of innovation project under consideration? The research undertaken here would suggest that the answer to this question is an absolute ‘no’. To justify this stance, it is argued that there is particularly strong evidence suggesting that customer integration in the context of incremental innovation projects is in many situations very different from the circumstances associated with platform innovations concerning new groups or categories of products and services such as rich media mobile services (Laurie, Doz, and Sheer, 2006; Lynn, Morone, and Paulson, 1996; Veryzer, 1998; Peppard and Rylander, 2006).

It has been argued that the circumstances surrounding platform innovations common to business ecosystems are strikingly different and hence, the application of conventional market research methods designed to assess incremental innovations could result in customer-focused studies continually evoking disappointment (O'Connor, 1998; Lynn et al., 1996). In most cases it is impossible to ascertain the future demands of markets through traditional market research methods (Lynn et al., 1996; O'Connor, 1998). Particular limitations associated with the shortcomings in such research include the tendency of most researchers to use random samples of customers in their objective of ensuring that findings are representative of a group of ‘typical’ customers in relation to the population of the target customers. The insight of these customers to new market needs and potential solutions is very often significantly constrained by their own real-world experience (based on current market circumstances), thus, limiting their ability to effectively identify their future needs based on anticpated market circumstances in the future (Davis, 1993). In certain exceptional cases where the customer is able to conceive a genuinely new market need that corresponds to their future need based on circumstances in the future, customers are still faced with the rigorous task of integrating the potential service into a use context which does not yet exist, prior to being able to produce a novel commercial service idea (Davis, 1993). This could prove to be a daunting mental task considering the fact that researchers are faced with a sample of ‘typical’ customers that generally populate the market, with limited capability and motivation to be able to conceive genuine platform innovations (von Hippel, 1986). Hence, it could be argued that it is reasonable to assume that the element of a high degree of familiarity with existing market offers and circumstances on the part of a typical customer may often inhibit the conception of a genuinely novel product idea (von Hippel, 1986).

In addition, the majority of market research techniques are known to indirectly limit the discovery of new product attributes and ideas outside the well known solution domain (Fornell and Menko, 1981). Traditional market research survey designs and stimuli, including the design of questionnaires and test products that researchers present to customers, are mostly predetermined (von Hippel, 1988). Customers are more often than not confronted with such predetermined stimuli and market researchers are tasked with the responsibility of recording the customers’ answers and reactions (von Hippel, 1988). There is limited evidence of the existence of a systematic mechanism to induce the participating customers to formulate emerging needs and to identify new solutions to those needs (von Hippel, 1988).

In view of the above arguments the following questions emerge to help articulate the type of business customers that are critical contributors to the NSD capability of business ecosystem:

- Should the ‘typical’ customers that generally populate the market necessarily represent the best pedigree of customers required as collaborators in NSD programs?

- Are these ‘typical’ customer positioned to contribute the highest value to platform innovations in NSD projects on a scale that adds significant value to the NSD project within the value network context?

- Are the traditional market research methods deployed to examine the future needs of these customers the best solution to predicting platform innovations in the NSD project within the business ecosystem context?

Based on the arguments presented earlier in this research, this thesis argues that traditional market research methods are not effectively positioned to capture the highest customer involvement benefit in platform innovations within the context of business ecosystem. Nor are typical customers positioned to optimally contribute towards circumstances involving platform innovations in business ecosystems.

Having acknowledged the limitations to the approach of adopting the ‘typical’ customer in collaboration purposes in NSD projects, it is then critical to determine the key characteristics of the kind of business customers that are best positioned to inform collaborative developments in order for such market research to make a substantial contribution towards the value creation potential of NSD projects.

3.8.3. Lead Business Customer Involvement

There is an increasing tendency among organisations in industries such as telecommunication, computing, media and pharmaceutical to increasingly develop working relationships with a specific category of users known as ‘lead users’ (i.e. lead business customers) in product or service innovation projects (Herstatt and von Hippel, 1992; von Hippel et al., 1999; Lilien, Morrison, Searls, Sonnack, and von Hippel, 2001).

Empirical research by the likes of von Hippel, (1986); Utterback et al., (1976); and Biemans, (1991) has illustrated the crucial innovation role of users facilitated by their specific needs that are very often associated with the development of new products and services, particularly in the context of industrial and business-to-business markets. In specific industry sectors, such as those involved in the production of semi-conductors and electronic sub-assembly processes, compelling evidence suggests that significant advances in technology were achieved by the semi-conductor manufacturers themselves and not by the developers of the respective process technologies, as was previously thought to be the case (von Hippel, 1977). Similar situations of product and services innovation were evident in the results of prior research conducted in industries as diverse as process technologies (Mantel and Meredith, 1986), scientific instruments (von Hippel, 1976) and medical devices (Shaw, 1985).

Therefore, having acknowledged the role of lead business customers in product and services innovations, it can then be suggested that innovating users (i.e. business customers) exist and their presence frequently initiates or even dominates product or service developments of major innovations with considerable market potential. Having established the role of lead business customers in product and service development programs, this thesis proceeds to distinguish lead business customers from the general mass of business customers in the marketplace.

Lead business customers display two unique characteristics that distinguish them in the marketplace with respect to a particular novel product or service (von Hippel, 1986). The first feature is based on the *capability* of lead business customers in terms of their particular effectiveness in articulating a future mass market need that is based on their own current needs due to the fact that these types of customers are ahead of the market in terms of need related trends (von Hippel, 1986). It can then be argued that lead business customers are particularly effective in articulating future mass market needs simply because this category of business customers often operate in use contexts that lie in the future in contrast to 'typical' business customers in a market. That is, they face certain needs months or years before the marketplace in general encounters such a need (von Hippel, 1986).

The second characteristics of lead business customers suggested by von Hippel (1986) pertains to the nature of their unique positioning in the market, in that these group of business customers are *motivated* to develop a new invention ahead of the general market needs so as to gain a significant innovation-related benefit (through both financial and non-financial means) by obtaining a solution to their current needs (von

Hippel, 1986). These initial characteristics first proposed by von Hippel (1986) have since been documented in several empirical studies, such as those undertaken by Urban and von Hippel (1988), Morrison et al (2000), and Franke and Shah (2001).

The two core characteristics of lead business customers as discussed above can serve as the criteria used by an organisation when it aims to identify business customers with leading-edge qualities in a particular market. Based on the argument that business customers tend to apply 'local' information (based on personally experienced needs and technical knowledge they already possess) within use contexts that lie in the future but which they currently experience, it can be further argued that the supplying organisations should be able to identify specific innovations of potential value through such lead business customer knowledge. Organisations should then be able to use such unique knowledge to predict the specific application area and innovation solution type that will most likely yield the best returns in new service development programs.

In generating customer involvement in NSD projects, whether in a uni-organisational or network organisational arrangement, the main intended outcome is the development of an understanding of the *lead business customer knowledge*. It can therefore be argued that, in order to achieve a through understanding of customer preferences in NSD projects, organized and systematic effort should be directed towards the acquisition of *lead business customer knowledge* in NSD projects.

3.8.4. Lead Business Customer Knowledge

Customer knowledge is no doubt a critical feature of modern day product development programs. Customer knowledge development has been identified as a fundamental prerequisite for new product success (Cooper and Kleinschmidt 1995, 1996). However, despite the acknowledged importance of customer knowledge development in facilitating new product and service success, there is considerable variance in the extent to which firms engage in this process in their product development projects (Cooper 1998).

Product development projects comprise two main phases: pre-launch and post-launch (Cooper, 1998). The pre-launch phase includes stages such as idea generation, concept refinement, product development, and product testing (Troy, Szymanski, and Varadarajan, 1982). Consistent with the research context of this project (and further expanded upon at a later stage), this thesis focuses on customer knowledge development in the *pre-launch phase* of new service development.

A review of literature on the new product preference formation of customers suggests that customer preferences for new products and services experience a process of evolution rather than remaining in a pre-existing state throughout the product development project. Such preferences evolve through active customer engagement with specific new product ideas, concepts, and prototypes across the stages of the new product development process (Hamel and Prahalad 1991, 1994). Therefore, in order to develop an understanding of the customers' evolving new product knowledge, it is necessary for customer preference for new products and services to be understood as an evolutionary process (Joshi and Sharma, 2004).

However, this thesis is particularly concerned about the kind of customer knowledge that is of value in circumstances where platform service innovations are involved. Consistent with the research context of this research, the acquisition and use of ‘lead customer knowledge’ is particularly effective in sustaining the quality of customer collaboration in the development of interorganisational NSD capability (von Hippel, 1986).

The concept of creativite of knowledge deployment as introduced by Perkins, (1988), and by Marsh, Ward, and Landau (1999) in the domain of new needs can be viewed as the creative step of developing unique products and services that differ from exisiting product and services currently available in the marketplace. It can be argued that when individuals and groups have to accommodate creative cognitive tasks, they tend to apply knowledge that is already in their possession to remedy a deprivation of a particular need that they currently face. In other words, the behavior of problem-solvers facing new situations tends to be dependent on their previous experiences with similar situations and problems (Lunchins, 1942; Birch and Rabinowitz, 1951; Adamson, 1954). Empirical studies have further indicated that when faced with a new need deprivation circumstance, individuals will almost certainly use prior knowledge and stored experience in creative problem-solving situations even if under specific instructions against its use (Marsh et al., 1999).

These research findings have a particular significance in that they explicitly suggest that business users who are familiar with new or emerging needs and already operate in future-use contexts would have the capability and motivation to generate substantially new product ideas through their prior knowledge and stored experience (von Hippel, 1986). As opposed to the ‘typical’ customers mentioned earlier, business customers at the leading edge of the marketplace do not confront any significant cognitive challenge when imagining themselves in an as yet non-existent situation. The 'new' is already familiar ground to them based on the use contexts that lie in the future for a 'typical' customer but which is already currently experienced by 'lead' customers. Thus, when developing service solutions that differ from existing market offerings this category of business customer poses a unique capability in using knowledge already in their possession to satisfy needs that have not yet been formulated (von Hippel, 1986).

Cognitive learning theories suggest that users facing new needs arising from changing circumstances are likely to start a learning process in order to develop new solutions to those needs (Witt, 2001). Hence, there is a correlation between the acquisition of new needs and learning how to satisfy them (Witt, 2001). As a consequence, the motivation to acquire knowledge to develop innovations is to a large extent formed by the existence of new needs and their current state of deprivation (Witt, 2001). Therefore, based on their higher capacity and capability to innovate, leading-edge business customers are very often associated with an ability to register innovation-related information (Witt, 2001).

Cohen and Levinthal (1990) highlight the significance of prior knowledge for learning in their exposition of the concept of 'absorptive capacity'. Using this concept, Cohen and Levinthal (1990) argue that users facing new needs find it easier to make sense of innovation-related information because the circumstances that prevail fit with their cognitive structure (see also Bower and Hilgard, 1981). This category of users is therefore more likely to identify, memorize and to transform pieces of information into knowledge that may be relevant for developing solutions that cater to their needs.

Hence, this thesis argues that it is critical for organisations in the business ecosystem not only to realize the unique value-creating feature of prior knowledge and stored experience among lead business customers in registering innovation-related information but, more significantly, to systematically tap on such a quality of knowledge and experience reservoir and effectively direct such a flow of resources in the form of lead customer knowledge and experience into the decision making processes of NSD programs through a well planned and effective customer collaboration program.

In so doing, interorganisational NSD projects would be better equipped to understand the intricacies of lead customer preferences for new services that unfold through the iteration of *probing* and *learning* activities in better understanding lead business customer knowledge in interorganisational NSD project (Lynn, Morone, and Paulson, 1996). In the research context of this research, probing activities could be argued to include the exploratory actions of non-lead actors within the NSD business ecosystem in understanding the lead customer knowledge. This understanding of lead customer knowledge is then directed towards the deployment of new product ideas, concepts, and prototypes among lead customers. These probing and learning activities would entail the processing activities of lead customer feedback and the development of subsequent probes based on the analysis of the initial outcomes (Hargadon and Sutton 2000; Leonard 1998).

Thus, based on the arguments presented in explaining the concept of ‘lead customer knowledge’ within the research context of this thesis, the following proposition is suggested:

P[6]: Lead business customer knowledge contributes to increased NSD capability in the business ecosystem.

Commentary: This working proposition claims that the lead business customer, the network operator, is critical to the service development capability of the business ecosystem. Lead business customers possess the capability and the motivation to provide leadership in contributing to new service developments within the business ecosystem. Due to their strategic position at the gateway to the need requirements of end-users, lead business customers are capable of articulating the services needs of end-users in the development of rich media services better than any other actor in the business ecosystem. The application of this knowledge is therefore critical in augmenting the rich media service development capability of the business ecosystem.

3.10. The Link between the Research Questions and Propositions

The theoretical triangulation approach (outlined in chapter 2) exposed a gap in the existing research literature by examining the available literature in the three major domains of Innovation, Network and New Service Development that inform this thesis. The theoretical triangulation process ultimately leads to the conception of the overarching research question as follows:

What factors affect interorganisational NSD capability?

To develop a better understanding of the principal research question, the following secondary research questions are posed in order to more effectively guide the scope of this thesis:

> RQ1: What are the concepts that define the notion of 'network interconnectednesses' in NSD activities between actors within business ecosystems?
>
> RQ2: What are the concepts that define the nature of 'collaboration' in NSD activities between actors within business ecosystems?
>
> RQ3: What is the nature of 'customer involvement' in NSD activities within business ecosystems?

The body of literature has been further explored in this current chapter to identify and discuss specific concepts that could possibly influence the development of rich media mobile services in business ecosystems. Subsequent to identification of the concepts, the literature reviewed in this chapter was used to develop the various working propositions that then articulate the parameters of this research.

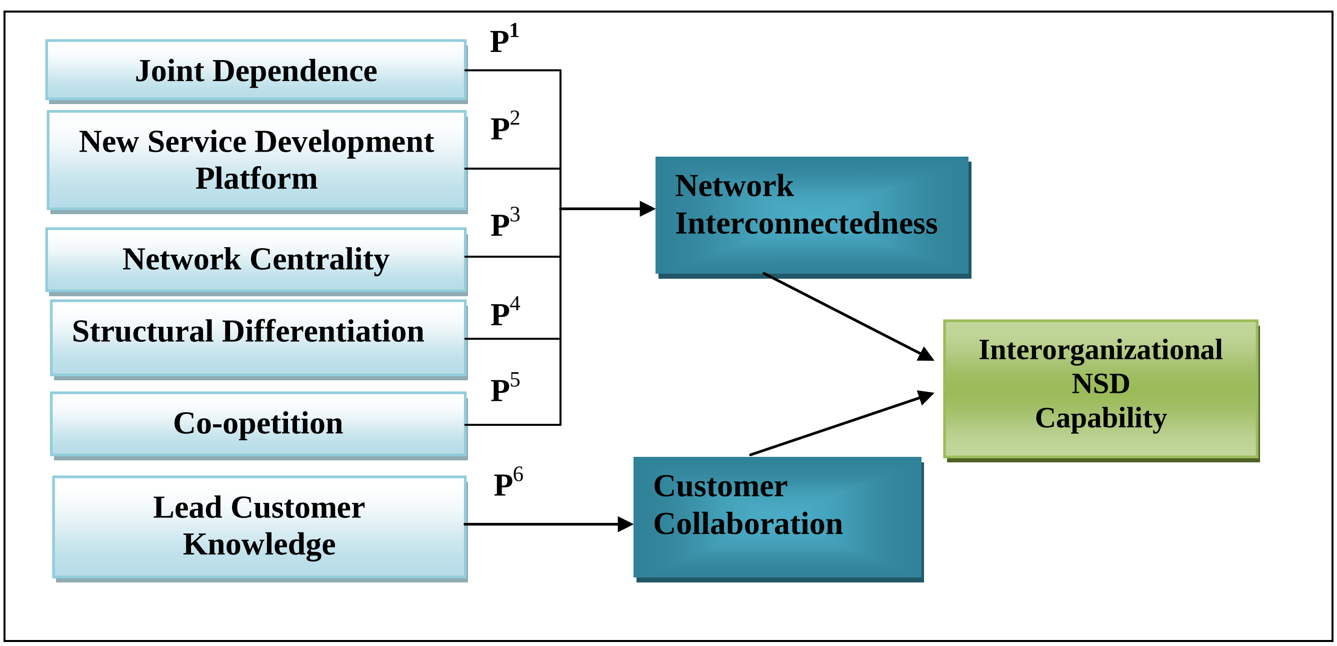
Table 3.1 provides a summary of the links between the overarching research question and the secondary research questions that define the research problem. The table projects the link between each secondary research question and the working propositions derived from the literature reviewed in this chapter. It exhibits how each research question is to be answered by verifying the research propositions derived from literature review. *Appendix 4* contains a summary of the working propositions related to this thesis.

Table 3.1: Link between Research Questions and Research Propositions

Overarching Research Question	Secondary Research Questions	Corresponding Research Propositions
What factors affect interorganisational NSD capability?	RQ1: What are the concepts that define the notion of 'network interconnectednesses' in NSD activities between actors within business ecosystems?	P^1, P^2,
	RQ2: What are the concepts that define the nature of 'collaboration' in NSD activities between actors within business ecosystem?	P^3, P^4, P^5
	RQ3: What is the nature of 'customer involvement' in NSD activities within business ecosystems?	P^6

The information provided in *Table 3.1* is further elucidated in *Figure 3.3,* which describes the research model derived predominantly from the literature review conducted and deliberated in this chapter.

Figure 3.3: Interorganisational NSD Capability Model



The research model provides an alternative but at the same time congruent view of the research constructs and propositions derived from the literature reviewed. The model depicts graphically how the various primary and secondary research concepts and propositions give rise to explanations for the most fundamental element of the research – Interorganisational NSD Capability – in the context of a rich media mobile services business ecosystem.

3.11. Conclusion

In this chapter the concepts that affect the new service development capabilities of business ecosystems are identified and explored. The two key concepts that emerge from the literature reviewed in this chapter are ‘network interconnectedness’ and ‘customer collaboration’.

This thesis argues that a number of concepts should be taken into account when defining network interconnectedness (Gulati and Stytch, 2007). Joint dependence, a concept derived from the notion of interdependence, is the first concept argued to be a precursor to the definition of network interconnectedness (Gulati and Stytch, 2007). Joint dependence is a concept based on the logic of embeddedness, commitment and mutual empathy, effective conflict resolution, and joint success (Uzzi 1997; Marsden, 1981; Murray et. al. 1996; Kelley 1979; Rusbult et al. 1991).

The next concept that defines interconnectedness is the New Service Development Platform (NSDP). The concept of a ‘platform’ is central to networks such as business ecosystems (Iansiti and Richards, 2006). Iansiti and Richards (2006) define a platform as “a set of tools or components that provide building blocks for application providers” (p. 81) These platforms are accessible to other ecosystem members and function to create rich media mobile communication system applications that in turn benefit end-users. The right mix of the portfolio of capabilities, business processes, systems, and assets can be assembled to generate new services based on the new platform concept (Laurie, Doz, and Sheer, 2006). End-to-end development and delivery of new services is possible through the very existence of a common platform in the business ecosystem facilitating network interconnectedness.

Network centrality articulates the significance of a specific organisation for the overall structure of a network (Freeman, 1979). Central actors are connected to other organisations in networks. This high level connectiveness is indicative of a relatively central position at the ‘hub’ of the business ecosystem and is aligned to the overall interests of the ecosystem (Noorderhaven et. al. 2002; Iansiti and Levien, 2004). Central actors are often the provider of the NSDP for the ecosystem (Iansiti and Levien, 2004). Their central position in the ecosystem allows them a high degree of visibility in the network (Gulati and Gargiulo, 1998). Thus, central actors are in a position to promote the ecosystem’s interconnectedness through promoting efficiency, innovation (through niche creation), and robustness (Iansiti and Levien, 2004).

While central actors are an important part of the business ecosystem they only constitute a minority of its actors (Iansiti and Levien, 2004). The development of niches in the ecosystem is critical to the health and vitality of business ecosystems, fundamentally because ecosystems are made up of heterogeneous landscapes (Iansiti and Levien, 2004). Niches contribute to the embeddedness of actors in the ecosystem including the progressive structural differentiation of the various actors that comprise the ecosystem. Niche actors make up the majority of actors in the ecosystem and are responsible for most of the value creation and innovation (Iansiti and Levien, 2004). The structural differentiation created by heterogeneous actors in the business ecosystem contributes to the availability of complementary resources for the network-level competencies. It can be argued that through effective articulation and facilitation of such complementary resources, an inimitable type of network-level competency arises at the business ecosystem level. The inimitability and rarity of the emerging network-level competencies enhances network interconnectedness (Pillai, 2006), indirectly contributing to the business ecosystems NSD capability.

Ecosystems base their success on both competition and cooperation, a paradoxical relationship that may emerge concurrently that is known as co-opetition (Moore, 1993; Bengtsson and Kock, 2000; Brandenburger and Nalebuff, 1996). Both processes of value-creation and value-sharing take place, giving prominence to a partially convergent interest (and goal) structure. The presence of both competitive and cooperative dynamics is simultaneously at work and strictly interconnected (Dagnino and Padula, 2002). Actors do in fact compete due to some similarity in resource and capability profiles. However, these same actors are simultaneously conscious of their wider roles of ensuring the health of the ecosystem in total. This notion of competition and cooperation fosters network interconnectedness between actors in the business ecosystem.

The concept that defines business customer collaboration is lead customer knowledge. The importance of establishing dialogue with business customers to create innovation in ecosystems is consistent with the notion that value in the networks is defined and co-produced with many business customers (Moore 2006; Iansiti and Levien, 2004; Prahalad and Ramaswamy, 2000). Business customers are value partners in the business ecosystem and are considered to be a source of competence in NSD (Prahalad and Ramaswamy, 2000). It is argued that lead business customers have a higher capacity and capability to register innovation-related information due to their higher ‘absorptive capacity’ (Witt, 2001; Cohen and Levinthal, 1990). Lead business customers possess unique knowledge to satisfy a deprivation of a particular need that they currently face. Although this need is considered a current need for lead business customers, it nevertheless, remains a future need for the general market (von Hippel, 1986; Birch and Rabinowitz, 1951; Adamson, 1954). Therefore, business ecosystems should tap into the knowledge and experience reservoir of lead customers and direct such knowledge and experience into NSD programs in exploiting the full potential of the latent needs of the market.

In sum, these concepts give rise to the suggested research propositions as outlined in *Table 3.1* and form the foundation of the research model presented in *Figure 3.3*.

Chapter 4
Research Method

4.1. Introduction

This chapter begins by identifying and outlining the research design that defines the structure of this research. The argument for the case study research method adopted in this research is based on the overarching research problems and nature of the inquiry being performed. This chapter then proceeds to define the unit of analysis under observation, the research instruments applied in this research, the logical linking of data from the data collection phases to the propositions as identified in chapter 4 and the criteria for interpreting the findings and the reasoning for the selection of each case.

This chapter subsequently proceeds to engage the reader in the case study research strategy, the qualitative research design and the research process chosen for this piece of research. This is followed by a description of the data collection, as well as data analysis procedures. Finally, the study validity and reliability are discussed.

4.2. Research Design

The research design is based on the logic that links the data to be collected and conclusions to be drawn about the overarching research question. The critical research design components that will be discussed in detailed analysis of the case studies include the research questions, issues concerning the purpose and type of study to be undertaken, the research propositions, the unit of analysis, the research instruments, and the logical linking of data from the data collection phase to the propositions and the criteria for interpreting the findings (Yin 2003; Malhotra *et al.,* 2003).

4.2.1. Qualitative Research

This study is qualitative in nature. Qualitative methodologies are often understood as those that are not statistical (Jensen and Rodgers 2001, Yin 2003). The qualitative research strategy considers a vast number of different human actions and events without necessarily emphasizing their frequency, recurrence or correlation.

The feature that most clearly distinguishes qualitative and quantitative methodologies is the manner in which scientific explanatory power is proven. The role of the researcher in collecting the data, as well as the level of researcher's interaction with the research participants, is very important (Yin 2003). Qualitative research occurs in a natural setting. Data is derived from the participants' perspective, whether of the interviewee or interviewer. The research design is flexible and allows the researcher to adjust the data collection or analysis method for context specific constraints. Instrumentation, observation methods, and modes of analysis are not standardized in the qualitative research arena (Lee 1999).

A qualitative research approach for this study was selected for various reasons. The primary reason is that the domain of rich media mobile services, which characterize the selected cases for this research, is a new business area and, more critically, an area that remains significantly under-researched. In order to understand in greater depth the phenomena characterizing these cases, a qualitative approach is considered as fundamentally necessary. It is assumed that emerging and thus far undefined concepts will surface in the study. Another reason for selecting the qualitative method is that the underlying theory and research propositions developed through the initial stages of the literature review seem to indicate a lack of comprehensiveness in the initial theoretical framework. This convinced the researcher that the research problem is one that is not appropriate for testing with statistical methodologies in the rich media mobile services context in the absence of clearly defined research concepts. Given the circumstances of the research, the researcher then realized the need for an in-depth understanding of the phenomena to support theory-building. This is consistent with the overarching research problem as defined earlier in this thesis. Finally, the embryonic stage of development in the rich media mobile services industry suggests that the number of people (particularly industry experts) involved in its development and evolution are relatively few in number. Therefore, any sample would have turned out to be rather small for a satisfactory statistical analysis.

Qualitative research design can be classified into three types: exploratory, descriptive and explanatory[22]. Yin (2003) argues that a case study that is qualitative in nature can be subjected to any of these three research designs and that, within any single study there can be a combination of exploratory and confirmatory aspects (Miles and Huberman 1994). Characteristic elements of exploratory and descriptive research are present in the design of this research. The purpose of exploratory research is the identification of problems, their precise formulation and the formulation of new or

[22] Also frequently referred to as the *causal research* design.

alternative courses of action. Exploratory studies are typically performed in research contexts or domains that are not well documented or are relatively under-researched (Snow and Thomas 1994). The objective of this thesis is to understand the concepts affecting interorganisational new service development capability in the provision of rich media mobile services. Identifying the concepts that affect rich media mobile service innovation constitutes the exploratory dimension of this research. The descriptive perspective adopted in the context of this thesis aims at describing the various actors that form the interorganisational network (i.e. the business ecosystem), their roles and characteristics, and the relationships that are built between these actors for the development and delivery of rich media mobile services. In the context of this research, descriptive features of the research domain are seen as particularly effective in providing information on interorganisational interdynamics or phenomena that already exist. Descriptive analysis has been argued to be particularly effective in defining the underlying concepts of a theory (Snow and Thomas 1994), but does not explain the nature of relationships (Smith and Albaum, 2005). This is an area where the explanatory feature of the research design is particularly effective. Explanatory studies explain the causes that are predicted and the reasons ‘why’ certain relationships occur. Such studies require a significant amount of information about the factors that are studied by the investigator. Explanatory studies specify a complete and logical series of causal events that connect variables and concepts in a manner that accounts for why these variable-construct relationships are formed (Miles and Huberman 1994). This research does not incorporate a causal design and therefore does not include explanatory features.

4.2.2. The Case Study Research Methodology

The case study research method is identified as the most appropriate method for the context of this research. The case study research methodology has been very frequently linked to the investigation of a "contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident" (Yin, 1984, p. 23). Yin (2003) further argues that case study inquiry is performed in a technically distinctive situation in which there are many more variables of interest than data points and, as one result relies on multiple sources of evidence (e.g. interviews, documents, field notes etc.), data needs to converge in a triangulated fashion. Triangulation of data is applied in this research to benefit the preliminary development of theoretical propositions that guide the data collection and subsequent analysis of the research findings. The understanding derived from the selected case study then contributes to the theory-building process.

A case study approach is considered a suitable research strategy when one or more of the following parameters are present: (1) when it answers questions such as 'how' and 'why' (Yin 1994, Yin, 2003, Tellis 1997); (2) when the investigator has little control over the phenomenon (Yin 1994); (3) for investigation of contemporary events as opposed to historical events (Yin 1994); and (4) in circumstances where little empirical research exists of the phenomenon being studied (Yin 1994). The objective of this study is to understand *how* 'interorganisational new service development capabilities' emerge in the context of a business ecosystem in developing rich media mobile services for the marketplace. The researcher had no control over the phenomenon in question and had not been involved in service development processes or commercialization initiatives in any of the case studies (both the pilot and the Mobile TV case study) observed in this thesis. The phenomena researched in the Mobile TV case study are contemporary developments and the study is undertaken within this dynamic context. The work of Peppard and Rylander (2006), which addresses the application of the value network concept in a mobile services ecosystem, limits its scope to the value network concept without explaining the interorganisational service development dimension of the research context. Apart from Peppard and Rylander (2006), which has an indirect relevance to this research project merely due to the adoption of the same research context for analysis in this study, no previous research in the domain of interorganisational new service development in rich media mobile communications services existed (to the best of this researcher's knowledge at the time of initiating this research). Therefore, consistent with the four parameters outlined above, a case study approach is justified as a suitable research strategy for this study.

Generally, there are two types of case studies approahes. The first and more commonly adopted approach in case study research seeks specific conclusions from a single case because it is of special interest. The second type aims to derive general conclusions from a limited number of cases (Gummesson 1991).

The case study design used in this study adopts a *single* case approach (Dyer and Wilkins 1991) – the Mobile TV case study in Australia. A single case study approach was selected because Mobile TV service innovation was of special interest due to its contemporariness and the dynamic phenomenon associated with its development. The network operator to which the case study is associated was among the pioneering mobile network operator in Mobile TV service within Australia and therefore provided an interesting platform for performing the study.

Eisenhardt (1989) suggest that theory-building is only possible through the study of multiple cases in parallel. New cases strengthen or weaken the conceptualizations made, a view close to Yin's (1998) ideas of building theory with case studies. In contrast to Eisehardt's view, Dyer and Wilkins (1991) argue that the multiple case approach limits the scope for useful findings compared to the higher degree of insights that would otherwise be obtained from the single case study approach. It is argued that the strength of case study research is typically found in its rich description and exposition of contextual factors in the development of new concepts. Studying one case well may lead the researcher to identify new theoretical relationships and question old ones. As Dyer and Wilkins (1991) simply puts, "the more contexts a researcher investigates, the less contextual insight he or she can communicate" (p.614).

Eisenhardt (1991) argues that application of a multiple case approach provides a powerful basis for the creation of theory for the reason that they allow for 'replication' and 'extension' of individual cases. Individual cases can be used for independent corroboration through replication, helping the researcher perceive patterns more easily and to eliminate chances associations. The use of multiple cases also allows for the extension and development of more elaborate theory. Different cases often emphasize complementary aspects of a phenomenon and thus, by piecing together the individual patterns contributed by each case, the researcher is able to draw a more holistic theoretical picture. Eisenhardt (1991) further argues the significance of creating precise and measurable constructs, for it is these constructs that eventually become the foundation of a powerful theory, characterized by a rigorous method and multiple-case comparative logic.

On the contrary, Light (1979) argues that the ultimate goal in using case study as a method of research is generally to provide a rich description of the social scene, to describe the context in which events occur, and to reveal the *deep structure* of social behaviour. Theory that is derived from such deep insights will be both more accurate and more appropriately tentative because the researcher must take into account the intricacies and qualifications of a particular context (Van Maanen, 1979).

Dyer and Wilkins (1991) argue that the use of Eisenhardt's method is constrained by the number of cases that will be studied, and as a result descriptions will be rather "thin," focusing on surface data rather than the deeper social dynamics. Although such studies can provide certain flashes of insight and can raise important issues and questions, they tend to neglect the more tacit and less obvious aspects of the setting under investigation. They are more likely to provide a rather distorted picture or no picture at all, of the underlying dynamics of the case. Dyer and Wilkins (1991) states that “ The central issue is whether the researcher is able to understand and describe the context of the social dynamics of the scene in question to such a degree as to make the context intelligible to the reader and to generate theory in relationship to that context” (p.616).

Based on the arguments provided by Dyer and Wilkins (1991), this thesis adopts a single case study approach. The Mobile TV case study is selected as the case for observation in this thesis. However, it must be made clear to the reader that the mobile music case study was also completed and analyzed. The Mobile Music case study was however not discussed in this thesis. In order to achieve the required depth in exploring and describing research context and the phenomenon that define the business concepts developed through literature review in greater depth, a single case study seemed more appropriate (Gummesson 1991).

According to Jensen and Rodgers (2001), from a time-frame perspective, a case study can be undertaken as a ‘longitudinal’ study, ‘pre-post’ study or a ‘snapshot’ study. This project was undertaken as a snapshot study. Jensen and Rodgers (2001) argue that a snapshot study is a description of an entity at a single point in time. A longitudinal study analyses events that occur over time. Pre-post case studies include assessment before the phenomenon and follow-up assessment after implementation. A snapshot approach was selected because the objective was to understand the factors affecting interorganisational new service development capability in the provision of rich media mobile services. In addition, the time and resource constraints affecting this research also have a bearing on the decision to apply a snapshot approach to this research, which would have prohibited a longitudinal or a pre-post approach. The longitudinal approach can be argued to be more appropriate when studying industry evolution as a whole or multiple stages of the industry evolution. In contrast, pre-post studies are more suitable for studying an outcome of implementing a particular program, policy or decision that is transformative in nature (Jensen and Rodgers 2001).

4.2.3. The Research Paradigm

Authors in the domain of qualitative research have recognized the significance of two major approaches to theory development: deductive theory-testing and inductive theory-building (Bonoma, 1985; Parkhe, 1993; Romano, 1989). The difference between the two approaches can be viewed in terms of scientific paradigms, with the deductive approach representing the positivist paradigm and the inductive approach representing the phenomological paradigm (Easterby-Smith et al., 1991). The phenomological paradigm can be further divided into three domains: critical theory, constructivism and realism (Guba and Lincoln, 1994).

This study is based on 'systematic combining', an approach first introduced by Dubois and Gadde (2002) that is grounded in abductive logic. Rather than adopting the extremes of deductive or inductive approaches to theory building, Dubois and Gadde (2002) suggest the use of a combination of both deductive and inductive approaches in case study research. Dubois and Gadde (2002) suggest that deduction refers to the reasoning chain that proceeds from known facts or theory to details. Theoretical reasoning is performed before the collection of empirical data. Induction on the other hand refers to reasoning that proceeds from details to fact or theory. In the case of inductive reasoning, the researcher has no preconceptions or prior assumptions about the phenomenon. Pure induction in science is often questionable due to the absence of any guiding theoretical framework (Strauss and Corbin, 1990). As Richards (1993) suggests "it is impossible to go theory-free into any study" (p. 40). Eisenhardt (1991) emphasizes the significance of the fact that the research design of a case study is necessarily associated with existing theory. Dubois and Gadde (2002) argue that in order to obtain new scientific findings, guiding principles are needed to direct the observations. These guiding principles are provided by an evolving theoretical framework. As the objective of this thesis is to develop theory, the thesis recognizes the need for the theoretical framework to remain open to the multitude of meanings that can arise in relation to any given concept. Dubois and Gadde (2002) argue that "the successive refinement of concepts implies that they constitute input, as well as output of an abductive study" (p. 558). This is consistent with the approach taken in this thesis to either accept, ammend or reject the working propositions at the data analysis phase of this thesis (see chapter 6). In systematic combining, Dubois and Gadde (2002) suggest the significance of a "tight and evolving theoretical framework" (p. 558) in contrast to the suggestion by Miles and Huberman (1994) that the framework should either be tight and prestructured or loose and emergent. According to these authors, the argument for a tight framework is that the tightness reflects the degree to which the researcher has articulated his 'preconceptions', whereas the justification that the framework should evolve during the study is because empirical observations inspire changes of the theoretical viewpoint and vice versa.

The empirical perspective of authors like Miles and Huberman (1994) have led them to emphasize the importance of 'pre-structured research' for budding qualitative researchers working in areas where some understanding has already been achieved but where more theory-building is required before testing of theory can be undertaken. This is similar to the circumstances of this research as evidenced in the earlier sections of this document where the literature review charts the body of research knowledge and identifies a number of significant gaps.

Existing theoretical concepts provide the basis on which analysis and interpretations are formed; however, at the same time, the research can be inductive in nature. 'Systematic combining' is based on having some guiding principles prior to the field study, but not necessarily a fully developed theory for testing. A guiding principle can either be an abstract intuitive idea or a relatively well-developed hypothesis or set of research propositions (Dubois and Gadde, 2002). At any stage of research, the guiding principle can be abandoned or changed (Dubois and Gadde 2002). In systematic combining, the reasoning process is anchored around an evolving theoretical framework. This evolving framework is the cornerstone: the original framework is successively modified due to unanticipated empirical findings and theoretical insights (Dubois and Gadde 2002). Systematic combining is a process where theoretical framework, empirical fieldwork and case study analysis evolve simultaneously. The researcher 'flip flops' continuously between empirical observations and theory. Systematic combining is particularly useful for the development of new theories and it builds more on the refinement of existing theories than on inventing new ones (Dubois and Gadde 2002).

Prior to embarking on the empirical study, theoretical concepts were drawn and developed from the literature review, analysis of previous studies of the mobile services industries, and from the pilot case study in accordance with Eisenhardt's (1989) guidelines for research design. Although the research concepts and research propositions were formed as a framework to guide the data collection initiative, they were nevertheless incomplete. Pre-developed research concepts prior to the empirical study enabled the empirical efforts to be partially guided by the selection of themes to be focused on during the semi-structured interviews. The study progressed in an iterative process, in essence adopting a systematic combining approach to navigate between existing theory and industry studies, empirical fieldwork, and case study analysis (Dubois and Gadde 2002).

The objective of this research is to modify and extend theory via the systematic combining approach rather than testing existing theory. Wacker (1998) defines theory as a statement of relationships between units observed or approximated in the empirical world. Such statements indicate the importance of relationship building in explaining *how* and *why* specific phenomena occur. The goal of a theory is to explain clearly *why* and *how* specific relationships lead to specific events. Theory provides both the researcher and practitioners in the field with a framework for analysis, an efficient method for field development, and a clear explanation for practical world problems. Wacker (1998) argues that theory must consist of four constructs: (1) definitions of terms or variables; (2) limitations of domains for the application of theory; (3) a set of relationships of variables; and (4) specific predictions. Definitions of terms or variables identify *who* and *what* are included or excluded from consideration. Domain limitations observe and limit the conditions in which the theory is applicable. The relationships among variables logically explain the reasoning of the relationship between each variable. Finally, specific predictions establish the conditions or outcomes that may be anticipated (Wacker 1998). Case studies provide a unique means for theory-building because they utilize in-depth insights of empirical phenomena and their contexts (Dubois and Gadde 2002).

As is the case with any research strategy, case study research is not without its limitations. The case study method has been criticized for providing little basis for scientific generalization (Dubois and Gadde 2002). However, Yin (2003) argues that, in contrast to statistical generalization, case studies do generate analytical generalization so that theoretical concepts and models that are generated can then be tested by at least explaining other phenomenon in similar research contexts. In analytic generalization, "the researcher is striving to generalize a particular set of results to a broader theory" (Yin, 1994, p. 36), rather than extrapolating findings to apply to a population set, as is the case of statistical generalization. To generalize to a theory is to provide some evidence that supports a theory but not to necessarily prove it definitively (Firestone, 1993). Yin (1994) argues that the "case study researcher's goal is to expand and generalize theories (analytic generalization) and not to enumerate frequencies (statistical generalization)" (Pg 10). Case studies have also been criticized for the tendency to describe *everything* observed in the research due to the rich in-depth information derived from case analysis. Dubois and Gadde (2002) have therefore suggested that case study researchers should be selective in absorbing the most relevant data that meets their research objectives.

Perry (1998) argues that realism is the preferred paradigm for case study research for several reasons. Firstly, Perry (1998) refers to the argument put forward by Boing (1994) in suggesting that case study research areas are usually contemporary and pre-paradigmatic, such as interorganisational relationships and relationship marketing. This suggests that the research areas under consideration usually require inductive theory-building for deduction from already existing principles and constructs of a ‘paradigm’. This is likely to be difficult in circumstances where accepted principles and constructs have not yet been established or are clearly inadequate.

Secondly, Perry (1998) adopts the argument by (Hunt, 1991) in suggesting that a realist paradigm is considered to avoid the limitations of relativism as it is often characterized by a certain level of researcher objectivity. Realism holds that there is an external reality (Tsoukas, 1989) that is accessible to the researcher, although the complexity of that reality and the limitations of a researcher’s mental capacity mean that the triangulation of data to refine fallible observations of that reality is essential.

Thirdly, this thesis is designed with the expectation that the knowledge claims and conclusions generated from this research will be evaluated through some common measures, like reliability and validity issues, and a careful evaluation of the research topic and the research method. With this in mind, and in the context and objectives of this research, realism is the appropriate scientific paradigm for the case studies undertaken in this research. Exactly how this position provides justification for some of the procedures adopted in this study is discussed later, when the procedures are discussed in greater depth.

Given the appropriateness of adopting a realist perspective for case study research, the research problems addressed in this thesis are more descriptive than prescriptive. As discussed earlier, no positivist experiments or cause-and-effect paths will be applied to solve the research problem. This research will be concerned with describing real world phenomena rather than developing normative decision-making models. Because this research is based on systematic combining rather than adopting the extremes of the deductive or inductive approaches to theory building, this thesis ultimately presents a proposed theory to provide a solution to the research problem (in terms specified by the overarching research question). Moreover, the final ‘future research’ section of the thesis will acknowledge that this theory will have to be tested for statistical generalizability in later, more quantitative research.

In summary, this research, which is effectively modelled on a case study approach, fits within the critical realism paradigm and essentially adopts the systematic combining of both deductive and inductive approaches to theory building. The research approach acknowledges the issue that fact and theory (induction and deduction) must be essentially complementary for one or the other to be of value (Emory and Cooper, 1991). Therefore**,** existing theory does have a role in this research. Firstly, although the interviews begin with unstructured questions and gradually move toward a semi-structured framework, some probe questions are also included in the interview protocol to ensure interviewees’ perceptions are sensistised to concerns with the limitations of existing theory, as noted below. Secondly, one pilot case study was completed prior to the major data collection stage. The pilot study is not a pre-test or ‘full dress rehearsal’ of the interview protocol (Yin, 1994) but is, in the context of this research, an integral part of developing the interview protocol; that is, of the ‘play writing’ process and setting the criteria for the selection of case studies for research observations. Thirdly, a round of interviews with general industry practitioners and from participants in the pilot case study was incorporated into the research design, in which existing theory gleaned from the literature is reviewed (Nair and Riege, 1995). In brief, theory was developed with a combination of preliminary findings from the pilot case study, preliminary interviews conducted with other industry executives external to the pilot case study, and a review of the research literature. This effectively formed the first step in the theory-building process of this thesis, consistent with the objective of analytically generalizing against the emerging theory of the research.

4.3. The Pilot Case Study Selection and Implementation Process

Figure 4.1: The Pilot Case Study Selection and Implementation Process

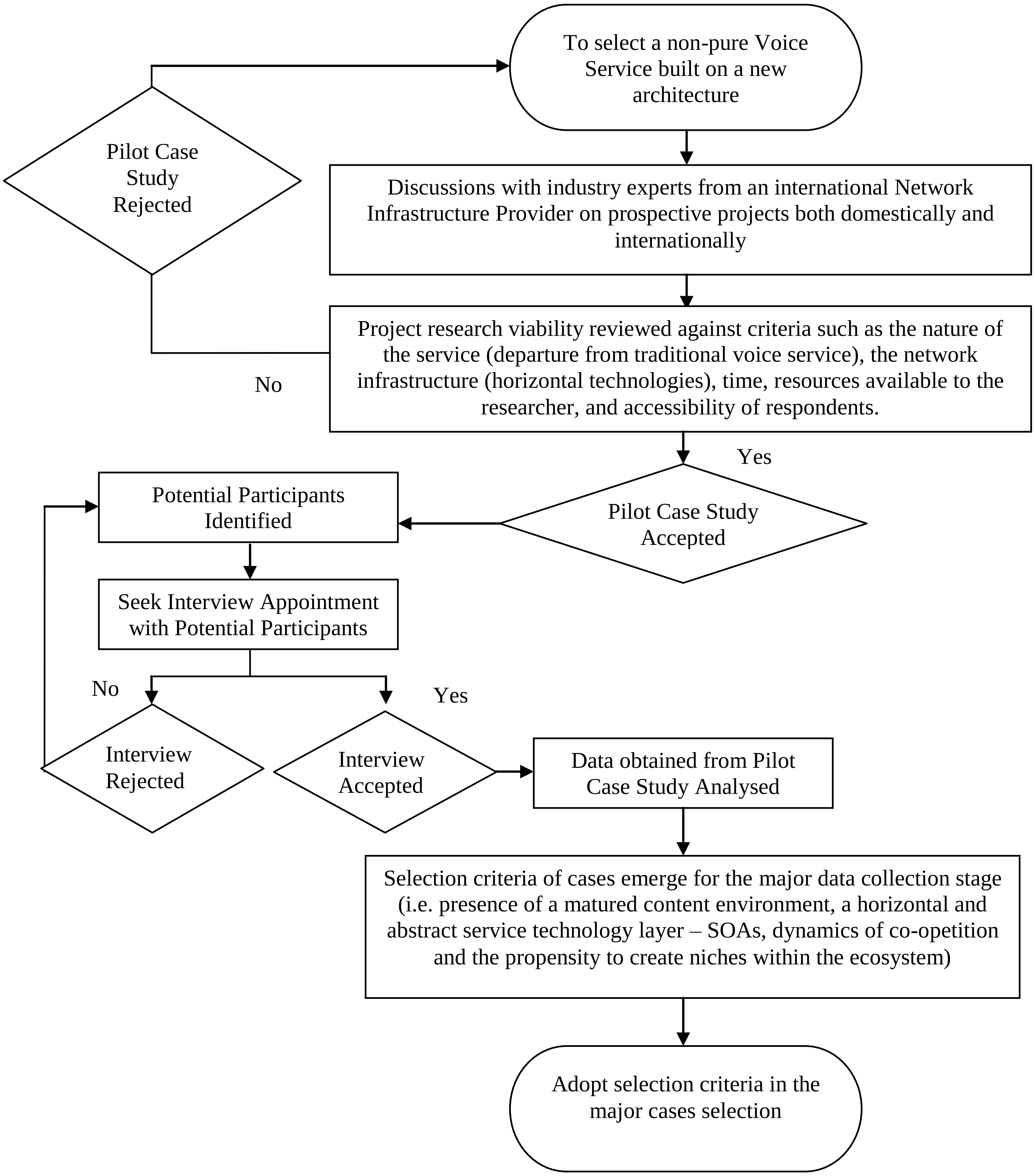


Figure 4.1 illustrates the pilot case study selection and implementation process. As the telecommunications industry is generally undergoing a transformation in network infrastructures towards an IP-enabled horizontal architecture, it was decided that the project selected as the pilot case study should be one that exhibits some signs of a departure from traditional voice services. The researcher maintained a close relationship with industry experts. In particular, Ericsson AG, a global network infrastructure provider showed a keen interest in the project undertaken by the researcher. Similar to other network infrastructure providers, such as Nortel Networks and Alcatel-Lucent, Ericsson AG is in a position to assist the researcher in identifying specific projects both domestically and internationally as being prospects for a pilot case study. The pilot case study was assessed in 5 aspects. These aspects centered mainly on the nature of service (e.g. voice or non-voice based services): (1) the architectural aspects of the network infrastructure involved in the provision of the service (e.g. horizontal architectural characteristics, exhibiting technologies such as IMS (IP Multimedia Subsystem) and SOAs (Service Oriented Architectures) such as SDPs); (2) the time required to complete pilot case study; (3) the resources at the disposal of the researcher to manage expenses such as accommodation, travel and meals during the data collection phase; and (4) the accessibility of prospective participants to participate in face-to-face semi-structured interviews for the research.

Based on these pilot case study selection criteria, the IP Centrex project based in Europe was selected. The IP Centrex project was particularly suitable because of the nature of the service in that it was not an extreme departure from traditional voice services. Although the core service remains an IP-based voice service, the IP Centrex project has other non-voice value adding services such as video-conferencing, conference calling, presence management and instant messaging. Based on such value adding services it was decided that the IP Centrex project offers an ideal transition project that is not entirely detached from traditional voice services and yet display the network architectural characteristics that indicate a transformational horizontal network architecture (through its adoption of IMS technology) for service development and delivery.

Potential participants were then identified through the contacts provided by Ericsson AG. An Ericsson Key Account Manager informed the potential contacts of the researcher's intent to initiate contact. This was to ensure that all ethical guidelines set by the research ethics requirements of the University were complied with at all times during the course of this research. In the event that a potential participant registered his/her interest to participate in the research, the participant then provided permission for Ericsson AG to provide his/her contact details to the researcher who then initiated contact and arranged for an interview appointment. The researcher initiated contact through email correspondence, providing the potential respondent with a letter explaining the research in detail (see *Appendix 9*). Also enclosed with the email was an informed consent form (see *Appendix 10*) for the participant to acknowledge the granting of consent for the interview prior to the appointment. This again is in compliance with the ethics requirements of the university. In situations in which the potential respondent declined to participate in the research, other potential participants were then identified in collaboration with Ericsson AG, and the same process recurred until a total of three participants confirmed participation in the pilot case study.

A total of three in-depth interviews with key informants from the IP Centrex project were completed. The data obtained from the interviews was then transcribed and analyzed along with other data obtained from documents provided by the participants. The data analysis of the pilot case study revealed some key selection criteria. The selection criteria generated from the pilot case study provided a framework for the selection of case studies for the major data collection stage of this thesis. The process of selection of case studies for the major data collection stage is described in greater depth later in this chapter. The following section provides a brief analysis of the pilot case study – the IP Centrex case study. This section discusses the case study selection criteria and how these criteria emerge as a result of the evidence deduced from the data presented in the pilot case study.

4.4. The Pilot Case Study Findings

The findings of the pilot case study is discussed in *Appendix 8*. In summary, the pilot case study revealed four main characteristics that were of fundamental significance when selecting cases studies for the data collection phases of the thesis. The pilot case study results provided the basis for the selection critaria of the Mobile TV case study discussed in Chapter 5 of the thesis. The four characteristics that provided the guidelines for the selection of the Mobile TV case study are as follows:

- The presence of a mature content environment.
- The presence of a horizontal and abstract service layer – SOAs (Service Oriented Architectures) in the network operator's infrastructure architecture.

- The presence of the dynamics of both cooperation and competition among actors (coopetition).

- The propensity to create niches within the business ecosystem.

Other characteristics that were subsequently decided to be included as criteria for the selection of case studies for the data collection phases of the thesis are:

- A project that is based on the third generation of radio access technologies, commonly known as the 3G standard, regardless of the protocols they are based upon (i.e. namely the Universal Mobile Telephone System (UMTS), Code Division Multiple Access (CDMA), and (Wideband-CDMA).

- The project involves all other core members of the business ecosystem as indicated in Peppard and Rylander (2006). This includes the Network Operator, Content Providers, Content Aggregators, Operating System Providers, and Devices OEMs.

4.5. Data Collection - Implementing the Case Study Research

4.5.1. Unit of Analysis

In the context of this thesis, the unit of analysis is best defined as the ***rich media mobile services ecosystem***, as opposed to a company, project or a product for case study. The concept of a 'business ecosystem' as argued by authors such as Peppard and Rylander (2006) and Iansiti and Levien (2004) is founded on the argument that resource allocations through the notion of value creation transcend industry boundaries. It is suggested that firms that comprise the business ecosystem constantly *co-evolve*, working both in competition and in cooperation at the same time in their objective to generate new knowledge and continuous innovation. Thus, the case study that qualify as the unit of analysis for the proposed research is essentially the rich media mobile services ecosystem.

4.5.3. The Major Case Study Selection Process

Figure 4.2: Major Case Study Selection and Implementation Process

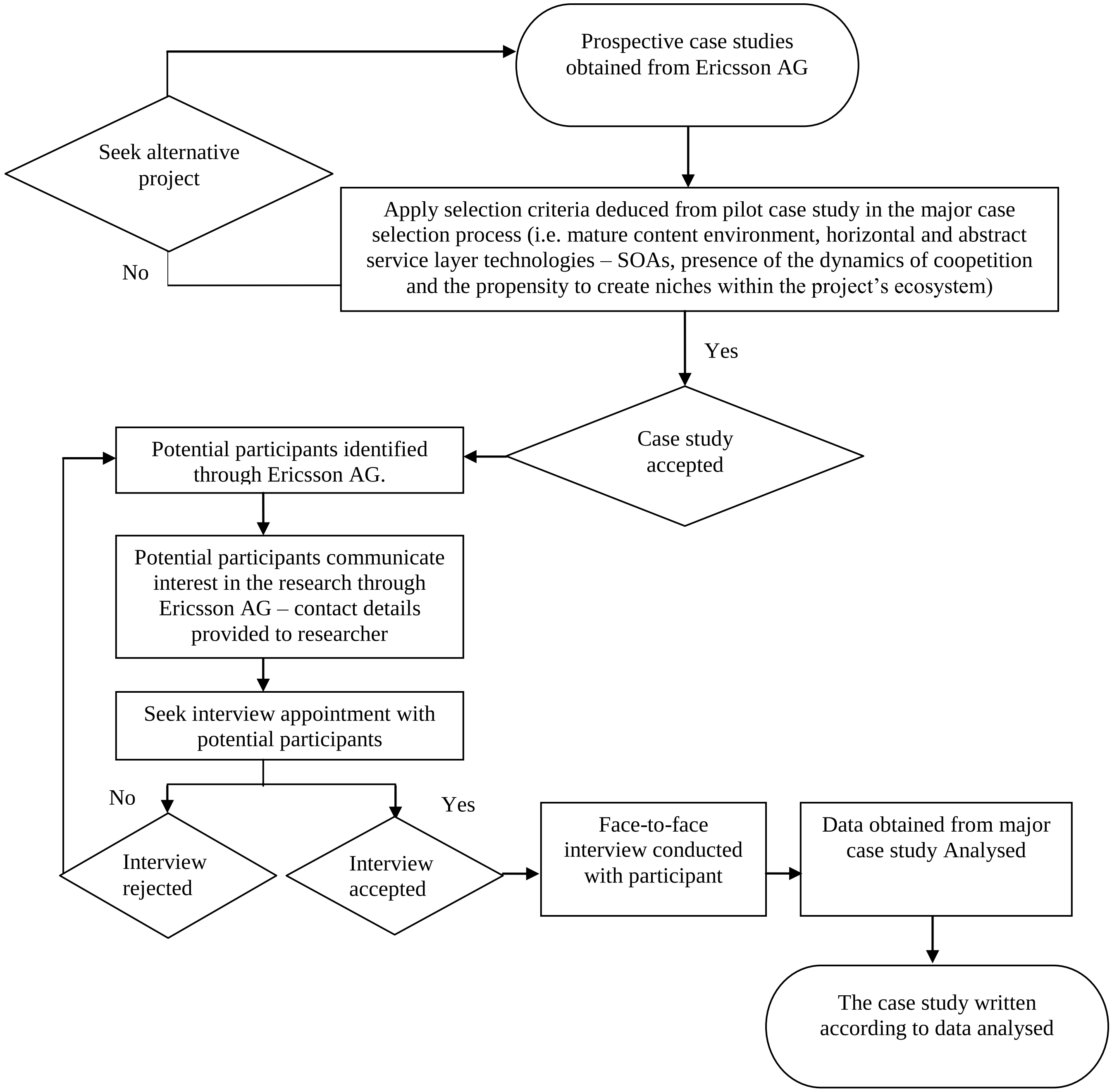


Figure 4.2 exhibits the major case study selection and implementation process used in this thesis. The process begins with Ericsson AG providing a list of prospective service providers and developers involved in the development services that would qualify as case studies that feature business ecosystem characteristics. After receiving the list of projects for potential cases studies, the researcher then engages in discussion with the Key Account Manager of these projects, applying the following selection criteria deduced from the pilot case study:

- Does the project operate in a mature content environment? (i.e. Does the project involve the development of rich media services?)
- Does the project exhibit horizontal and abstract layer technologies such as SOAs? (i.e. For example, does the project have a Service Delivery Platform or Service Delivery Framework?)
- Are there dynamics of competition and cooperation simultaneously present in relationships between actors? What are the examples that show the presence of such dynamics?
- Are niches created within the business ecosystem? Does the number of niches fluctuate with time as new niches emerge and older niches disappear?
- Is the project typically represented by actors such as network operators, network infrastructure providers, content providers, content aggregators, systems integrators and device manufacturers, among others?

If the initial information provided by the Key Account Manager of the project meets the criteria listed above, the project is then approved by the researcher as a potential case study. The potential participant representing the network operator in the case study is identified by the Key Account Manager of Ericsson (based on the participant selection criteria outlined in *Figure 4.3*, discussed later in this chapter). The Key Account Manager then initiates contact with the potential participant to confirm interest in the research. If the potential participant declines to participate, the process is repeated again until a saturation point is reached in addressing the theoretical concepts in this thesis. If the potential participants agree to participate, that verbal intent to participate is communicated to the researcher with the contact details of the participant by the Key Account Manager of the project at Ericsson. The potential participant will be informed by the Ericsson Key Account Manager of the researcher's intent to initiate contact. This is to ensure that all ethical guidelines as maintained by the research ethics requirements of the University are complied with at all times during the course of this research.

The researcher then initiates contact through email correspondence providing the potential participant with a letter outlining the research in detail. Also enclosed with the email is a copy of an informed consent form for which each participant acknowledges prior to the interview appointment that their consent to participate has been granted. This again is in compliance with the ethics requirements of the university. In situations where the potential respondent declines to participate in the research, other potential participants are then identified in collaboration with Ericsson AG, and the same process recurs until a total of 7 participants from the major actors within the business ecosystem are confirmed for each case study.

Finally, the researcher conducts face-to-face interviews with the participants in their office premises. The interview data is then transcribed using a qualitative research software package (Nvivo 8) and subsequently analyzed before the case study is written.

4.5.4. The Participants

The ‘key informant’ technique has been the method of choice in previous research work by authors such as Peppard and Rylander (2006) and Menor and Roth (2007) in similar research contexts. The key informant technique has also been particularly useful in research work concerning interorganisational settings (Gulati and Stych, 2004; Morris and Carter, 2005).

Prior research has found that senior level executives are well qualified as key informants to respond to questions about their organisations and interorganisational relationships affecting their organisations (Philips, 1981). In the context of this research, project managers or other relevant executives are also considered critical as their views are very much connected with the phenomena surrounding the case study under observation. These groups of respondents have been recognized as likely to provide reliable information on organisational dynamics and the phenomena surrounding the case study. Philips (1981) further argues that the key informant approach is particularly appropriate to validate research concepts. This is explained at a later stage of this chapter.

Based on the insights of researchers outlined above and taking into account the nature of this research, including costs and time issues affecting the proposed research, it was decided that the key informant technique is the approach best suited to this research. Key informants were selected on the basis of their knowledge of the research issues, the particular roles these respondents perform in their organisation and their willingness to participate in the proposed research. Based on the design of the proposed research, senior executives responsible for functions such as marketing, project management, information systems and strategy were ideally suited as informants for this research.

4.5.5. Interviews

Interviews were the primary data collection method used in this research. There were a total of 3 in-depth interviews conducted with general telecommunications industry practitioners to aid in the development of theoretical concepts during the literature review phase of this research; 3 in-depth interviews with participants of the pilot case study; and 7 in-depth interviews with participants of the Mobile TV case study. In addition to these interviews, a total of 8 interviews were conducted in relation to the Mobile Music case study which is not discussed in this thesis (details of participants in pilot and the Mobile TV case studies are furnished in *Appendix 5*).

The strength of using interviews as a research technique is that it enables in-depth study of the phenomena present in each case. The interviewing method is also associated with the advantage of the absence of the interviewer's direct participation in the phenomena, thus, leading to a greater degree of objectivity (Snow and Thomas

1994). Interviews are typically very targeted and focused on the study topic and, therefore, often provide more insight than might otherwise be expected (Yin 1998).

The interviews were semi-structured in nature (the research instrument – a semi-structured question is provided in *Appendix 17*). Semi-structured interviews provide the benefit of drawing from the most productive features of both structured and unstructured interviews (Yin 2003). The semi-structured interviews designed for this research have predefined overall themes, general discussion themes, targeted issues and specific questions, as well as a predetermined sequence for their occurrence. The interviewer is free to cover issues that arise in the interview and warrant further exploration (Mc Cracken, 1988). The fact that questions and answers are not standardized in semi-structured interviews minimizes the researcher's effect on the interview results (Mc Cracken, 1988).

A semi-structured questionnaire with interview themes was prepared prior to the interviews and used as a guide during the interview process. It consisted of thematic questions to be discussed with the participants. A test interview was performed with a Mobile TV industry expert in order to ensure that the language used was industry specific and comprehensible. Even though the semi-structured questionnaire existed as a guide for the interview, each interview followed its own form depending on the responses from the respondent and the interviewee's expertise, competence and views. Follow-up questions, probing questions, specifying questions and interpretive questions were also asked in appropriate circumstances to get a more in-depth understanding of the relevant issues as they emerged (Lee, 1999).

In the beginning, the interview was framed for the participant in the following way: the purpose of the interview was clarified, an overview of the interview structure was explained, the expected nature of responses was clarified, confidentiality was agreed and an agreement that the interviews could be recorded was reached, all of which are steps suggested by Lee (1999). Once these initial procedures were completed, the interview began. The interview consisted of factual as well as interpretive questions, as suggested by Lee (1999). Biographical and general industry questions were used in the beginning as a warm-up discussion and to create a pleasant discussion platform, as well as to ensure a sufficient background understanding for the interviewer (Mc Cracken 1988). Perry (1998) has observed that the first question after the preliminaries should invite the participants to tell the story of their experience of the project being researched. The initial questions should be structured to capture the interviewee's and not the researcher's perception. As Dick (1990) explains, "the starting point is a question that is almost content-free. This is your warranty that the answers came from the respondent and did not arise simply because your questions created a self-fulfilling prophecy" (p. 9).

In order to obtain a better insight of the phenomena in question, some probe questions about the research themes were prepared. These probe questions were particularly effective in circumstances where the participants did not raise certain issues or key factors for consideration in the first instance, particularly in the more unstructured part of the interview. However, there were many instances where the answers provided in the interview did not require further elucidation through probe questions. As probe questions deal with the need to find insights to a particular issue, they almost always begin with ‘How…?’. These questions in most situations required a more elaborate answer and could not be answered with a ‘yes’ or a ‘no’. The probe questions formed a major part of the prepared interview protocol (Yin, 1994). These questions were used to provide a reliable framework for cross analysis of data.

The number of interviews conducted was based on the concept of *theoretical saturation*. Eisenhardt (1989) argues that the limit to additional data is reached when the incremental contribution to theory development of any additional data derived from additional interviews reaches saturation. *Appendix 5* describes the interview participant.

The interviews were conducted with people from different companies that were represented in the ecosystem of the Mobile Tv case study. The respondents varied in their competencies, skill sets and the particular perspectives they had of the ecosystem (depending on the organisation they represented in the ecosystem). This enabled the researcher to gain a broad overview of the phenomenon. In addition, holding the interviews shortly after the ecosystems (in all case studies) had launched their services, enabled the researcher to get access to current information and challenges that were not necessarily based on the memory of the participants. As the study was independent of any commercial interest, the respondents were willing to discuss issues openly. However, their ability to share information, particulary in terms of providing documents was limited by their company policies. The interview discussions were directed to the participants’ areas of expertise. Mc Cracken (1988) argues that semi-structured interviews require strong interviewing skills. With 12 years professional experience in the industry and having completed similar research initiatives, the researcher was fairly comfortable, confident and mature in conducting the interviews to professional standards. He has a good interviewing technique and is skilled in comfortable situation-building, question-asking, conversation-directing, listening, and interview-flexibility (Yin 1998). The interviewer took the necessary steps to be as objective as possible in each interview situation and again during data analysis, even though Mc Cracken (1988) argues that a qualitative researcher can never be fully objective.

The participants selected for this research were from different parts of the ecosystem, representing the various actors and particularly the critical actors in the ecosystem. Due to the time and resource constraints as well as the degree of complexity characterizing each of the ecosystems in each of the cases researched, it was not possible for the researcher to solicit participants and conduct interviews in such a way as to ensure that each actor in the ecosystem, regardless of their importance, was represented in the interviews. This was further complicated by the fact that each project or case study was represented by actors that were significantly dispersed geographically. In a single case study, one would encounter situations where actors could be located in North America, Europe, Asia and Australia. This rendered impossible any propsect of interviewing representatives from every actor organisation in the ecosystem observed in the case study selected. The list of participants is provided in *Appendix 5* of this thesis. The respondent code, company code, type of company, designation in the organisation and the interview duration are some of the details recorded in *Appendix 5*.

All interviews were conducted on a one-to-one basis by the same researcher. A total of 5 follow-up interviews were conducted via the telephone. All face-to-face interviews were undertaken at the participants’ offices. The follow-up telephone interviews were conducted with the researcher based in Melbourne and the respondents based in their respective offices. Skype IP (Internet Protocol) telephone was employed only in the follow-up telephone interviews so that the telephone interviews could be digitally recorded for transcript development purposes. On average, the face-to-face interviews lasted an average of 1 hour 45 minutes, with the shortest interview taking 60 minutes and the longest taking 2 hours 30 minutes. A typical interview lasted slightly more than an hour and a half. Only one interview lasted less than an hour and six interviews took more than an hour and a half.

Yin (1994) mentions that access to the target participants and the information they hold is an important factor in a study's success. As described in greater detail later in this chapter, the researcher corresponded via electronic mail with each potential participant to request an interview and interviews were agreed to without any need for an intermediary. In each correspondence, the general objective of the study was presented. Copies of an explanatory letter and a letter of informed consent were attached for reference. The fact that the topic was current, and that the research data collection and analysis process was independent of industry involvement, ensured that individual interview results remained confidential at all times. Ericsson AG's involvement in the research remained confined to assisting the researcher to gain access to otherwise globally distributed projects, as explained in subsequent sections of this chapter. The researcher was flexible with interview scheduling times and this enabled easier access to the appropriate participants. Only one interviewee on the potential participant list could not be reached by the researcher.

All interviews were digitally recorded on MP3 recorders upon obtaining the consent of the participants. Prior to the interview each participant was asked to acknowledge an informed consent form indicating an agreement on the part of the participants for the interview to be conducted and recorded. It was critical for the interview to be recorded digitally for these interviews were to be later transcribed so as to ensure that the researcher could capture all insights and details of the phenomena characterizing the case study. Transcription was performed for each interview. The interviews were transcribed within a few days of completion of each interview by the researcher himself so as to ensure that any field notes, documents and other insights gained by the researcher at the time of the interviews were incorporated into the contextual framework of the interview.

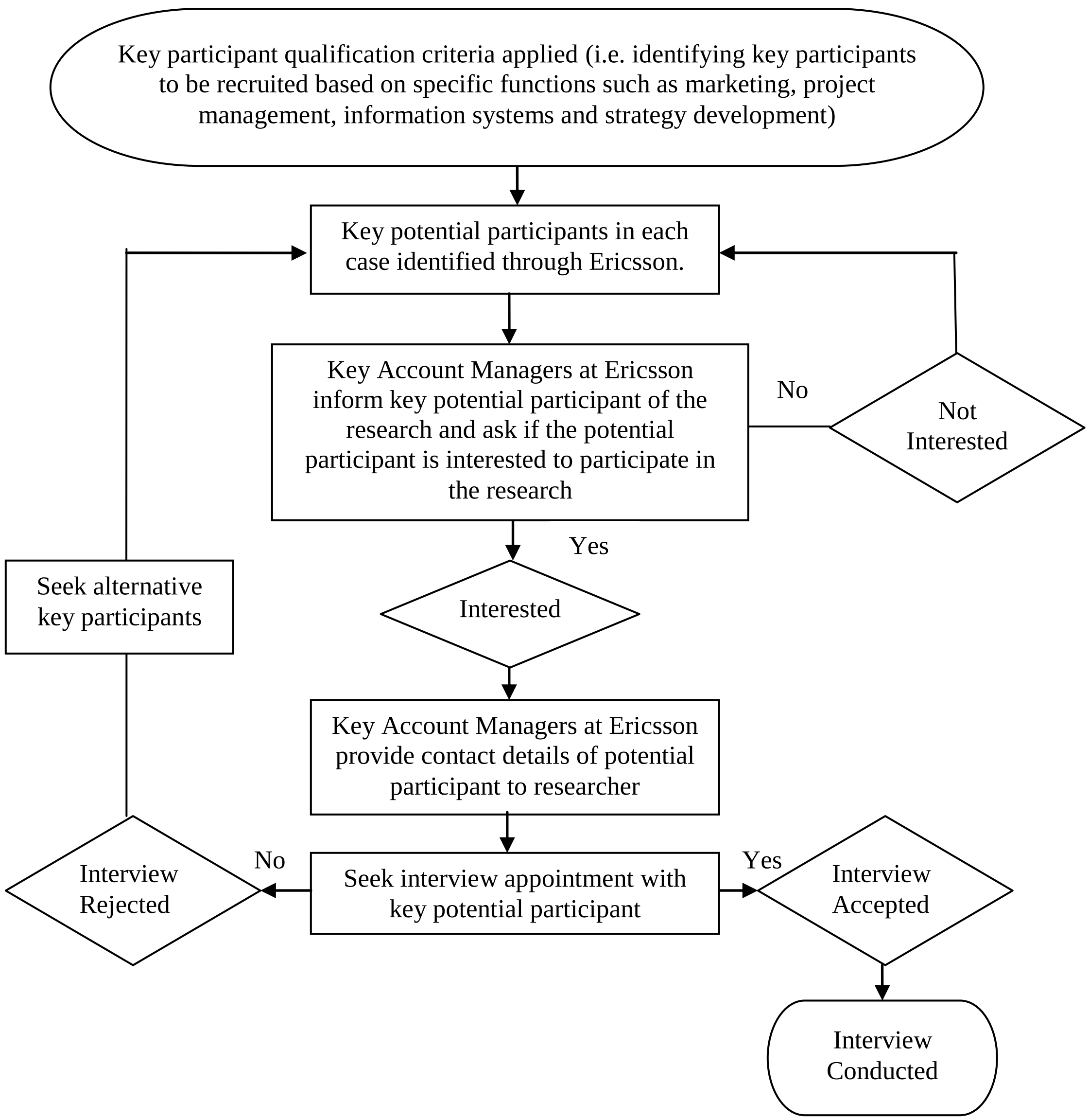
Having argued the importance of the interview method as a primary means of data collection, interviews nevertheless have some inherent shotcomings. For example, interviews rely on the opinions, perspectives and memories of respondents at the time of the interview taking place (Snow and Thomas 1994). Interviews are also often associated with bias due to poorly constructed research instruments (Yin 1998). In some instances responses obtained from the interviews could introduce bias if respondents do not provide accurate information because they do not have the ability or they are unwilling to provide certain information. It has also been argued that, based on the concept of reflexivity, the interviewer only gets answers to the specific questions asked (Yin 1998). In addition, errors may relate to the researcher's comprehension skills, sample (e.g. potential participants, the recruitment process of participants), interviewer-introduced weaknesses (carelessness, bias, interpretation), or to the character of the research instrument or participant (inconsistency, lack of commitment, fatigue) (Smith and Albaum 2005). Due to the shortcomings in the interview method, there was an apparent need for the use of multiple data sources in the process of empirical evidence formation. This is discussed in greater detail at a later stage in this chapter.

4.5.6. The Key Participants Recruitment Process

Based on initial industry reports and conversations with industry executives, it was evident that the best way to first identify business ecosystems that were in the process of introducing rich media mobile services was through network infrastructure providers such as Ericsson, Alcatel-Lucent, Nortel Network, Nokia, etc. A primary indicator of network operators making the transition toward the provision of rich media services is a substantial rise in their investment commitments in next generation infrastructures, particularly in service oriented architectures. The network infrastructure providers were best positioned to indicate the network operators that were in the process of making (if not already engaged in) substantial infrastructure investments for the provision of rich media services. These were essentially the type of network operators that were best positioned to participate in this research. Network operators are seen as the organisations that are the most strategically located within the business ecosystems. Industry reports, online panel discussions from the internet, and conversations with industry executives all indicated that network operators are the organisations best positioned to approach for access to the rest of the actors in the business ecosystem.

The recruitment process framework was designed in strict compliance with the guidelines of the Standing Committee on Ethics in Research involving Humans (SCERH) provided by Monash University. The final key participant recruitment framework as presented in *Figure 4.3* is a result of multiple iterative meetings with the Human Research Ethics office at Monash University.

Figure 4.3: The Key Participant Recruitment Process



As discussed earlier, the initial formal contact with representatives of these various network infrastructure providers resulted in Ericsson AG lending their support to this research. Ericsson agreed to assist in identifying network operators that were best placed to be approached for participation in this research. Upon identifying the various projects that qualify for this research based on the criteria provided by the researcher (as indicated in *Figure 5.3*), Ericsson then proceeded to engage the respective Key Account Managers within its organisation who provide services to the network operators who met the research criteria.

The Key Account Managers would then initiate contact with key potential participants based on the criteria provided by the researcher; namely, a senior management member of the network operator to be recruited to represent specific functions such as marketing, project management, information systems and strategy development). If a potential participant declines to participate in the research, an alternative individual is then identified and approached by Ericsson, following the same process outline dearlier. On the other hand, if a key potential participant responds positively to participating in the research, the contact details of the representative of the network operator are, with the prior consent of the key potential participant, then passed on to the researcher through a Key Account Manager from Ericsson. From this point onward, the researcher engages directly with the key potential participant from the network operator. Formal correspondence via email is initiated. An introductory email with attachments including an explanatory letter (*Appendix 9*) and an informed consent form (*Appendix 10*) pertaining to the compliance requirements of the Standing Committee on Ethics in Research involving Humans (SCERH) is sent to the representative for reference prior to a formal response from the individual. At this juncture of the recruitment process, the key potential participant is still given the option to either accept or decline participation. If the key potential participant declines participation, the process of seeking an alternative participant resumes (as illustrated in *Figure 5.4*) and the recruitment process is repeated again. Alternatively, if the potential participant confirms their willing participation, details of a date, time and venue are finalized for an interview appointment. Prior to the interview, individual participants are required to acknowledge and return a copy of the informed consent form, indicating that they have agreed to terms and conditions of the interview. A copy of the informed consent form is attached in *Appendix 10*.

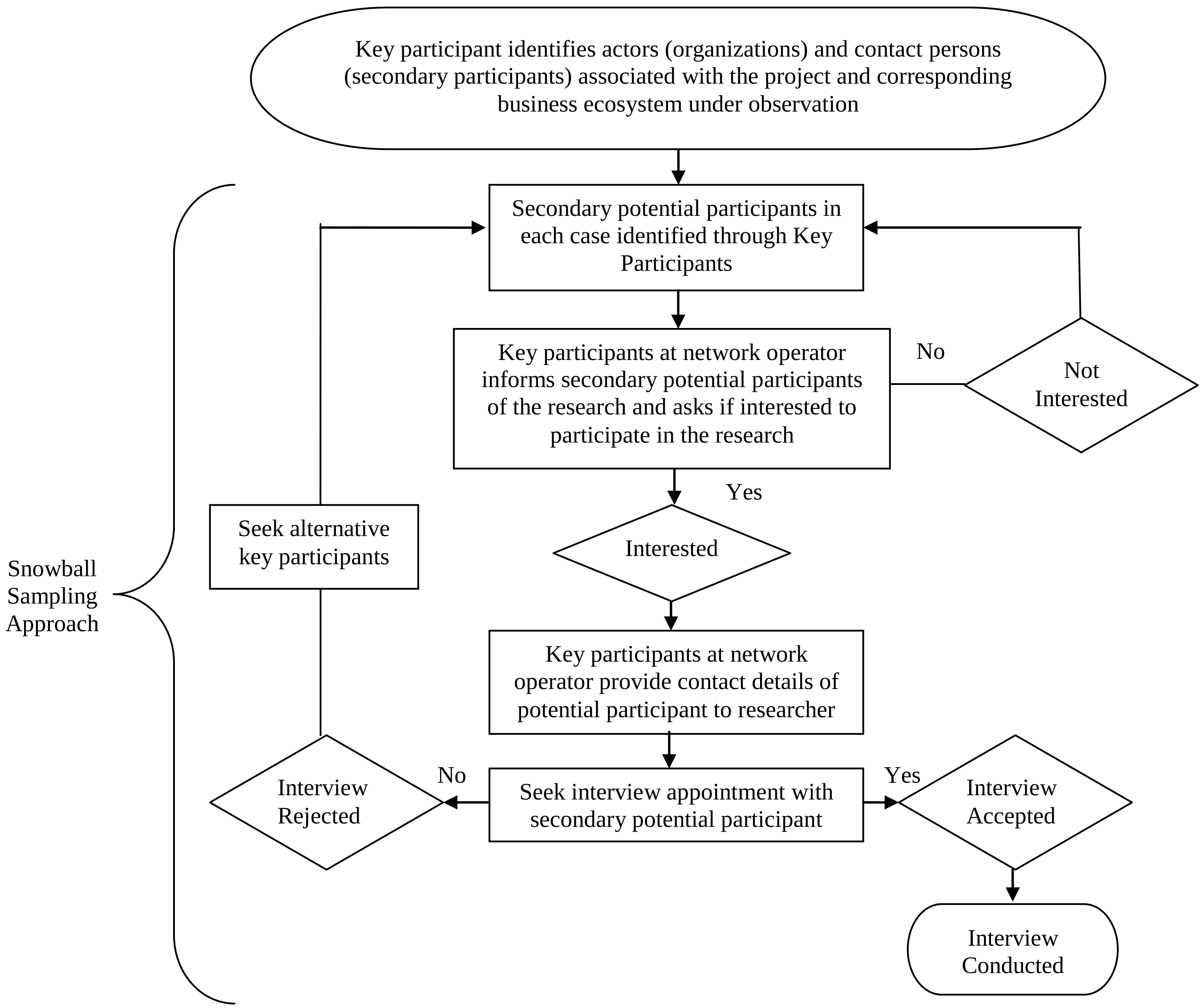
4.5.7. The Secondary Participants Recruitment Process

In this thesis, secondary participants are those who are identified by the key participant as important participants who could be included in the study, mainly because of their unique roles in the project selected for case study or in the business ecosystem with which the project is associated. In the initial stages of the participant process, neither Ericsson nor the researcher has a 'birds eye view' of the project and the business ecosystem associated with each project. The network operator, on the other hand, is a central actor within the ecosystem and therefore best placed to advise the researcher of the key actors involved in the project.

Given these circumstances, the 'snowball' sampling approach was chosen in which the key participants in the initial core interviewee group were asked to recommend any additional participants from other parts of the business ecosystem

(Salganik, and Heckathorn 2004). As a result the key actors within the projects were identified. Individuals associated with each organisation involved in the project were identified.

Figure 4.4: The Secondary Participant Recruitment Process



As illustrated in *Figure 4.4,* the snowball approach was effective in identifying potential participants who were particularly well-informed regarding the case under observation. The snowball approach was particularly useful in identifying potential participants from other actor organisations (excluding the network operator) within the business ecosystem in the observed project.

During the interview with key participants from the network operator organisation, a graphical representation of the business ecosystem related to the project under observation is developed and a clear picture of the other actors within the business ecosystem emerges. It is at this juncture that the snowball sampling approach becomes critical for the inclusion of participants from other significant organisations such as content providers, content aggregators, network infrastructure providers and systems integrators. The key participants representing the network operator are asked to propose potential participants within these organisations. With prior consent obtained from these individuals, contact details are provided to the researcher. The research then attempts to initiate contact with these secondary participants with the view of soliciting participation.

Formal correspondence via email is initiated. An introductory email with attachments including an explanatory letter (*Appendix 9*) and an informed consent form (*Appendix 10*) pertaining to compliance of the research with the requirements of the Standing Committee on Ethics in Research involving Humans (SCERH) is sent to the potential participant for reference prior to a formal response from the potential participants.

Consistent with the earlier stages of the recruitment process, secondary participants at this phase of the recruitment process are at liberty to either accept or decline participation in the research. For those who have confirmed participation, interview schedules are agreed upon and finalized via correspondence. Prior to the interview, individual participants are required to acknowledge and return a copy of the informed consent form, indicating that they have agreed to terms and conditions of the interview. The interview then proceeds as scheduled.

4.5.8. Sampling Procedures

The 'snowball' sampling approach, as indicated in the outline of the secondary participants selection process above, was adopted in that the participants in the initial core interviewee group were asked to recommend additional participants to include other participants of the business ecosystem (Salganik, and Heckathorn 2004). The snowball approach was effective in identifying potential secondary participants who were particularly well-informed of the case under observation, both within and external to the network operator's organisation. The snowball approach was particularly useful in identifying potential participants from other actor organisations within the business ecosystem. Selection of participants was based on (1) their experience, particularly their specialist (e.g. technology specialist, product specialist) and generalist (e.g. project manager, product portfolio manager) roles in association with the project under observation; and (2) their knowledge of customer involvement in the project, as well as involvement in the service innovation process. The inclusion of people from different parts of the business ecosystems, from different companies, and from different levels and positions in these companies was important for the representativeness of the sample.

Patton (1990) lists 15 strategies of 'purposeful sampling' (in contrast to 'random sampling') that can be used to select cases. The selection of the case study for observation in this research depended on two fundamental issues. The first issue concerned the availability and access to specific individuals in the respective projects. The second issue concerned the availability of resources to allow for travel, accommodation and other related expenses for the successful completion of the research given the geographically dispersed locations of the available projects (in Europe and Australia). Both issues had a significant bearing on the selection of the cases in the context of the proposed research.

4.5.9. Documents

Yin (2003) and Eisenhardt (1989) argue that multiple data sources are necessary in case studies before data can be classified as a fact. Both researchers have proposed that data triangulation is performed using multiple data sources. Yin (1998) argues that a robust fact can be discerned when evidence from three or more different sources coincides. Therefore, in addition to the interviews used in this research, documents, internet resources and other industry materials were used as data sources. Documents used in this research included publicly available presentations and interviews with leading industry experts acquired from the internet, panel discussions with leading experts and captains of industry acquired from the internet, newspaper and magazine articles about industry related topics, internet sites and market research studies about rich media mobile services. The documents used in the case studies are specified in *Appendix 6*. Field notes developed for the case study during the data collection phase of this thesis also form part of the collection of documents used for triangulating data to develop empirical evidence.

The advantage of using documents is that they can be reviewed numerous times. Documents are considered secondary data in that they are not created for the case study, and therefore typically have a broad coverage. The potential problems in using documents are that they can be biased in representing the opinion of the author, they may be difficult to access, and the biased selectivity of the data in these documents may occur without the knowledge of the reader. Therefore, documents were only used as supporting data in this research. They served the purpose of data triangulation with data already obtained from the interviews (Yin 2003).

4.5.10. Data Analysis – Computer Aided Analysis

Yin (2003) suggests that data analysis includes examining, categorizing, tabulating, testing or otherwise recombining evidence. Miles and Huberman (1994) define the data analysis steps as: data reduction, data display and conclusion drawing or verification. Data reduction includes selecting, focusing, simplifying, abstracting, and transforming the data into transcripts. Data reduction occurred continuously from the initial phases through to the final phases of the research. Even in the data collection phase, anticipatory data reduction was applied by the researcher (Miles and Huberman 1994). In the data display phase, data was organized and compressed to allow conclusions to be drawn and to facilitate conclusion drawing. Drawing conclusions and verification is a continuous process in qualitative analysis (Miles and Huberman 1994). From the early stage of the study, the researcher begins searching for regularities, patterns, explanations, possible configurations, causal flaws and propositions. Conclusions are verified as the analysis progresses (Miles and Huberman 1994).

The literature review indicates a significant lack of informed literature regarding data analysis strategies and techniques in qualitative case study research strategies (Yin 1998, Yin 2003). The data analysis process of this study follows the principles of 'template analysis'[23] (King 1998). According to King (1998), template analysis is a particular way of thematically analyzing qualitative data. The data usually consists of interview transcripts, but may include any kind of textual data (Teal 2005). King (1998) describes template analysis as an approach where the researcher creates a list of *codes* that represent *themes* in textual data: "Put simply, a code is a label attached to a section of text to index it as relating to a theme or issue which the researcher has identified as important to his or her interpretation" (King 1998, p. 119). A code is an identifier that is attached to a section of a text that categorizes specific parts of that section. Codes represent themes or issues that the researcher has identified as important to his or her interpretation. Codes can be defined before, modified during, deleted if not needed, or added during the texts analysis. This differs from both grounded theory, in that some codes exist before the analysis phase, and from statistical analysis, in that not all codes are predetermined. King (1998) argues "it is crucial to recognize that the development of the template is not a separate stage from its usage in analysis of texts" and that "in qualitative template analysis, the initial template is applied to analyze the text through the process of coding, but it is itself revised in the light of ongoing analysis" (1998, pp. 121-122). This implies that the predetermined set of codes developed for case study research can be (and is usually) revised during the analysis process.

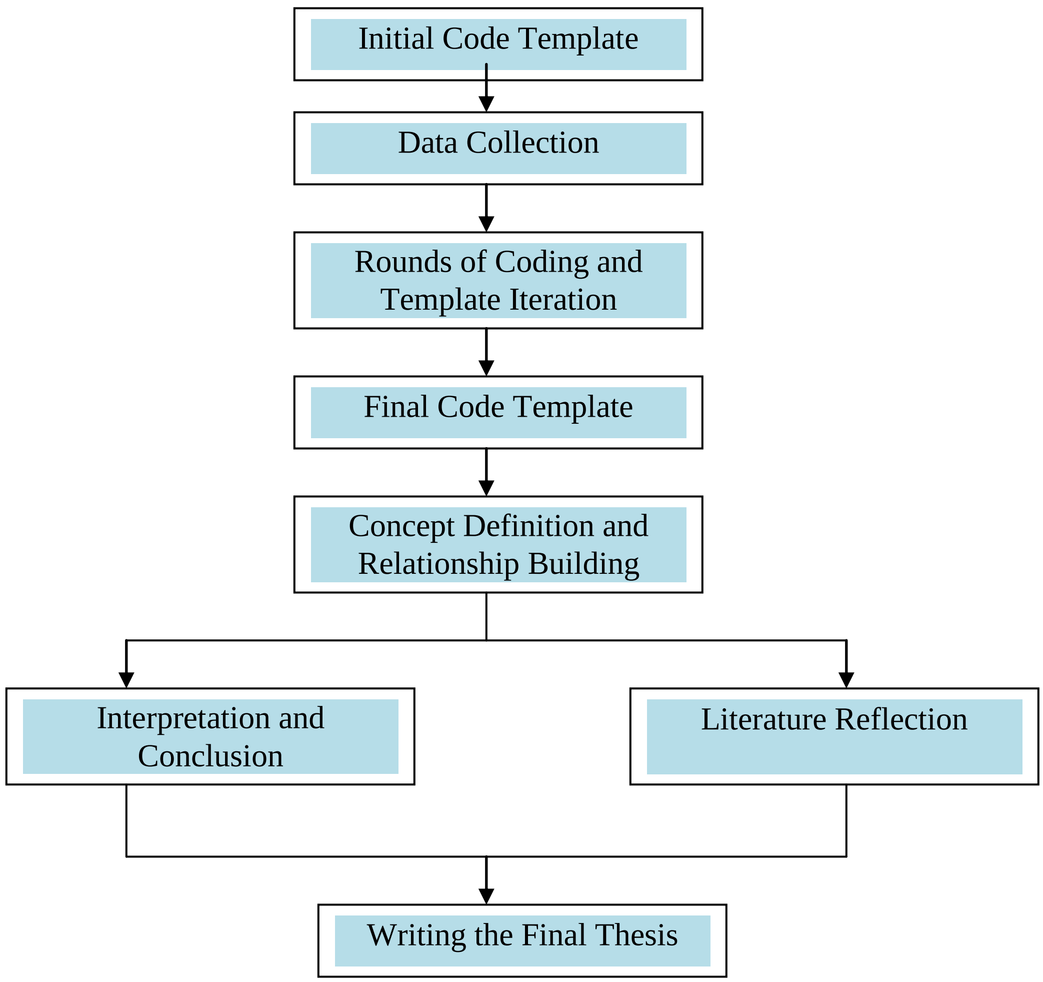
[23] Template analysis is referred to in literature as codebook analysis or thematic coding (King 1998).

In template analysis, a coding template is developed which summarizes themes identified by the researcher as important in a data set and organizes them in a meaningful and useful manner (Teal 2005). Codes are often organized hierarchically in that they are clustered to produce more general and higher-order codes. This enables the analysis of text at different levels of a hierarchy. Parallel coding is also possible, which means that the same part of the text can be coded with various codes. Teal (2005) explains that the template analysis process follows five steps. The first step involves the transformation of data into written text. The second step defines the initial code template. The third step involves coding of the data and modifying the code template simultaneously as the coding progresses. The fourth step involves finalizing the template and arranging the data according to the finalized coding structure. The final step involves the interpretation of the data from the finalized coding structure (King 1998). Once a final template is created and all transcripts have been coded to it, the template serves as the basis for the development of interpretation and conclusions. *Appendix 18* provides more details of the coding process adopted in this research.

The advantage of template analysis is that it is very flexible and easy to learn. It also forces the researcher to analyze data in a structured way. The disadvantage is the lack of substantial literature on this method, which may result in either simplistic or overly complex templates. The possibility of losing individual voices in the process of aggregating themes also exists (King 1998). In addition, the description of the fifth step, interpreting and organizing data, is very vague. In this research, that step was performed according to the recommendations of various qualitative research practices.

Figure 4.5 presents the data analytical process that was used for this research in all four case studies.

Figure 4.5: The Data Analysis Approach of the Thesis



The first step in the analysis process involved the definition of an initial code template, the creation of which was based on the theoretical triangulation advocated in the iterature review, previous mobile industry studies and the pilot case study (the IMS based IP Centrex case study). The initial code list enabled the process of data reduction and display. Miles and Huberman (1994) suggest that it is particularly useful to create an initial, provisional list of codes from the conceptual framework prior to the fieldwork. The code categories developed for this research were not mutually exclusive (Smith and Albaum 2005); therefore, one text extract could be placed in various categories.

In the second stage, data collection was performed. This part of the data analysis process has been described at length in the previous section. Several rounds of coding and template iteration took place as new interviews were performed, transcribed and analyzed. As new themes emerged, new codes were added to the template and, towards the end when evidence for a specific theme had not emerged, a few codes were deleted. During the coding process, new findings were then linked back to the literature iteratively. Interviews and literature research formed an iterative process. Miles and Huberman (1994) advise that coding should be started as soon as the data emerges so as to ensure a continuous process of analysis. Based on this suggestion, the data obtained from interviews were coded before going back to the field for further data collection (Miles and Huberman 1994). This enabled the researcher to start looking for underlying patterns very early in the data collection process (i.e. during the initial interviews, especially in regard to the interviews with key participants representing the network operator), to define areas that needed further understanding and data collection, to refine the code list during analysis, and to perform the early steps of theory building.

The final code template (see *Appendix 11*) was then eventually formed. The code template had been iterated and refined during the analysis process and therefore, upon completion of the final interview, there were minimal changes made to the final template before it was completed. The next step involved the arrangement of data according to the final code template. Even though the data analysis occurred during the data collection phase, the major part of the data analysis work was done upon completion of the data collection phase (Yin 1998).

A computer software program, NVivo 8 from QSR International, was used for coding interview transcripts and documents. NVivo is grounded theory-based software. The main advantage of computer software in such qualitative research is the cut and paste or the drag and drop techniques with large amounts of data (Miles and Huberman 1994, Kelle 1995, Yin 2003). NVivo was used for the following purposes: initial coding of the interviews, rounds of coding, final re-coding of the defined data, and networking or linking the theoretical constructs with the codes. NVivo enabled the researcher to maintain the chain of evidence. According to Kelle (1995), computer programs increase the validity of research findings by assisting in the management of a large quantity of data and facilitating the retrieval of all relevant data in the coding phase. Even though the software was helpful in organizing the data, the actual critical thinking, research logic and drawing of conclusions was largely dependent on the researcher's competencies.

After the data was organized into the desired categories of codes, data interpretation could then be performed. The codes in the final template were given final names and some codes that were lacking clear definitions in the existing literature were refined and given a solid definition. In addition to this, relationship-building between different concepts (i.e. codes) took effect. Relationship-building was performed according to the research concept present in the proposed research model (as represented in *Figure 3.3*).

The interpretation of findings and drawing of conclusions based on the template were then developed. Concept definition clarity and relationships between the various concepts in the research model were then clearly established. Yin (1998) argues that a robust fact can be argued to be defined when evidence from three or more different sources coincides (i.e. data triangulation). This approach was adopted in the research conclusion-building process. The findings were then tested in a couple of interviews and compared with the research literature. Yin (2003) suggests that the researcher should communicate his or her research findings with participants of the research in order to increase the research validity. The critical analysis of literature that supports and contradicts the case study conclusion is yet another way suggested by Eisenhardt (1989) to increase the research validity. This procedure enhances the internal validity, generalizability and the theoretical level of theory-building in case study research (Eisenhardt 1989).

After receiving feedback from research participants and reflecting on the research framework and concepts in relation to previous literature review initiatives, some minor modifications were performed. The Mobile TV case study was then ready to be written. The final step was writing the case study literature and finalizing the case study. The case study is written in a theory-building format (Yin 2003), which best illustrates the findings of the research. Yin (1998) mentions that a case study report should make sufficient references to the case study database, (i.e. to interviews and documents related to the case study) in order to show a chain of evidence. Yin (1998) also suggests that direct quotes should be used when they help the reader to understand how conclusions are drawn. Therefore, relevant interview quotes were presented in the case study report, particularly where necessary to support the development of theory and to formulate conclusions.

4.5.11. Validity and Reliability

This section discusses both the *validity* and *reliability* of the case study selected. A research design should aim at maximizing conditions related to design quality: construct validity, internal validity, external validity and reliability (Yin 2003). 'Validity' refers to the shared true variance between the phenomenon and it's scored measurement; i.e. the results or the conclusion of the study (Lee 1999). Richards (1993) argues that the measurement of validity in a research applies to arguments or conclusions developed for that research. Validity does not apply to the research design and the data analysis processes. In good qualitative research, and even more so in scientific research, valid conclusions or arguments are made convincingly based on: (1) what was studied and how it was studied; (2) how the research was questioned before arriving at conclusions and arguments; and (3) the reason why the researcher is confident that the conclusion and arguments formed are well founded and applicable, sound and to the point, against which no objection can fairly be brought forward (Richards 1993).

Construct validity (or as it is refered to in this thesis, concept validity) means that the variables linked to these research concepts actually explain the research concept (i.e. what the research is intending to explain) (Yin 1994). Although there is no quantitative measurement involved in this thesis, there are nevertheless two steps that a researcher can take to ensure the validity of the concepts being examined in qualitative research. Firstly, specific types of changes, (for example, the addition or deletion of research concepts and the respective variables supporting each concept) are to be selected and related to the original research objectives. Secondly, it needs to be demonstrated that selected research concepts do actually reflect the specific types of phenomena that are under observation (Yin 2003). The timing of the case studies is seen to have a crucial influence on the case study results. All cases selected for this study were of projects merely 1 or 2 years into their life cycle from their initial point of commercialization. The case study data collection process was performed between September 2007 and July 2008. This ensured that research concepts developed through the theory-building process across multiple cases were valid at the point in time during which this research was conducted.

Researchers have pointed out that some tactics can be used to increase validity of research concepts. These include using multiple sources of evidence (Yin 2003, Yin 1998) or triangulation. Triangulation in a case study can be performed at four levels: data sources triangulation, theory triangulation, methodology triangulation and researcher triangulation (Tellis 1997b). In this study, theoretical triangulation was performed (see *Appendix 3*). Data source triangulation was performed using interviews and documents as data sources. A pilot case study was also performed, along with theory triangulation using an iterative process between theory and the pilot case study. Therefore, it is argued that the research framework adopted in this thesis is representative of the phenomena observed in the real world. Secondly, a chain of evidence can be established to increase construct validity. This was also performed in this study and enabled the researcher to go back and perform checks of the interview transcripts and documents. Finally, the research concept validity can be increased by having key informants review the case study draft (Yin 1998, 2003). After the interpretations and conclusions of all four case studies were summarized, a couple of interviews were performed in which the framework and conclusions were tested with additional industry experts. Therefore, it is argued that the case study arguments and conclusions fulfill the concept validity expectations.

Internal validity refers to the absence of alternative explanations for a researcher's claim of causation (Yin 1994). In this thesis, internal validity was seen as irrelevant. Internal validity is only relevant in studies that try to establish a causal relationship. This thesis was not designed to test for causalities. External validity means that a study's results can be generalized to a larger population or to another population (Lee 1999). External validity can be tested by replicating the study in another situation (Yin 1994). External validity can be increased by using theories in single case studies and using replication logic in multiple case studies (Yin 1998, 2003).

The findings of this research were supported with theory, previous mobile industry studies and a pilot case study, and the Mobile TV case study that formed the unit of analysis. The findings of this thesis can only be generalized to larger populations in a selective manner. There are two perspectives that need to be carefully considered when analyzing the external validity of these case studies: generalizability to other mobile service innovations and generalizability of the results to other geographic markets. The theoretical framework was developed in an iterative process between the literature, previous mobile industry studies and the Mobile TV case study. Therefore, it is argued that the framework and concept definitions can be generalized to other emerging rich media mobile service innovations. However, how these concepts appear in other rich media mobile services contexts depends on a number of factors and thus, cannot be generalized directly. These factors are: (1) the rich media mobile service in question; (2) the underlying technologies that define the infrastructure for the development and the delivery of these services; (3) the ecosystem that generates such services; and (4) the business models adopted. Furthermore, the study findings might not be directly applicable to other markets across diverse geographical locations in the world and thus, further testing of the research framework should be conducted. Nevertheless, the research framework still gives a good overview of the factors affecting mobile service innovation market emergence in other geographic regions.

'Reliability' measures the *consistency* and *stability* of (data) scores. The data in the context of this research, which is qualitative in nature, are the results or findings of a study. Consistency refers to study *repeatability* (Lee 1999, Yin 2003). Another researcher must be able to replicate the results using the same theoretical model under similar conditions (Smith and Albaum 2005). Stability refers to the ability to obtain the same results over time (Lee 1999). With detailed data logging of the study process and findings, research can be replicated if needed (Yin 1994). In this research, the researcher recorded the interviews, transcribed each interview and created a database so that it is possible to repeat the study. Yin (1998) also recommends creating a database. The Mobile TV case study selected as case studies for this research pose certain challenges with regard to the issue of stability. This is simply because of the ever-evolving underlying technologies that constitute the infrastructure and business models for the development and delivery of new rich media mobile services. The standards relating to technological infrastructures and business models in the rich media services arena are in an embryonic stage and yet to reach the degree of stability that would allow for industry standards to emerge. Due to the high degree of turbulence affecting the telecommunications industry in particular and the infocoms sector in general, repeating the case study all over again at any other time would probably not yield the same results or findings because such future research may not necessarily analyze the same phenomenon, given the time context this research has currently adopted (via investigation of rich media mobile services that are one or two years into their life cycle). In order to research the same phenomenon, the study should be repeated under a similar research context.

4.6. Conclusion

This project is essentially a qualitative research investigation. In large part, the decision to go down a qualitative route was primarily influenced by the fact that rich media mobile services constitute a new business area and, more importantly, an area that was grossly under researched. The underlying objective of the research was to understand the phenomena characterizing The Mobile TV case study in greater depth. Hence, a qualitative approach was seen as fundamentally necessary. Secondly, the underlying theory and research propositions developed through the initial stages of literature review seem to indicate incomprehensiveness in the initial theoretical framework.

As a qualitative research, this thesis was designed to exhibit both exploratory and descriptive characteristics. The exploratory nature of the research assisted in the identification of the problems and the precise formulation of the research questions. It is particularly significant in leading to a better understanding of an otherwise relatively under-researched business area (Snow and Thomas 1994). The objective of this research was to understand the concepts affecting interorganisational new service development capability in the provision of rich media mobile services. The exploratory nature of the research provided the platform to achieve this end.

The descriptive nature of the study assisted in defining the various actors, their roles and characteristics for the development and delivery of rich media mobile services, and the interorganisational interdynamics or phenomena that already exist within the business ecosystem. The case study method was employed in this qualitative research, a method that is consistent with the aim of the research in that it contributed to theory-building. The case selected and studied facilitated an in-depth understanding of the phenomena characterizing the research context (Yin 1994).

This study is based on a critical realist paradigm that employs systematic combining, a research approach grounded on ‘abductive’ logic first introduced by Dubois and Gadde (2002). The objective of this research was to modify and extend theory (i.e. theory development via the systematic combining approach) in contrast to testing theory. Systematic combining of both deductive and inductive approaches to theory building in this research acknowledges that fact and theory (induction and deduction) are essentially complementary for the other to be of value (Emory and Cooper, 1991). Therefore**,** existing theory is to have a role in this research. Existing theory was identified in the literature review and further revised in the light of data obtained from the pilot case study and convergent interviews. This formed the first step in the theory-building process of this research, consistent with the objective of analytically generalizing against the emerging theory of the research.

In the data collection phases, the business ecosystems represented by each case study emerged as the unit of analysis. The Mobile TV case study was employed based on the purposeful sampling method (Patton, 1990). Semi-structured interviews were employed as the means to obtain primary data (Yin 2003). The key informant technique was the technique of choice in this piece of research and participants represented functional areas as diverse as marketing, project management, information systems and strategy development from more than one single actor organisation within the business ecosystem observed. The number of interviews conducted was based on the concept of theoretical saturation.

Documents were used to substantiate the correspondence of facts with the data obtained from the interviews through triangulation processes. Documents included in this research were publicly available presentations and interviews with leading industry experts acquired from the internet, panel discussions with industry experts and captains of industry sourced from the internet, newspaper and magazine articles about industry related topics, internet sites and market research studies into rich media mobile services.

The data analysis phase of the research involved data reduction, data display and conclusion drawing or verification. The data reduction process of this study adopts the template analysis[24] approach (King 1998). The grounded theory-based computer software Nvivo was applied to the coding of interview transcripts and documents.

Various data sources were triangulated to establish construct validity (Tellis 1997). The researcher communicated the research findings with participants of the research in order to increase the research validity (Yin, 2003).

Generalizability of the research findings across multiple cases of similar circumstances is the objective of the study. However, a sense of caution has to be introduced in that generalizability of results to other mobile service innovations and generalizability of the results to other geographic markets may not produce similar scores or results. The replication of the theory would only produce similar results if the study analyses the same phenomena, in a similar time context to that which has been adopted in this research (i.e. analysis of rich media mobile services one or two years into their life cycle since their launch). Therefore, in order to produce the same results, the research would have to be addressed to the same phenomenon, and the study should be repeated under a similar research context.

24 Template analysis is referred to in literature as codebook analysis or thematic coding (King 1998).

Chapter 5
Data Analysis

5.1. Introduction

This chapter begins with a brief overview of individual case studies of the Mobile TV and the Mobile Music business ecosystems. Each case study is described briefly in terms of the services provided, the various actors in the ecosystem and the roles they perform. The case description also includes a general picture of the systems and processes involved in the development and the provision of the services associated with the mobile TV case study.

The chapter then proceeds to verify (i.e. accept, reject or amend) the propositions based on the literature discussed in chapter 4. Thematic coding (King, 1998) based on the template analysis method was used to organize the information gathered for each research construct. Pattern-matching and triangulation of qualitative data is employed to test the research propositions. This chapter is organized according to the research propositions and their related research concepts. In verifying each concept and proposition, the properties characterizing each concept are examined from one case study to another, and finally evaluated according to the aggregated evidence at the end of the chapter.

5.2. Theory Building

5.2.2. Case Study: The Mobile TV Service Ecosystem

The rich media service analysed in the 'Mobile TV' case study is defined as "real time or near real time streaming of programmed content (usually made for TV) across either wide area cellular or broadcast networks for viewing on handheld devices" (Strategy Analytics, 2004, p. 1). The service is characterized by the notion of time independence, which reflects the ability of customers to consume Mobile TV services at a time of their preference based on a video-on-call concept. The service is then accessible through their Mobile device in the form of content downloads or streaming[25]. This research defines Mobile TV as any kind of video content specifically developed for the Mobile TV channels. The rich media Mobile TV services offered by the network operator are made available to end-users via its mobile portal[26], which also serves as a phone menu list available on all its approved mobile devices. The Mobile TV service is offered to the market based on a subscription model.

The subscription based Mobile TV service offers in excess of 100 channels, including channel categories as diverse as news and documentaries, entertainment,

[25] *Downloading* is distinguished from the related concept of *streaming* on the basis that downloaded data is sequentially usable as it downloads and is stored in a memory device. In contrast, streaming is the transfer of data for consumption without having the data stored in the consuming device for subsequent consumption.

[26] The term portal essentially describes an entry point for accessing content and services. A portal aggregates large numbers of users and/or subscribers around specific types of service. Mobile portals enable the creation of new specialized service channels. These portals provide customers with shortcut access to Mobile TV content and services. An example of a mobile portal is the i-mode portal of NTT DoCoMo. (http://www.ebstrategy.com/mobile/articles/m_portal.htm)

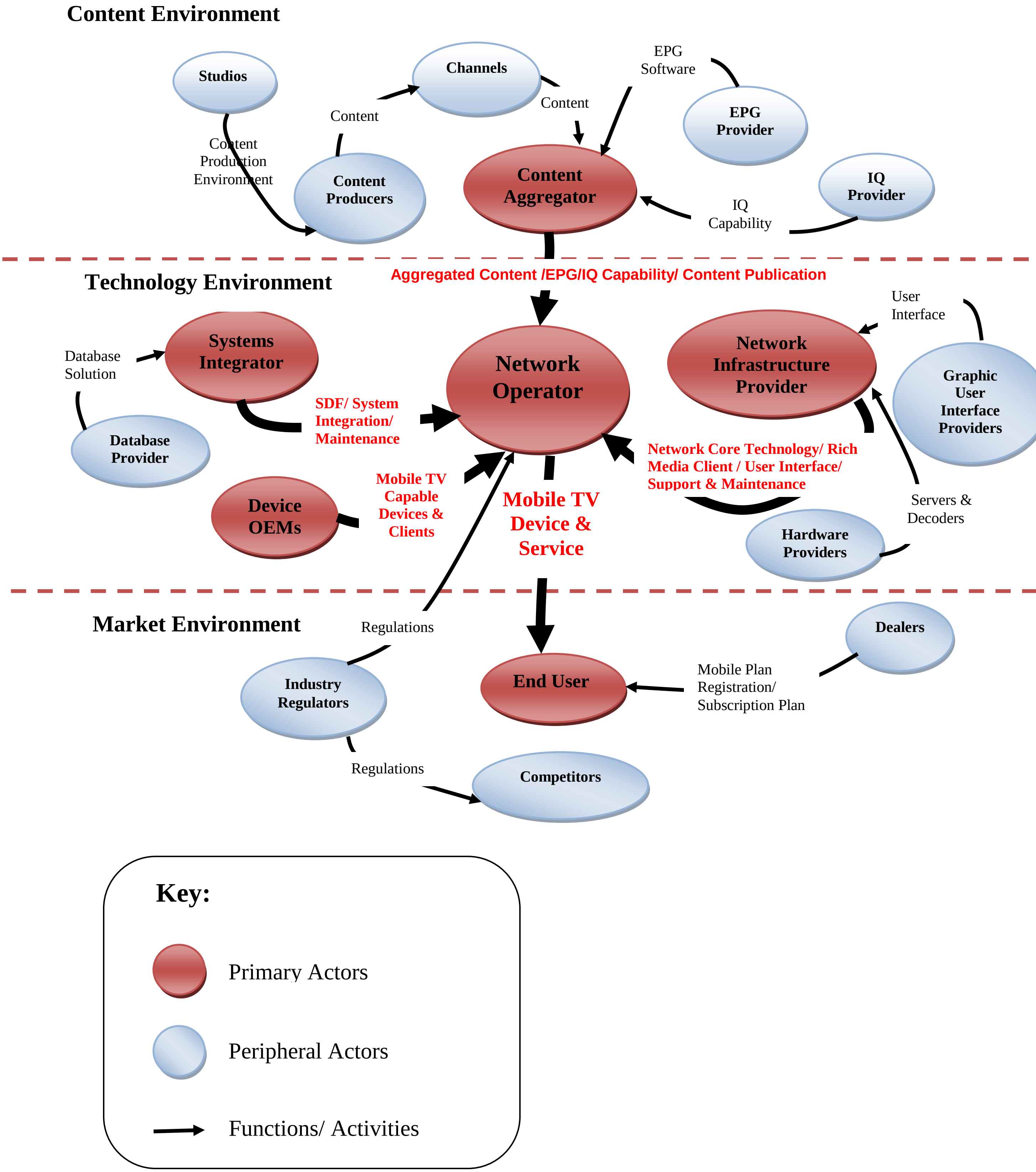
sports, children's shows and music. This service qualifies as a rich media mobile service as the service is rich in mobile content and is delivered through an IP based end-to-end delivery infrastructure. The rich media mobile services are developed through the collaborative effort of multiple business organisations. This collaboration of firms and the business activities they undertake in this integrated framework provides a platform for developing services in an ecosystem. The IP Centrex pilot case study (see *Appendix 8*) identifies three interrelated environments that, in turn, define the Mobile TV case study. These include the content, technology and market environments, as shown in *Figure 5.1*. The end-to-end development and delivery of the Mobile TV service is realized through the collaboration of all the actors from the various environments that make up the Mobile TV ecosystem.

In the content environment, the major actors include studios, content producers and channels, and content aggregators (each actor is described further in *Appendix 1*). Their primary role is the creation of content in the appropriate format for delivery through mobile network infrastructure. In the technology environment, the mobile network operator is supported by other primary and peripheral actors in providing the technology required for developing the network infrastructure that, in turn, supports the development and delivery of Mobile TV services.

The primary actors include the systems integrator, network infrastructure provides and the mobile devices OEMs. The systems integrator provides mainly systems integration services between IT systems residing with various actors in the ecosystem. The network infrastructure provider supplies the Mobile TV platform for the management and the delivery of mobile content to mobile devices, and the mobile devices OEMs that provide the mobile devices that are capable of receiving the Mobile TV service through the network operator's infrastructure. The market environment consists primarily of consumers, industry regulators, authorized dealers and other competing network operators (each actor is described further in *Appendix 1*).

The Mobile TV content originates from the content environment. Among the major actors responsible for the production of content are the studios, content producers and channels. Content is then aggregated and refined by a content aggregator prior to being ingested into the mobile operator's network infrastructure. Once in the network operator's back-end system, the content is then ready to be sent to mobile devices via the mobile network for final consumption. The customer accesses the services through the mobile portal in the client of their authorized mobile devices and then chooses the content for consumption made available by the network operator. The flow of content through the various horizontally integrated organisations involved in the service delivery process reflects the end-to-end context of the Mobile TV solution, as represented in *Figure 5.1*.

Figure 5.1: The Partial Mobile TV Business Ecosystem



5.2.2.1. Joint Dependence (RQ1: P^1)[27]

Proposition P^1 suggests that the underlying substance that creates interconnected relationships in networks is the element of *joint dependence* between the actors that comprise the ecosystem. Through this joint dependency, actors within business ecosystems are able to strategically leverage other actors' strategic capabilities and resources in their collective attempt to mitigate the uncertainty generated by that dependence. In order to verify proposition P^1, the data derived from the semi-structured interviews are presented in the form of coded results obtained from the interview transcriptions. The data obtained from the semi-structured interviews are then triangulated with a combination of additional resources obtained from the internet and from participants or the organisations they represent, including a variety of documents, industry reports, panel discussions and published interviews with industry leaders.

5.2.2.1.1. Embeddedness

Joint dependence in the Mobile TV business ecosystem is manifested in several forms. As argued by Gulati and Sytch (2004), the primary factor that defines joint dependence is the logic of embeddedness. Observations suggest there is a clear indication of *embeddedness* of actors within the business ecosystem in providing the Mobile TV service:

[27] The bracketed information indicates that this section's discussion is guided by research question 1, its related proposition P1 [NOTE - not in superscript] and its corresponding research construct.. The same notation also applies to the remaining sections of this chapter.

I think it is fairly well understood through formal [Service Level Agreements between the network operator and the other key actors in the ecosystem] and non-formal agreements [agreements reached in project management meetings and other ad hoc discussions between representatives of the key actors including the network operator, the systems integrator, the network infrastructure provider, and the device OEMs] of what is expected of each party in the puzzle play [in the ecosystem] (PAR2 - General Manager of rich media services, network operator).

The statement also indicates the structured roles and functions performed by each actor within the ecosystem for end-to-end delivery of the Mobile TV service. However, field notes (FN1) show that the ecosystem was, at the time of data collection, in embryonic stages of development. Hence, any attempt to collectively summarize the roles of all actors in the ecosystem would lack sufficient clarity. Nonetheless, a relatively high degree of clarity is emerging, in an organic manner, regarding the roles of each actor at the central level of the ecosystem.

Embeddedness in the context of the Mobile TV case study is represented by the formal agreements that exist between the various actors in the ecosystem. The content aggregator provided greater depth to the concept of embeddedness, outlining these formal agreements between the channels, the content aggregator and the network operator:

You're talking at least about 20 other companies out here in the content environment alone [of the ecosystems]. Each [actor] with their own roles and functions. Each [actor] contributing in their own unique way. Each [actor] is defined by individual agreements and negotiation *renewed every 12 months and so there is a lot of stuff going on, a lot of dynamics there [in the Channel niche of the ecosystem]. ... we [content aggregator] have our own agreement with the Network Operator but we have a lot of negotiations going on for every one negotiation that the Network Operator does with us [the content aggregator need only have a single framework agreement with the network operator, but the content aggregator would on the contrary have multiple agreements with multiple channels - i.e. channels actors such as CNN, BBC, MTV, etc.]. (PAR 3 – Manager, New Media Platforms, Content Aggregator)*

The confirmation of the existence of agreements such as SLAs (Service Level Agreements) between the content aggregator and the channels is in fact an indication of the embeddedness of key actors in the ecosystem and their relational profile with each other. The relationship between the content providers, content aggregator and the network operator, for example, seems to be manifested partly in the agreements that are provided in the form of SLAs. The SLAs then effectively provide for an embedded position for each of the actors in the business ecosystem, defining the roles, scope, responsibilities and other contractual obligations attributed to each actor in the Mobile TV business ecosystem[28]. It can be argued that network actors embedded like the other actors are basically dependent on each other through these contractual agreements in developing new services to sustain the growth of the ecosystem.

5.2.2.1.2. Mutual Empathy and Bilateral Commitment

The researcher observed an obvious degree of mutual empathy and bilateral commitment among the actors in the ecosystem. Actors are willing to show empathy and commitment in ensuring the sustainability of the business ecosystem. Key actors such as

[28] See Field Note 2 for further details on the role of SLAs in embedded ecosystem relationships.

the content aggregator have shown genuine initiative in absorbing some of the effects of adverse price fluctuations in the cost of mobile content from content producers without passing on the increases to the network operator in the short-term, as reflected in the comments of the content aggregator regarding the risk of price fluctuations:

> *... we protect I guess the network operator from a lot of that. They [network operator] don't get to see prices go up on one particular channel and the channels say oh this service is doing great and we're going to charge higher next year. You know, the network operator don't see any of that (PAR 3 – Manager, New Media Platforms, Content Aggregator).*

The capability of the content aggregator to negotiate the best content terms for the acquisition of mobile content for the Mobile TV service is evident through their wholly owned subsidiary (in this case, FOX 8). Through the content negotiation skills and capability available through FOX 8, the content aggregator exercises his or her competence to ensure that the ecosystem as a whole is not disadvantaged against competing ecosystems offering similar services in terms of both the variety and price of content acquired from other channels[29].

Mutual empathy and commitment among the actors in the ecosystem for joint success is further manifested in the following extract:

> *I think it's more of mutual interest ... Content providers themselves have the same issue. If they do not provide a great experience from the content side, so that reflects quality on them. So they're interest*

[29] See Field Note 3 for further details on the inherent capability of the content aggregator in negotiating content deals with channel members though the capability provided by FOX 8, a subsidiary in the TV channel business.

in that is to mutually making it better for everyone. And we actually have mutual relationships where it tends to be based on remunerations, based on performance factors where everyone tries to obviously meet those performance factors so that they can optimize their performance in terms of the revenue stream that comes their way. So all comes down to within the intermix where everybody is dependent on each other to some degree. For example, channel actors are very much dependent on us the network operator to make sure that we can get services launched and working and stuff like that. We [Network Operator] depend on content providers to make sure that they provide content that they are constantly adapting, changing and improving. The quality of the content they have as we go on. So it sort of a mix scenario where we also depend on each other for this (i.e. Mobile TV service) to work properly (PAR2 - General Manager of rich media services, network operator).

Feedback from interview participants suggests that, apart from mutual empathy, the bilateral commitment on the part of actors such as channels, the content aggregator and network operators is also driven by the presence of an agreed revenue model, which provides the economic incentive for the actors in the ecosystem to collaborate in ways that make the business ecosystem economically viable. A given economic model thus drives the bilateral commitment exhibited by the key actors in the ecosystem. In addition, this model is linked to other economic initiatives, such as keeping operating costs to a minimum while trying to increase the aggregate revenue of the entire ecosystem collectively through measures like keeping mobile content costs at a competitive level in relation to other competing ecosystems offering similar services[30].

[30] See Field Note 4 for further details on the revenue model that sustains the collectiveness on the Mobile TV business ecosystem in developing end-to-end services.

5.2.2.1.3. Structural Congruence

A key feature promoting joint dependence is *structural congruence*, which is particularly evident among the more critical actors in the ecosystem (Dyer and Singh, 1998). The nature of the service being delivered (i.e. end-to-end Mobile TV content delivery from the content providers to consumers on their mobile devices) requires that assets, systems and business processes that are developed around the adoption of certain technologies in the ecosystem should be congruent with the technologies of other service providers in the ecosystem. The congruence of the assets, systems and business processes provided by each actor allows for the effective integration of new technologies within the ecosystem. This in turn enables the seamless development and delivery of new services in the ecosystem, as the network operator observes:

> *At the same time we [network operator] are also working with the content aggregator itself in getting information particularly on technologies like the EPG [Electronic Program Guide], the actual content delivery system and processes, the content streaming and ingestion into our system [the congruent assets, including hardware and software such as servers that make up the IT systems and System Integration software that allows for seamless business processes], taking into account the other partners that the content aggregator brings onboard as the part of the active channels [the replication of congruent assets, including both the hardware and software of IT systems as well as the business processes adopted by other actors within the ecosystem, such as the Channels] (PAR 5 – Solutions Architect, Network Technology, Network Operator).*

Other respondents made similar claims. Further observation indicated that actors invested in other technologies that required a similar congruence in assets, systems and business processes[31], as manifested in the following:

> *Because of the IT infrastructure [the congruent assets, systems and business processes] that was used to receiving the content [from the content providers] now most content came in FTP [File Transfer Protocol] format rather than in a tape. The EVS[32] system [the technology] was perfectly aligned to handle the content. We [content aggregator] were then able to pipe out content [transfers the content] to the network operator, via the routers and all the other IS infrastructure [the congruent assets, systems and business processes] around that pipe [network infrastructure]. All that needed to be purchased and it was purchased specifically for the Mobile TV project. (PAR 3 – Manager, New Media Platforms, Content Aggregator)*

Investment in the congruent assets, systems and business processes enables new technologies such as EPG and EVS digital systems to become operational within the Mobile TV ecosystem. This, in effect, structurally changes the operational disposition between otherwise independent actors (i.e. between the channel and the content aggregator and, in turn, between the content aggregator and the network operator). The structural disposition that becomes amplified by the more congruent profile between actors, facilitates lesser friction in operations between actors. In turn, this ultimately

[31] See Field Notes 5 and 6 for further details on how the decision to invest in a single technology, in this case the EPG, has bearing on the interfacing of assest, systems and business process between actors in the business ecosystem to make the end-to-end delivery of the EPG feature of the Mobile TV service possible.

[32] EVS is a provider of digital video broadcast production system. It's recorders have become the dominant standard for broadcasters worldwide. The platform enables the creation, editing and exchange of video files. The technology's success is based on compressed video and audio data processing capabilities. The migration from analogue to digital in television networks has further facilitated the adoption of these technologies among broadcasters. (http://en.wikipedia.org/wiki/EVS_Broadcast_Equipment)

allows for the promotion of seamless development of new services in the Mobile TV ecosystem[33].

Apart from investment in the congruent assets, systems and business processes, there are also indications to suggest that structural congruence is achieved through knowledge and information exchange between actors, as discussed below:

> *However, I do get great visibility in their [Network Operator's] marketing initiatives, on how things are being promoted and how well it's doing on a monthly basis, on a weekly basis* [the content aggregator is provided with the hit rates of the various programs on the various channels offered through the Mobile TV service]. *And vice versa, where the Network Operator gets to see from our stats* [data pertaining to the popularity of various programs offered by the content aggregator through their traditional cable TV service], *obviously which channels are doing well, which shows are doing well and all that sort of information they're getting as well* (PAR 3 – Manager, New Media Platforms, Content Aggregator)

A project committee consisting of representatives from the key actors such as the content aggregator, the network operator and the system integrator) representing the key actors in the Mobile TV ecosystem ensures the benefits of structural congruence are realized. These key actors in fact meet to discuss issues concerning the development of the Mobile TV service and the committee is a key body providing solutions to the problems facing the development of the Mobile TV service throughout its development

[33] See Field Notes 6 for further details on relation-specific-assets that are put in place resulting in lesser friction in the operations of development and delivery of the Mobile TV service.

stages[34]. For example, the knowledge obtained from the network operator's activities is clearly accessible to the content aggregator and vice versa. This establishes a sense of joint dependency between actors, enabling the progress of the Mobile TV service development through sustained dialogue and constructive suggestions. In effect, the activities of the committee decompartmentalize the divisions that exist between key actors in the Mobile TV ecosystem. This creates an environment in which actors with specialized knowledge can take the lead role in advising on specific issues concerning the development of the Mobile TV service, such as the packaging of services in terms of, for example, the channels and types of content to be included in the news category. This clearly illustrates the important function of joint dependence between the key actors in the ecosystem, which is also supported in the following comments:

> *I mean, we [content aggregator] discussed service subscription packaging [the grouping of channels into categories such as news, entertainment, sports, documentaries, etc. that are then made available to consumers via various subscription packages].We discussed this with them [network operator] and how we thought that certain packaging arrangements were better than others to drive sales. So that sort of information is an area that the Network Operator was not familiar with and we had to drive that (PAR 3 – Manager, New Media Platforms, Content Aggregator).*

Another domain in which knowledge exchange was prevalent is in the decision to select the appropriate mobile terminals (handsets) to provide for subscribers to the Mobile TV service. The researcher observed that the network infrastructure provider and the 'graphic user interface' (GUI) provider were the best positioned actors in the

[34] See Field Notes 7 for further evidence of the presence of an interorganizational project committee streering the development of the Mobile TV service.

ecosystem in terms of their competencies and knowledge base to select the most appropriate make and model of mobile terminals (i.e. mobile handsets), as attested in the following remarks:

> *We targeted specific handsets. So what we had to do is to decide on the best handset in that they were suitable for Mobile TV Services [i.e. the mobile handsets selected need to be compatible with the technologies underlying the Mobile TV service]. So here, there was a lot of meetings between Network Infrastructure Provider and the GUI Provider to help decide on the most suitable range of handsets [the network operator was dependent on the network infrastructure provider and the GUI provider to assist them in the selection of the optimum mix of mobile handsets for the Mobile TV service] (PAR 4 – Technology Specialist, Content Engineering, Network Operator).*

The selection of the most appropriate mix of mobile devices was particularly critical for the development of the Mobile TV service. The reason for the high level of attention given to selecting the mix of mobile devices is fundamentally because of the complexity in corresponding technologies that underpin the end-to-end development and delivery of the Mobile TV service. A substantial number of mobile devices in the market had to be tested. Through the availability of the skills and expertise at the disposal of the network infrastructure provider and the GUI provider features of the handsets (e.g. screen resolution, battery power, data processing capacity, data storage capacity, video and audio handling capabilities, etc.) were rigorously tested to ensure that weaknesses are eliminated in developing a quality Mobile TV service experience.

It is through the synchronized joint participation of the network infrastructure provider and the GUI provider with the network operator that the decision on the optimum mobile devices mix is reached[35]:

> *The Mobile TV services for the mobile itself are very complex. Seventy five devices had to be tested, where each of them had their own features. How they display their screens and resolutions, how they cater for the different types of video formats that are available. So this is a very complex implementation to do it right, to actually hammer the testing down to all these details. You don't do it you're in for a failure. … We've got to make sure that our customers are all served properly, that they have the right experience [the experience of having good video service throughout the consumption period without having to experience an interruption in the service or any other quality issues such as voice, video or navigational problems affecting the consumption of the Mobile TV service] (PAR2 - General Manager of rich media services, network operator).*

Knowledge exchange was also apparent in the critical role played by the systems integrator. The role of integrating systems and business processes between the more critical actors (i.e. actors displayed in red in *Figure 5.1*) and the network operator necessitates a significant amount of joint dependence between the systems integrator and the network operator. Joint dependence rather than network interconnectedness seem to underpin the development of new rich media services such as Mobile TV service:

[35] See Field Notes 8 for evidence indicating an interorganizational concerted effort in selecting the appropriate device mix for the Mobile TV service.

... they [system integrator] nevertheless, provided the bridge that connected all the different systems that needed to be integrated in the ecosystem. Through their knowledge of integrating systems, they collaborated with us [network operator] to piece together the different solutions, the interfaces between our systems and the different systems external to us [systems managed by other key actors in the ecosystem] are made to connect and work properly end-to-end. (PAR 4 – Technology Specialist, Content Engineering, Network Operator).

The systems integrator has the ultimate role of piecing together the information technology systems, specific assets between the key actors to provide a seamless end-to-end Mobile TV service development and delivery infrastructure. Given their position as the project manager, and as they are equipped with systems integration knowledge coupled with a bird's eye view of the entire project from end-to-end, the systems integrator was in the best position to facilitate the promotion of joint dependence of the ecosystem as a whole through systems integration initiatives.

The research findings indicate that knowledge, capabilities and resources do in fact move between actors in order to provide an otherwise complex service to the marketplace. The evidence provided highlights the necessity for each actor to be well embedded in the ecosystem with a clear definition of their role and functions in terms of how they interact with other actors within the ecosystem. The evidence deduced also substantiates the fact that mutual empathy and bilateral commitment is present in most of the critical actors populating the ecosystem. This tendency for a mutually beneficial behavior is further facilitated by the structural congruence that is exhibited through the adaptive structural dispositions of the various actors in adopting new technologies, business processes and organisational structures. The resulting relations between these key actors on a repeated and a recursive basis necessitated the investment in some relation specific assets; substantial knowledge exchange and transfer; and the combining of complementary resources and capabilities in unique ways for the joint development and delivery of the Mobile TV service. These adaptive dispositions of the various actors have to a large extent contributed to reducing the degree of friction that would otherwise be present in the activities surrounding the development and the delivery of the Mobile TV service.

5.2.2.1.4. Familiarity and Mutual Forbearance

The concept of familiarity and mutual forbearance brings to the forefront the dimension of time (Pillai, 2006). As time progresses, so to do the maturity in relationships involved in bringing the Mobile TV service to the marketplace. This finding is consistent with the argument provided by Pillai (2006) in which he argues that, as relationships mature with time, they also become more stable. The stability that characterizes mature relationships reduces opportunities for information asymmetries that could result in opportunistic behavior. The arguments provided by Jayachandran et al., (1999) further reinforce the importance of time in relationships, suggesting that in more established network relationships, organisations are likely to foster familiarity and mutual forbearance and thereby reduce the likelihood of organisations engaging in opportunistic behaviour. Highlighting the potential for the content aggregator to act opportunistically, a participant representing the network operator explains how the level of maturity in established relationships provides for familiarity and mutual forbearance in relationships rather than exploitation between actors in the ecosystem:

> *I think one of the things which relate to their [content aggregator] ability to do that [to act opportunistically] if they wanted to is because the content agreement is signed already. The content is key. Mobile TV is not a service without the content. So there is some captive power for the content aggregator to do things and impose on us to do things if they wanted to. But that's not necessarily how it would pan out or work. So I think overall the relationship with us the network operator and the content aggregator is very strong in this particular aspects. We are the part owner of the content aggregator anyway … But I think the longer we deal with each other the better our understanding in how we can bring progress to this service [Mobile TV service]. (PAR2 - General Manager of rich media services, network operator).*

One can argue that although room for opportunistic behavior exists in the ecosystem, the features of joint dependence such as embeddedness, mutual empathy, bilateral commitment and structural congruencies promote joint success for all actors. Joint dependence fosters familiarity and mutual forbearance and, in the wider interests of the business ecosystem providing the Mobile TV service, reduces the prospect of organisations engaging in opportunistic acts[36]. The network operator sums it up in saying:

> *I think everyone has a role to contribute to this ecosystem. It doesn't have to be the case where one actor has the most power. We need to learn to survive and co-evolve together I guess (PAR 5 – Solutions Architect, Network Technology, Network Operator).*

Analysis of the data reveals determinants such as embeddedness; bilateral commitment and mutual empathy; structural congruence; and familiarity and mutual

[36] See Field Notes 11 for further evidence on how joint dependence minimizes opportunistic behavior among the actors in the business ecosystem.

forbearance. These determinants provide a framework for better understanding the concept of joint dependence in ecosystems. The evidence suggests that joint dependence rather than network interconnectedness enhances the development of new rich media services in ecosystems. The triangulation of data supports the primary insight that joint dependence rather than network interconnectedness provides the essence of the ecosystem. The uniquely embedded position that each actor occupies in the ecosystem given their resources and capability profiles; the bilateral commitment and mutual empathy that is manifested in relationships between actors as a result of their clearly defined roles in the ecosystem; the nature of the technologies that are introduced into the ecosystem for the development of new services that require structural congruence in interfacing assets, systems and business processes; and the familiarity and mutual forbearance that prevails as relationships between actors mature all collectively signify the importance of joint dependence in the development of new rich media mobile services. The preceding arguments supported by data suggest that the network interconnectedness between actors in the ecosystem has emerged as a notion that is dependent on the concept of joint dependence. It is through the concept of joint dependence that actors are interconnected. Thus, P^1 is amended to P_1 as indicated below:

P_1: The determinants of joint dependency (embeddedness; mutual empathy and bilateral commitment; structural congruence; and familiarity and mutual forbearance) rather than network interconnectedness, enhance rich media development in the mobile service ecosystem.

Comments: The revised proposition (P_1) claims that rich media mobile services development is enabled by the determinants of joint dependence. The concept of joint dependence was first coined by Gulati and Sytch (2004). However, Gulati and Sytch (2004) stop short of describing the determinants of joint dependence. The theoretical contribution of this project is the extension of the contribution made by Gulati and Sytch (2004) to include the determinants of joint dependence in the context of rich media mobile service development: embeddedness; mutual empathy and bilateral commitment; structural congruence; and familiarity and mutual forbearance.

5.2.2.2. Platform – A New Service Development Building Block (RQ1: P^2)

The second proposition (P^2) suggests that a common platform underpins the business ecosystem's capability in developing new rich media mobile services. The notion of the existence of a common platform for the Mobile TV business ecosystem is reflected in the responses provided by the participants in this case study, as the following illustrates:

> *So everything (services) we've developed is part of a framework which performs the function of a key building block [a common platform for the ecosystem in developing new rich media services] looking forward (PAR1 – Director of Rich Media Services, Wireless Consumer Services, Network Operator).*

The notion of a 'key building block' is consistent with the definition of a 'platform' provided by Iansiti and Richards (2006): "A platform is a set of tools or components that provide building blocks for application providers" (p.81). When probed further, the participant (PAR1) elaborates on this notion and explains how the building blocks serves to facilitate the development of new services and application for Mobile TV services[37].

> *So tomorrow when I build the next service, I can reuse the same building blocks. I can reuse components such as identity, authentication and payment and all of these functions which are part of the SOA (service oriented architecture) framework [a common platform for the ecosystem in developing new rich media services] (PAR1 – Director of Rich Media Services, Wireless Consumer Services, Network Operator).*

5.2.2.2.1. Standardized Reusable Common Capabilities

The notion of a service oriented architecture (SOA) as a platform for the development and delivery of rich media services such as Mobile TV is not new to network operators. Organisations such as AT&T and Bell Laboratories in the United States are in fact some of the first telecommunications giants to adopt a SOA to improve their ability to develop and provide telecommunications services. As Brian Levy, the chief technology officer of the communications, media and entertainment division of Hewlett Packard argues, SOA is the way forward for the communications industry in general.

> *This whole architecture is the SOA of carrier grade [network operator quality] … This is a concept of Lego blocks. With Lego you can achieve amazing things. With just a few shapes you can build the whole city of London. If you could do that with network operator services, it would be fantastic. If we could have a set of standardized reusable components that we could assemble together in different ways that will take new service development in the telecommunications industry to a*

[37] See Field Note 12 for further evidence of leading industry experts having referred to the notion of 'keybuilding blocks'.

new level. So that's the way we're moving. The trick is in the assembly of those standardized reusable components. Putting them together creatively with our partners [other actors in the ecosystem] to create services [new rich media mobile services]. This way we can reduce the time to market and the costs of actually producing those sorts of services. Also we are in an age of convergence where we need to make things work together. So if we got common blocks, then it is likely that the components can be integrated nicely to develop services that can be marketed (VR1[38] *- Brian Levy, the CTO (Chief Technology Officer) of the Communications, Media and Entertainment division of HP).*

The notion of SOAs as a platform for the development and delivery of rich media services has been acknowledged by industry experts as the way forward in developing new rich media mobile services. SOAs such as SDPs (Service Delivery Platforms) are emerging as platforms for new service development in rich media mobile services because of the standardized reusable components that are embedded in these platforms. This has been further acknowledged by Hewlett Packard CME's Chief Technologist, David Croslin, who states,

Service providers such as network operators get great advantage by being able to take their legacy silos deconstruct them and then reconstruct them again into a horizontal architecture where they can reuse the components that they have … Everybody in the industry today understand that if you're going to deliver services in a clean fashion, then you've got to evolve to adopt horizontal architectures such as IMS (IP Multimedia Subsystem) and SDP (VR2 – HP CME's Chief Technologist, David Croslin).

[38] See Appendix 7 for details of VR (Video Resources).

The advancements experienced by the communications industry in general as argued by Brian Levy and David Croslin, and attested to in the remarks of PAR1 (above), indicates the critical role of Service Oriented Architectures in the changing landscape of the telecommunication business. After acknowledging the critical contribution of SOAs, PAR1 also singles out the 'standardized reusable components' in SOAs that are bringing the network operator to the next frontier of collaborative new service development. These standardized reusable components seem to be important in contributing to the service development capability of the network operator in collaboration with other actors in the business ecosystem, as indicated by the following comments:

> *… the whole design is a Service Delivery Framework (SDF) … The SDP and the SDF. SDP is the Service Delivery Platform and SDF is the Service Delivery Framework. And the SDP is actually the subset of an SDF. The SDF sort of paints the whole framework where else the SDP is a component of the SDF (PAR1 – Director of Rich Media Services, Wireless Consumer Services, Network Operator).*

The Director of Rich Media Services explains the significance of the SDP as a platform in the context of the business ecosystem. The participant explains what these standardized reusable components are and how they are embedded in SOAs like the SDP, which enables the development and delivery of new services to the market in an effective and speedy fashion.

> *It gets us to situation where bought once serve many times [the components are reusable]. It gets us to that situation. Because in the past without a SDP in place, every time you build a new service you got to*

duplicate components such as billing, presence and identity. Imagine I build an application today. If I don't have an SDP I've got to build that application (i.e. service) first and then construct separate billing and presence systems to operationalize the service. I've got to integrate this new service identity into the billing systems, into the presence system. Each of those things has got a proprietary interface, which will have to be developed. And when I launch application number 2, I've got to do all of that work again. If you have an SDP, you've got one common or standard platform with standardized billing and presence systems from which interfaces can feed from, and then every time you build a new application, they all go through that same platform using these same standardized common capabilities. You don't have to go rebuilding the platform all over again for subsequent new services. We just add interfaces. And then the SDP itself manages the backend communications ... So it[the SDF of which the SDP is a component] develops an abstract layer where we can develop services and applications in. Otherwise you'll end up with spaghetti. Because if you don't have an SDP you'll end up with a mess (PAR1 – Director of Rich Media Services, Wireless Consumer Services, Network Operator).

5.2.2.2.2. Speed to Market and Lower Cost of Service Development

In recognizing the significance of the SDP as a platform, a participant representing the content aggregator reinforces the notion of the SDP and its standardized reusable common capabilities[39]. The participant provides a similar account of the SDP to that outlined above, highlighting how it provides the infrastructure with a lower cost and more timely development of new rich media services such as Mobile TV services:

[39] See Field Note 12 for key capabilities provided by the SDP.

I think it's [SDP] a very useful tool, because obviously it sits on top of the enablers [standardized reusable common capabilities] so you've got your presence, your identity, billing and all your other enablers within the network, which is the infrastructure. And then with the SDP sitting on top [as an abstract layer] you can very quickly and easily design a service that uses any one or a combination of those standardized reusable common capabilities. It used to take nothing less than 24 months to introduce a new service to the market before the telecoms sector adopted the SOAs. Now it only takes about 3 months, sometimes even less to develop new services because the SOAs platforms are in place. So I do see it [SDP] as a very useful way of producing new services (PAR 3 – Manager, New Media Platforms, Content Aggregator).

The service development capability of the network operator in collaboration with its business ecosystem partners seems to be noticeable, particularly in terms of the plethora of services – enabled by platforms such as the SDP – being developed at significantly lower development costs and which have a faster time to market. There seems to be agreement between industry experts in general that, due to their ability to make available standardized reusable common capabilities, the SDPs have in fact significantly reduced the time to market for new rich media mobile services. As HP CME's Chief Technologist, David Croslin states,

One of the significant advantages offered by such SOAs is for network operators to be able to create services at a very high speed. Traditionally, services take 18 to 24 months which is pretty much the standard across the industry (telecommunications industry). The concepts of SDP and IMS for example, allow these operators to shrink the service development times substantially to sometimes 3 to 6 months *and enter what we call the Innovation Spiral (VR2 – David Croslin, HP CME's Chief Technologist)*

Through the sharing of common capabilities such as identity, billing presence and service orchestration, there seems to be a marked decrease in the duplication of effort in the service development process and thus, significantly reducing the development cycle times of new services. This has enabled the business ecosystem to increase the speed to market of services such as rich media services like Mobile TV services:

> *If you get into a standard framework environment such as the SDP, there is one single set of service orchestration, identity and billing. This makes it much easier to manage … This (the SDP and the SDF) makes the technology of delivering such services much more simplistic and quicker … when I have an ecosystem of application providers, with the SDP in place, it helps me to bring services to the market quicker (PAR1 – Director of Rich Media Services, Wireless Consumer Services, Network Operator).*

Observation suggests that SOAs such as the SDP emerges as a platform that offers standardized reusable capabilities for the collaboration of members of the business ecosystem in the development of new services. It appears that the SDP by itself is merely a piece of technology and is limited in its capability in producing new services. However, it is the exposure of its standardized reusable components to the actors of the business ecosystem that makes the SDP a significant contributor in its own right to the new service development capability of the business ecosystem. In collaboration with its highly specialized actors in the business ecosystem, the network operator exposes the common capabilities such as identity, billing presence and service orchestration to actors such as content providers and other technology partners in making rich media mobile services such as Mobile TV a reality. In so doing, the network operator establishes the SOAs such as the SDP as a common platform, enabling the development of rich media services such as Mobile TV in the context of the business ecosystem.

5.2.2.2.3. Capability to Develop Niche Market Services

New Service Development (NSD) success is also commonly expressed in terms of speed to market and lower development costs (Lynn, Abel, Valentine and Wright, 1999). Apart from these notion of NSD success, evidence deduced from the interviews suggest that SOA platforms such as the SDP are also positioned to enable the business ecosystem as a whole to tailor a service and target the right customer segments with a higher degree of precision. This is greatly assisted by the underlying common capabilities such as identity, billing, presence and service orchestration that are present in platforms such as the SDP, as confirmed in the following comments:

> *You could think about a SDP like a portal, which allows us to tailor the service for different segments. So I could build services for different consumer segments (PAR1 – Director of Rich Media Services, Wireless Consumer Services, Network Operator).*

This is further reinforced by Hewlett Packard CME's Chief Technologist when he argues that the ability for the network operator in the past to develop and commercialize niche market services for consumers has been suppressed by the pressures of meeting target profitability. This is to a large extent dictated by the cost of relying on the stove-pipe technologies (proprietary systems characterized by vertical architectures) of the past for the provision of new services:

> *In the past , network operators had stove pipe systems [propriety systems characterized by vertical architectures] … The problem with this is when you've spent about 50 to 100 billion dollars on an existing infrastructure over the years just developing basic telecommunications services such as voice services and SMS. And these were mass market services [that took approximately 24months to bring to market]. Volume sales were very critical in qualifying such services as commercially viable [due to the scale of investment made in duplicating capabilities such as billing, presence, and identity for each new service brought to market in the stove-pipe systems, it took 24months on average to bring a service to market] . However, with the computing capabilities offered by computing technologies today coupled with horizontal architecture [SOAs] such as the SDP, it now makes it possible for network operators to develop and deliver services at a fraction of the cost and time in comparison to services developed and delivered through legacy architectures of the past. Previously service providers were very hesitant to develop micro services [niche services] such as LBS (Locations based services) or MP3 services [rich media services] for niche consumer market segments which did not have the required mass to justify the huge investment required. However, with such SOAs, the service providers are now positioned to tap into these niches [niche markets] that remain untapped through faster and cheaper new service development programs. (VR2 – David Croslin, HP CME's Chief Technologist)*

The evidence that emerges seems to suggest that SOAs like the SDP enable network operators and other members of the ecosystem to collectively develop new rich media services that are particularly appealing to niche markets. In the past, with high investment costs and long service development times, niche services such as Mobile TV services have been less attractive, if not commercially unviable. However, with the transition experienced by the telecommunications sector in particular in adopting new technologies with horizontal characteristics such as SOAs (as explained in chapter 2), network operators and the members of their ecosystem have never been in a better position to explore and develop services such as new rich media service like Mobile TV for niche consumer market segments.

5.2.2.2.4. The Mobile TV Platform

The literature review indicates the presence of a Service Delivery Platform as a common platform in the development of rich media services. This appears to be the case concerning the network operator observed in this business ecosystem. However, in this Mobile TV case study, the SDP does not emerge as a platform specifically dedicated to the development of Mobile TV services. Rather, the Mobile TV service feeds on the common capabilities offered by the SDP. These common capabilities residing in the SDP are not specifically dedicated to Mobile TV services. The Mobile TV services are merely one of many services that use the common capabilities offered by the SDP. Instead the SDP emerges as a platform that is important for the development of rich media services in general and not Mobile TV services in particular. Rich media mobile services include services such as Mobile TV, Mobile Music and Mobile Games and Location Based Services (LBS) to mention a few. The emerging results could also be due to the business and technology model that the network operator and other members of the business ecosystem choose to adopt.

The SDP is a shared platform that provides common capabilities not only for the development and delivery of Mobile TV services but also for other forms of rich media services offered by other business ecosystems in which the network operator is a critical actor. This is reflected in the following statement:

> *We had a little bit of customization. It [the Mobile TV service] had to link into the generic components, for example, our billing, presence, identity, service orchestration systems which comes out the standardized capabilities offered by the SDF and the SDP; we also had to combine that [the capabilities present in the SDF and the SDP] with the use of our Content Management System (CMS) and things like that which are part of the Mobile TV platform … the Mobile TV platform … makes the development and provision of Mobile TV service a reality (PAR 4 – Technology Specialist, Content Engineering, Network Operator).*

The notion that the SDP and the SDF are not the only SOAs that form the platform for the development and delivery of the Mobile TV service is further supported by the following observations:

> *We call it the Mobile TV platform. … So that's the platform that delivers the Mobile TV offering. The SDP and the SDF are more overarching framework offering common capabilities but not necessarily specific to the development and delivery of the Mobile TV service … The Mobile TV platform has multiple elements. It has the WAP Portal, Service Orchestration component, the subscription engine, integrating to other parts of the internal systems like alarming and reporting. MiTV [content management system] is just one but an important component of the Mobile TV platform which was brought in by the network infrastructure provider. It is a critical part of the Mobile TV platform,*

but there are these other things around it that make sure everything works in developing and delivering the Mobile TV services (PAR5 – Solutions Architect, Network Technology, Network Operator).

A participant from the content engineering division of the network operator further reinforces the notion of a specific platform dedicated particularly to the development and delivery of Mobile TV services[40] :

The Mobile TV platform is an amalgamation of some qualities and features derived from the SDF and so you can say the Blue box [the participant points to the SDP as shown in the systems architecture blueprint of the network operator], the Green box [the participant points to the SDF , as shown in the systems architecture blueprint of the network operator] are some of the components feeding into the Mobile TV platform. The Mobile TV platform is a platform dedicated specifically for the Mobile TV service [the systems architecture blueprint of the network operator conclusively shows that the SDP, the SDF and the Mobile TV platform collectively form the New Service Development Platform for rich media services in the context of the ecosystem] (PAR 4 – Technology Specialist, Content Engineering, Network Operator).

Representing the systems integrator, consultants and project managers further substantiate the importance of the Mobile TV platform as a critical component in the development and delivery of the Mobile TV services.

The Mobile TV platform can be referred to as the platform because there are multiple applications that make up the capabilities that are then involved in making the Mobile TV service a reality. So it's not

[40] See Field Note 14 for evidence that the SDP and the SDF technology architecture was shown to the researcher. However, due to confidentiality reasons a copy of the document was not provided to the researcher for reference.

just one application on one server that does it. There are 98 servers with various kinds of capabilities that ultimately bring the Mobile TV service to the customer. Now that is already a very complex system. The Service orchestration component is one component within the Mobile TV platform, which then integrates with the SDF and the SDP where the standardized reusable common capabilities such as billing, identity and presence capabilities are present (PAR6 – Senior Consultant and Project Manager, Systems Integrator).

Responses from particpants at different levels of the business ecosystem clearly indicate that the Mobile TV service development capability does not specifically hinge on any single piece of SOA. Instead, the evidence seems to suggest that the new service development capability of Mobile TV services is dependent on a combination of technological platforms. In the Mobile TV case study, evidence suggest that the SDP, the SDF and the Mobile TV platform are all components of a wider New Service Development Platform (NSDP) underpinning the capability of the Mobile TV ecosystem in the development of new services (*Appendix 15,* graphically illustrates the components of the NSDP relating to the development of the Mobile TV service).

The Mobile TV platform consist of a combination of the components made available by the SDF, the SDP and other components that are not available on either the SDF or the SDP but instead are specific to the requirements of the Mobile TV service. Having now established that Mobile TV service development and provisioning is made possible by a combination of SOAs, refered to in this thesis as the New Service Development Platform (NSDP), it is then critical to examine how such a platform provides for interconnectedness between the various actors in the business ecosystem in the development of new services.

5.2.2.2.5. The New Service Development Platform (NSDP) for Mobile TV Service

The evidence deduced indicates that the Mobile TV platform is in fact the gateway within the NSDP to the actors in the ecosystem. The Mobile TV platform provides the physical interface between actors in the content, technology and market environments of the Mobile TV ecosystem:

> *At the end of the day it's the platform (i.e. the Mobile TV platform) that is at the center of all this ecosystem controlling data in and data out. The content that we received from the content aggregator is channeled through the content management systems (CMS) which resides in our Mobile TV platform (PAR 4 – Technology Specialist, Content Engineering, Network Operator).*
>
> *Yes, that'll be the Mobile TV platform that is bringing everything together in the ecosystem ... Mobile TV platform is in fact a platform that integrates the relevant actors bringing all these otherwise independent actors together in the ecosystem. (PAR5 – Solutions Architect, Network Technology, Network Operator).*

The interface enabled by the NSDP ultimately allows for the other actors, particularly those in the content environment of the business ecosystem, to participate in the end-to-end delivery of the Mobile TV service. *Figure 5.2* illustrates a conceptual model of an end-to-end Mobile TV service delivery. The service delivery process begins at a point at which the content originates and ends at a point at which the service is consumed. Between these points is a whole chain of events represented by value-adding activities of the service development and delivery process. The figure shows the various organisations that would come into concert, interfacing with each other through integrated information technology systems for the collective development and delivery of the Mobile TV service to the marketplace.

Figure 5.2: End-to-End Mobile TV Content Delivery

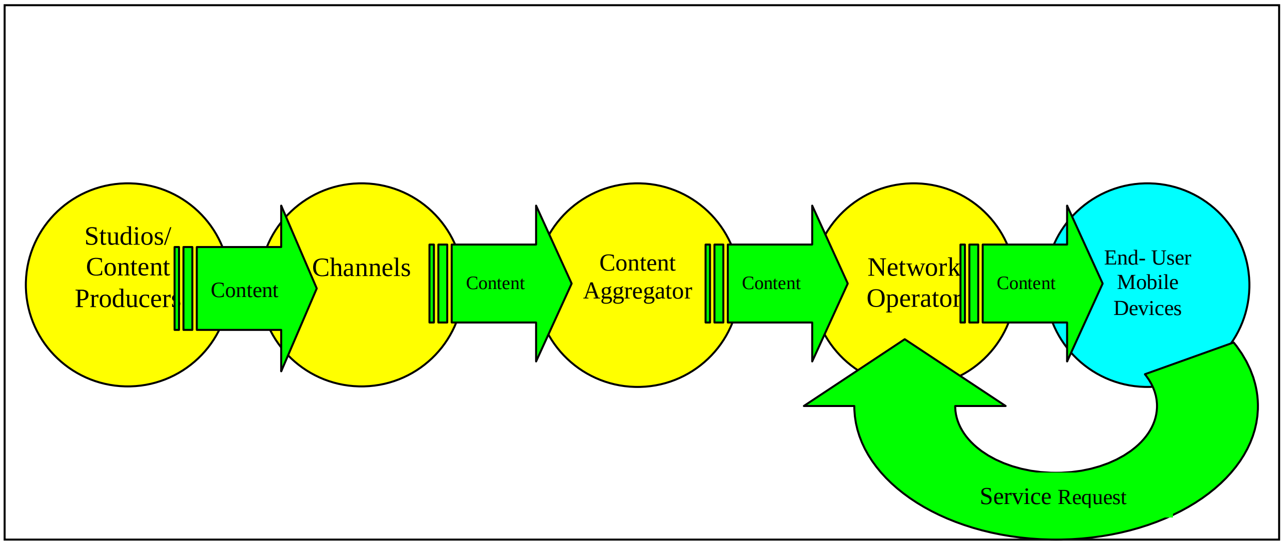
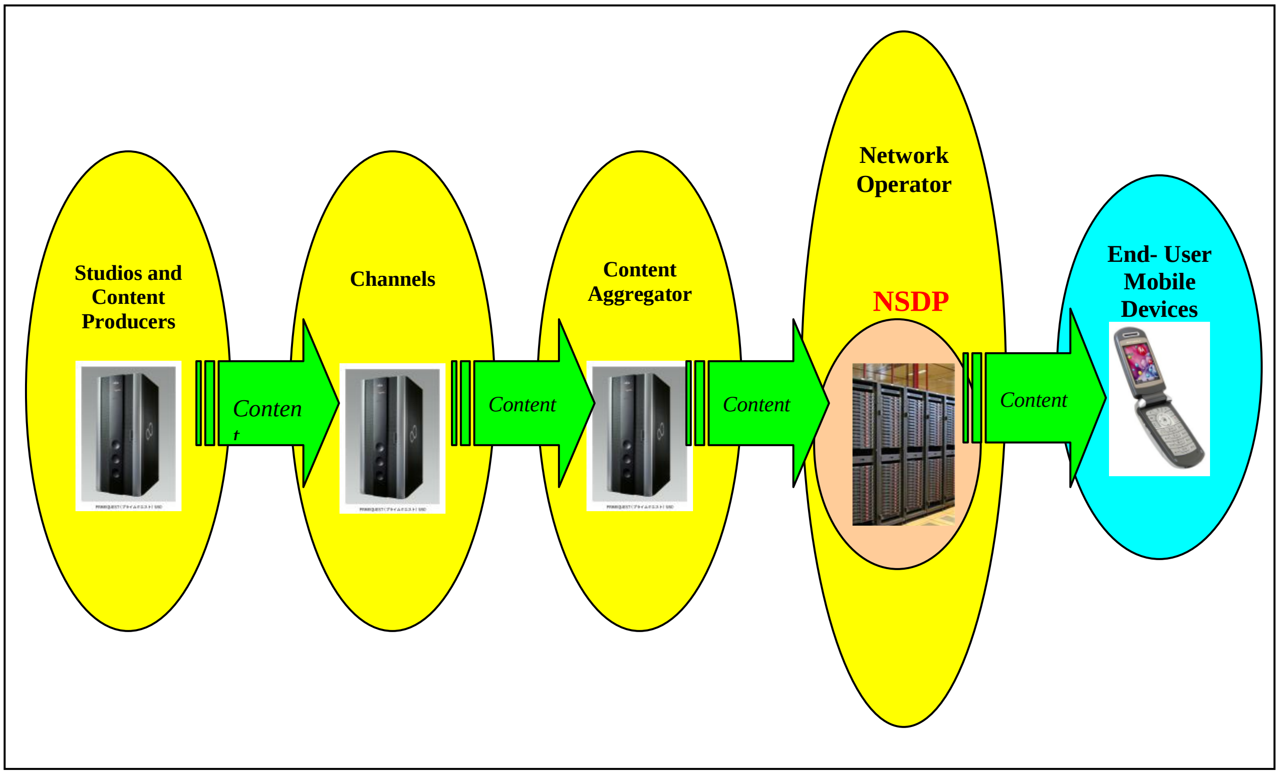


Figure 5.3 illustrates a model that demonstrates the position of the NSDP in the context of the end-to-end[41] development and delivery of the Mobile TV service. It exhibits how the NSDP performs an underpinning function as the hub, enabling the physical interface between actors in the ecosystem. It shows how the physical interface is achieved through systems integration initiatives between the IT systems of the various actors in the delivery of Mobile TV content to end-user devices. This in effect directly promotes joint dependence between the various actors involved in the development and delivery of the Mobile TV service to the marketplace.

[41] *End-to-end* in the context of this paper refers to the provision of a rich media service from the point where the content for the service originates to the point where the services is consumed by the user. For example, in the case of providing a mobile music service, the content (i.e. a music track) would originate from the content owners (i.e. record labels – e.g. EMI or Sony BMG) and is consumed when the customer (i.e. user) experiences the mobile music track via his/her mobile device

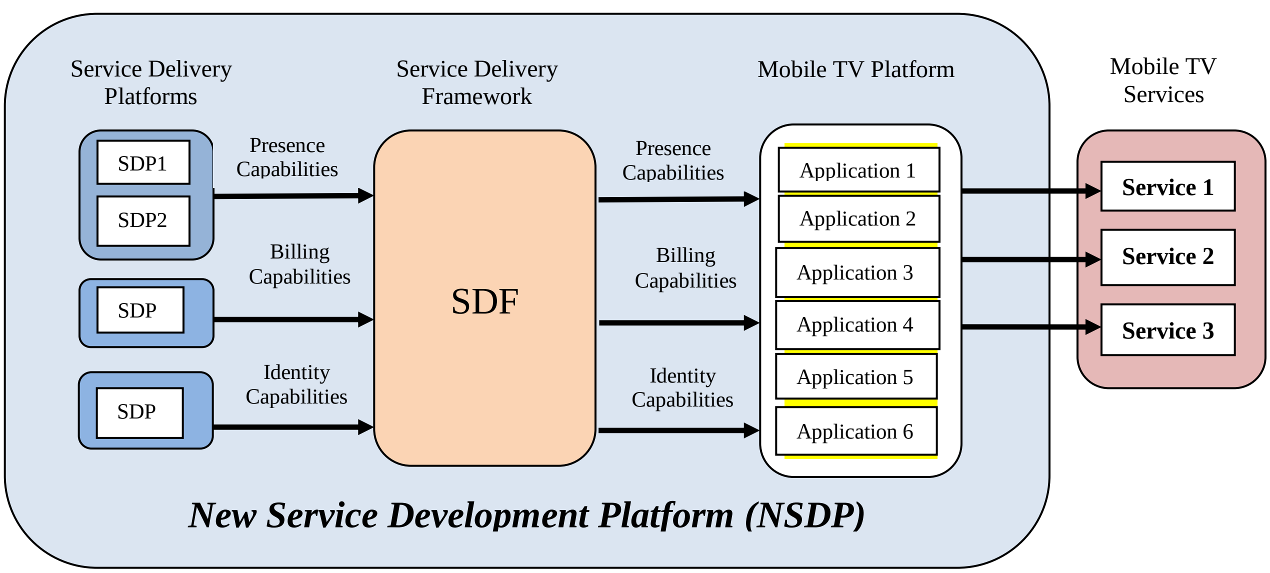
Figure 5.3: End-to end Mobile TV Content Delivery



According to our research observations, the NSDP is, apart from its content management function, also capable of managing remittance of payment due to content providers (this is done through the reporting function embedded within the NSDP). This indicates yet another activity the NSDP provides in promoting the joint dependence between actors in the ecosystem. The NSDP is able to facilitate an effective revenue model and a payment system agreeable to all parties in the business ecosystem as a prerequisite for the successful development of the end-to-end Mobile TV service[42]:

> *Also it [the Mobile TV platform, which is a component of the NSDP] allows us to charge customers and complete remittance transactions for the content partner and that sort of things. So what they [content providers] do is they use our platform [the Mobile TV platform which is a component of the NSDP]. We have got a fairly large platform there for our streaming services and what they [content providers] can do is upload their content and setup the sort of billing or charging structure they want based on the agreements. And we do all that in partnership with the content providers via the Mobile TV platform [a component of the NSDP]. So the Mobile TV platform through its capabilities allows us to do this by linking up with their [actors within the ecosystem] systems (PAR 4 – Technology Specialist, Content Engineering, Network Operator).*

Figure 5.4: The Mobile TV Service Project New Service Development Platform (NSDP)



[42] See Field Note 15 for evidence of a remittance system present in the Mobile TV platform.

As represented in *Figure 5.4,* the NSDP is an *open system*, a system open to all relevant actors in the business ecosystem. The NSDP's components, particularly capabilities such as the content management system (CMS), are standardized as much as possible so that interfaces can be effectively attained through the efforts of the systems integrator (along with other actors, particularly content providers). The number of interfaces between the NSDP and the other independent systems residing in the various actor organisations (e.g. content providers) within the business ecosystem indicates the underpinning role played by the NSDP in promoting network joint dependence among the actors involved in the development and the delivery of the Mobile TV service in the ecosystem. This conception is revealed in the following comments:

> *In the platform [the NSDP] … there are components that are proprietary, but all the other interfaces offered to third party [content environment actors] we try to standardize as much as possible. So yeah, the interfaces with third party or content providers are in fact standardized to expose our common capabilities for their content to flow through to the end user via our Mobile TV platform [a component of the NSDP]… This platform has a number of interfaces with other actors in the ecosystem. You know from one end we're plugging into the mobile network giving access to broadcasters and content aggregators; and on the other end they have interfaces with us on something as unique as our billing systems. So they're just some examples of the interfaces between the platform [the NSDP] and the systems residing in other organisations [actors] within the ecosystem". (PAR4 – Technology Specialist, Content Engineering, Network Operator).*

> *… The architecture [the NSDP] enables you to exploit the various kinds of capabilities in different ways and basically piece together a business process, or a process to achieve a certain business outcome in a*

particular way that would then suit the business. And that's why platforms such as the SDP and the Mobile TV platform [components of the NSDP] based on a SOA architecture does then provide some of the greatest flexibility (PAR6 – Senior Consultant and Project Manager, Systems Integrator).

With the joint dependence that it facilitates between the various actors in the ecosystem, the Mobile TV platform (as part of the New Service Development Platform (NSDP)), effectively contributes to the new service development capability of the ecosystem. By promoting joint dependence through intensive system integration efforts between systems residing in otherwise independent organisations, the new service development capability of the ecosystem from an end-to-end context is brought to reality, as acknowledged in the following comments:

> *I can certainly see [anticipate] that sort of proliferation [of service] as a result of the platform [NSDP]. And there would be more and more services that will be built into your phone ... There might be a lot of these platforms and other systems out there in the ecosystem [systems residing within other actors in the ecosystem] and there will be a lot of connections or interfaces between them. These are the interfaces that are made possible by the platform [NSDP]. These are the interfaces that make new services a reality (PAR4 – Technology Specialist, Content Engineering, Network Operator).*

In summary, the evidence presented in verifying P^2 indicates some additional contributions. Firstly, although the SDP and the SDF remain important to the development of the Mobile TV service in making available the standardized reusable components (e.g. identity, billing, presence and service orchestration), the Mobile TV platform has also emerged as the platform directly pertinent to the existence of the

Mobile TV business ecosystem through its content management system capability. Secondly, the Mobile TV platform, a component of the NSDP, also provides for functions such as a remittance capability facilitating the revenue model upon which the participation of the actors in the ecosystem is justified. Thirdly, the NSDP is in fact an open platform in that it enables certain actors within the ecosystem to gain access to standardized common capabilities such as the content management system, billing, presence and identity. This allows for the collective participation of actors from the content environment in the development of the Mobile TV service. Together, SOAs such as the SDF, the SDP and the Mobile TV platform form the NSDP. Through the NSDP, the ecosystem is then provided with the key building blocks for the development and provision of Mobile TV services.

The additional evidence discussed above suggests that SOAs such as the SDF, the SDP and the Mobile TV platform (the NSDP) collectively underpin the capability of the Mobile TV business ecosystem in developing new rich media Mobile TV services. One can argue actors within the ecosystem are dependent on each other through a common technological architecture refered to in this case study as the NSDP. The SDF and the SDP provide standardized reusable components such as billing, presence and identity, while the Mobile TV platform provides other Mobile TV service specific capabilities such as content management and remittance components. The Mobile TV platform enhances the interconnectedness between actors in the business ecosystem through intensive system integration between actors allowed by the ‘open’ nature of the Mobile TV platform. Therefore, the working proposition P^2 can be refined to reflect the underpinning importance of SOAs in the provision of rich media services such as

Mobile TV. The SDF, the SDP and the Mobile TV platform (the NSDP) are in fact SOAs directly attributable to the service development of the Mobile TV ecosystem in the development and provision of Mobile TV services. In this thesis these technical platforms are collectively referred to as the New Service Development Platform (NSDP). The refined proposition is therefore stated as:

P_2: SOAs such as SDF, the SDP and the Mobile TV platform all collectively form the new service development platform (NSDP) that underpins the business ecosystem's capability in developing Mobile TV services.

Comments: Iansiti and Richards, (2006) define a platform in the context of a business ecosystem as "a set of tools or components that provide building blocks for application providers" (p.81). As Laurie, Doz, and Sheer (2006) suggest, the formation of new growth platforms are facilitated by the forces of change such as new or converging technologies, changing regulatory environments, or social pressures, which in turn creates a whole new window of opportunity to satisfy some unmet or latent customer need. Platforms assemble the right portfolio of capabilities, business processes, systems, and assets that are required to deliver new services that satisfy these customer needs (Laurie, Doz, and Sheer, 2006). Peppard and Rylander (2006) also acknowledge the notion of platforms by specifically identifying SOAs such as the SDP as a rich media mobile service platform, although they stop short of describing the SDP as a component of the NSDP. The theoretical contribution here is the extension of the contribution made by Peppard and Rylander (2006) to include SOAs such as the SDF, the SDP, and the Mobile TV platform as components of the NSDP, underpinning the development of rich media services like Mobile TV. It appears that no single technology platform is solely responsible in providing the capability required by the business ecosystem in providing Mobile TV services. Although the SDP remains important to the development of rich media services, it nevertheless provides standardized reusable components that are important but not specific to the development of Mobile TV services. Instead a combination of multiple SOAs such as the SDF, the SDP and the Mobile TV platform – referred to as the New Service Development Platform (NSDP) in this case study – provide a new service development building block for Mobile TV services.

5.2.2.3. Network Centrality (RQ1: P^3)

The third proposition (P^3) suggests the notion that a central actor is integral to the network interconnectedness of the business ecosystem. Central actors play a critical role in providing the platform (the NSDP), leadership direction in innovation and sharing with other members of the business ecosystem the value created through innovation. The platform in the first instance provides the central actor with the most strategic position in the business ecosystem. Through their position at the core of the ecosystem, central actors will shoulder the responsibility of leading and providing strategic direction in major technology investment decisions, niche creations and ultimately making decisions on the new types of services to be created. In the meantime, while providing leadership direction for the rest of the business ecosystem, central actors are fully aware that due to the interdependent nature of their relationships with other actor in the business ecosystem, they will have to provide the innovative environment for other actors to co-exist in the development of new services. This is particularly critical in the case of niche actors (e.g. channels, GUI provider, device OEMs), who make up the largest number of actors in the business ecosystem and generate the highest degree of value through the contribution of their niche spcialities and components in the creation of new end-to-end rich media services in the business ecosystem (Iansiti and Levien, 2004; Iansiti and Richards, 2006).

5.2.2.3.1. The Central Actor in the Business Ecosystem

The presence of central actors in the Mobile TV business ecosystem is acknowledged in the responses provided by the participants in this case study, coupled with the field notes obtained during the interviews:

> *We [network operator] don't have absolute control over other actors in the ecosystem, but we certainly do have the overall say in the ecosystem … If you've got to identify an organisation for it [central position in the ecosystem], then the network operator would be it [the central actor] … The content aggregator, they have some influence [in the content environment] but content providers [other actors in the content environment e.g. channels, studios, etc.], they typically don't [have control in the ecosystem]. Most actors typically don't [have control] funny enough. They tend to provide products but they don't tend to be part of the puzzle [the decision-making process]. I think the content aggregator may have a part [contribute to the decision making process] in it [of the ecosystem] but from my point of view I think everything is still structurally sorted out here in the network operator (PAR2 - General Manager of rich media services, network operator[43]).*

The content aggregator, a key actor in the ecosystem, further supports the notion of the existence of central actors. The content aggregator acknowledges the importance

[43] See Field Notes 17 and 18 which provide evidence that SLAs and the NSDP are features associated with the central actor.

of certain actors in the ecosystem. The higher the stake that an actor has in the ecosystem, the deeper that actor seems to be embedded in the ecosystem:

> *I think it is really this two [the network operator and the content aggregator], the both of us [are central actors in the ecosystem]. I think some channels may come and some may go. You know that's [Content Makers] going to change. These actors are peripheral and not deeply embedded in the ecosystem [the peripheral actors such as channels, studios, content makers, for example, do not have an exclusive stake in this ecosystem. They also participate in other competing ecosystems providing much of the same content and capabilities]. It really comes down to the network operator and the content aggregator that's always going to be there. Even if the EPG provider is dropped out of the ecosystem at some point in time, you know, we'll find another way to do it (PAR 3 – Manager, New Media Platforms, Content Aggregator[44]).*

The systems integrator also confirms the existence of a central actor. The initial investments made by the network operator and the initiative it takes in assembling an ecosystem for the delivery of the Mobile TV service indicates the higher stake they have as a central actor in the ecosystem in ensuring the sustainability of the ecosystem, as suggested by the following comments:

> *Ultimately, in this example [the Mobile TV ecosystem], the services ownership belongs really to the network operator. They [the network operator] initiated the project. They laid out the initial investments [investment in the SOA platforms that make up the NSDP, the systems integration work between systems residing in actors and the NSDP, prescribing the types of mobile devices to be adopted for the Mobile TV service, etc.] required for the project. And so they were the*

[44] See Field Note 20 which provides evidence that certain actors participate in more than one ecosystem.

ones that were really central in the ecosystem at all times for developing the Mobile TV service (PAR6 – Senior Consultant and Project Manager, Systems Integrator).

5.2.2.3.2. Higher Connectivity Relative to other Actors in the Ecosystem

Noorderhaven et al. (2002) suggest that a highly central organisation is connected to more organisations within a given network. This connectedness is exhibited in the SLA (Service Level Agreement) that is forged between the various peripheral actors leading back to the central actors, as explained:

> *We've [network operator] got SLAs with the systems integrator, the network infrastructure provider. We have one with the content aggregator too … And in turn I know that the network infrastructure provider has got SLAs with the providers of the end stream encoder [hardware providers - peripheral actors] and the providers of the front-end streaming servers [hardware providers - peripheral actors]. These are secondary level SLAs between them [the network infrastructure provider and the peripheral actors] that is developed to indirectly serve us [network operator]. So these SLA ultimately leads back to us [Network Operator] … On the system integrators side, the network operator has also got a direct SLA with some of these companies here [the peripheral organisations associated with the systems integrators]. We [network operator] got a SLA with the database provider I know that we manage directly. And the reason for that is because these components are also deployed into the wider network operator's network, which offers other services apart from Mobile TV services [other rich media services such as Mobile Music, etc.] (PAR4 – Technology Specialist, Content Engineering, Network Operator).*

Service Level Aggrements (SLAs) involving both the primary and peripheral level actors in the ecosystem are used. Primary SLAs are those SLAs between the network operator and the primary actors in the ecosystem. As revealed in *Figure 5.1* above, the primary actors within the ecosystem include the systems integrator, the network operator, the content aggregator and the devices OEMs. These are some of the actors that would maintain a direct SLA with the central actor (the network operator). Peripheral SLAs are SLAs between the primary actors and the peripheral actors. For example, as the primary actor in the content environment of the ecosystem, the content aggregator has peripheral SLAs with channels, which are considered peripheral actors[45]

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5.2.2.3.3 Providing the New Service Development Platform (NSDP)

The central actor has been associated with a critical role in business ecosystems as they aim to improve the overall health of their ecosystem by providing a stable and predictable set of standardized and common reusable capabilities – in essence, a common platform of tools that other organisations can use to contribute their specific service or product components to complete the sum of the parts of the total business ecosystem service offering. In the Mobile TV service ecosystem, the evidence seems to suggest that this is in fact the case:

> *We [network operator] drive the collective business requirements through interfaces with the platform [the NSDP platform]. Through the platform [the NSDP platform], we design the business requirements such as business process including the service delivery process. This in reality*

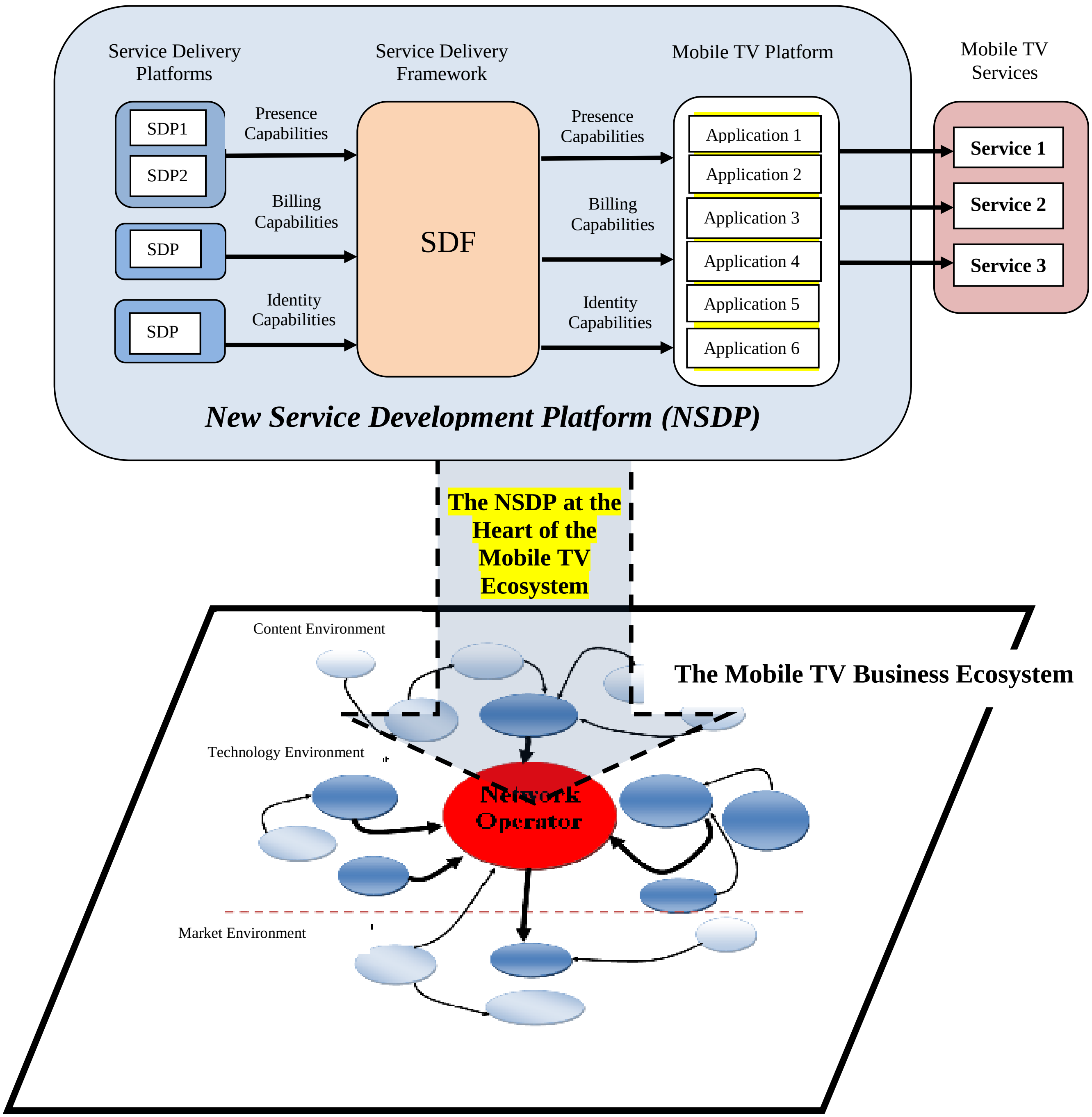
[45] See Field Note 21 indicates that participants are able to identify the two levels of SLAs that bind actors together in the ecosystem.

drives the technology design [system integration interfaces] with the other actors … We expose all the relevant standardized reusable common capabilities [made available through the NSDP platform] and by doing this we enable the participation of third parties such as content providers in the end-to-end service delivery. So yes, the horizontal architecture or what I call the abstract layer [the SOAs such as the SDF, the SDP and the Mobile TV platform] supports the business processes to develop and deliver the Mobile TV service (PAR1 – Director of Rich Media Services, Wireless Consumer Services, Network Operator).

The above comments indicates how the network operator being the central actor, through the ownership of the New Service Development Platform (NSTP), planned and implemented a business process defining the activities and interfaces that integrate the various actors in the new service development process in the business ecosystem. By default, through its ownership of the NSDP and the business process that is defined by the components of the NSDP, the network operator is positioned strategically as the central actor[46]. The statement above also suggests that, through the NSDP, the central actor (network operator) is able to influence specific technological and strategic directions of the ecosystem. This in fact influences the development of new services and the general evolution of the business ecosystem and the services that it develops and offers to the market over time. Other participants in the case study acknowledge the contribution of the NSDP in positioning the network operator as the central actor, as illustrated by *Figure 5.5*.

[46] See Field Note 22 indicates that the design of the business processes characterizing the Mobile TV business ecosystem almost entirely dictated by the network operator.

Figure 5.5: The Mobile TV Service Project New Service Development Platform (NSDP) at the Heart of the Business Ecosystem



The configuration of the platform depicted in *Figure 5.5* is summarized as follows:

> *At the end of the day it's the platform [the components of the NSDP] that is at the center of all this controlling data in and data out. That platform [the NSDP] resides in the network operator … because we [network operator] have the highest stake in this whole thing [through the upfront commitment to investment made by the network operator in developing the ecosystem for the provision of the end-to-end Mobile TV service]. The flow of content through these platforms [the NSDP] is certainly controlled by the network operator … And probably looking at the number of interfaces [systems integration interfaces] that all go back to the network operator, the platform [the NSDP] to a large degree justifies the network operator's central role in the ecosystem. You could also have a similar argument with regards to the end users and say that the end-user is the reason that the services is designed for in the first place, and so they should be at the center, and everything flows to them. But in this context we're talking about the context of the service development and provision and therefore, the network operator is certainly at the heart of the ecosystem (PAR4 – Technology Specialist, Content Engineering, Network Operator).*

5.2.2.3.4. The Interorganisational New Service Development Process (INSDP)

The research finding also indicates that the central actor's new service development process model as defined by the network operator seems to provide a common new service development framework to which other actors in the ecosystem subscribe for the end-to-end service development in the context of the business ecosystem. The network operator seems to have this ability to provide a sense of processual direction, a common reference framework for all other actors in the service development process of the ecosystem as a whole. The network operator clearly identifies a service development framework: *"We (network operator) have a defined service development methodology which we call XZYPD*[47] *[XZY Product Development]"* (PAR4 – Technology Specialist, Content Engineering, Network Operator).

Although a common framework for the wider ecosystem, the common service development framework manifested through the network operators' internal service development process guidelines is more functional in its application to particularly guide the primary actors in the ecosystem (including the network operator, systems integrator, content aggregator , network infrastructure provider and the devices OEMs) as suggested by the comments:

> *So the guys like the systems integrator, the content aggregator, the mobile devices OEMs and the network infrastructure provider [the primary actors in the Mobile TV ecosystem] would be informed of this process. However, with regards to the other peripheral actors, they are not informed of this process [service development process]. They are not aware or care about how we implement and build the thing [Mobile TV Service] (PAR2 - General Manager of rich media services, network operator).*

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[47] *XZYPD in its original form would reveal the identity of the network operator. For the purpose of this research, XYZPD is a substitute term introduced as part of the measures adopted in theis thesis in keeping the identity of the network operator confidential.*

However, acknowledging the presence of a common new service development framework to guide the service development process within the context of the business ecosystem is not to say that the individual actors do not have their individual organisation-specific product/ service development methodology. However, these individual organisation-specific product/ service development methodologies are nevertheless, guided by the wider service development framework manifested by the network operator's service development methodology. The service development framework provided by the network operator in effect guides and provides a sense of direction in setting the overall milestones for new service development within the wider context of the business ecosystem, as suggested by the following comments:

> *The System Integrator has its own methodology that it uses to deliver projects. Generally with regards to a new project we go through a project mapping in ensuring that the project development methodology [an internal project development methodology for the systems integrator] is defined. As for the XZYDP as a methodology it is relatively high level in describing the task and activities that occur at every stage [of the service development process]. However, for us [systems integrator] we end up using the hybrid methodology based on our process on how we deliver a project with modified deliverables based on the framework provided by the network operator so that we also comply with their corporate and internal processes … For example, when XZYDP say test an application [the Mobile TV service], we use the system integrator's methodology for the testing. We don't use the details as mentioned under the testing stage of the XZYDP methodology (PAR6 – Senior Consultant and Project Manager, Systems Integrator).*

This indicates that the XZYDP methodology practiced by the network operator as a new service development process does in fact serve as a new service development process framework to steer the new service development initiatives of the ecosystem in a concerted direction. This process framework does not reveal itself as a strict methodology to be followed down to every detail, as prescribed in the XZYDP. On the contrary, the new service development process framework provides the relevant project milestones for the development of new Mobile TV services. As suggested above, actors such the systems integrator follow through the testing stage of the XZYDP with their own testing procedures. This seems to suggest that although the detailed procedures at each stage of the XZYDP framework might be adapted to suit the various actors who participate in the service development process, the framework provided by the XZYDP remains a guiding framework for the new service development process for the ecosystem as a whole. It engages the relevant actors at specific stages of the framework. In doing so, it provides for the responsibilities of each actor at each stage of the new service development process. One can argue that the XZYDP in effect forms the interorganisational new service development framework (INSDF) for the Mobile TV ecosystem. *Appendix 16* illustrates the key stages and some of the key actors involved at the various stages of the INSDF in the development and delivery of Mobile TV services.

5.2.2.3.5. Providing Direction through Visibility and Attractiveness

Visibility and attractive of actors such as the network operator helps to position them as the central actor in the ecosystem. The visibility and attractiveness of the network operator is manifested through their ability to develop a framework of formal processes and agreements, including the SLAs concerning both primary and peripheral actors, the development and maintenance of a new service development platform (NSDP) hosted by the network operator, and the adoption of a common new service development process (provided by the network operator as a common Interorganisational New Service Development Framework (INSDF) for the development of end-to-end Mobile TV services). Collectively, these factors enable the network operator to influence the blueprint for the ecosystem's new service development into the future. This effectively provides the network operator with the capacity to steer a common direction for new service development initiatives of the ecosystem.

The extract below provides an account of how the central actor (network operator) effectively coordinates the service development initiatives involving the content providers and the devices OEMs in the ecosystem. Through the common direction provided by the network operator, the network operator is able to effectively guide the contributions made by the actors in the ecosystem towards a concerted new service development initiative:

> *"So we've launched this project [the Mobile TV project] to develop this service [the Mobile TV service] and we've got ten different content providers or application providers. These content and application providers will have to understand the intricacies of the devices [mobile handsets] for which ultimately these content and applications are meant for. They would have to be briefed on the intricacies of these devices such as content format [e.g. various types of file formats for content to be delivered] , screen resolutions [difference between the smallest (128 x 128) and the largest (800 x 480)], other hardware capabilities [e.g. hardisk memory capability], battery life and so on, so that these content or applications developed are compatible to*

the devices they are meant for. With regards to the devices OEMs [handset manufacturer], it is critical that we explain to them what kind of content and applications as well as how the content is going to be delivered. This is important for the device to evolve in its capability to carry these services (new services) or applications. We [network operator] are in the best position in the ecosystem to coordinate this [the communication between content providers and the devices OEMs]. We get the overall picture of the ecosystem. So we're dealing with a whole new ball game here. In the past before rich media services was introduced, or before we provided content, we tested the device, it works, and we then put them out to the market for services. Now there's a whole bunch of other parties involved to get just one service out the market [therefore, the central role played by the network operator through their visibility and attractiveness becomes very critical for the success of the Mobile TV project] (PAR2 - General Manager of rich media services, network operator).

In discussion with the network operator, the researcher observed that the central position that the network operator occupies within the ecosystem commands the visibility and attractiveness to direct new service development projects. Apart from providing a mediator function between the content providers and the mobile devices OEMs, the network operator is also critical in providing an evolutionary roadmap for the Mobile TV services that are developed in the ecosystem. The researcher observes that, in providing an evolutionary roadmap[48] for the Mobile TV services that are developed in the ecosystem, the network operator is able to identity the resources, skill sets and capabilities required in the development of new services. Having first hand knowledge

[48] See Field Note 26 for an observation made by the researcher as to how the new service development roadmap affects the ability of the network operator to identify, assemble and populate the the required niches with niche actors to complete the development of a new service in the business ecosystem.

of these resources, skill sets and capabilities requirements, through the visibility of being a central actor, the network operator is then able to create and prepare new niches that will ultimately offer the business ecosystem the required resources, skill sets and capabilities in completing the development of new services according to the service development roadmap. However, in soliciting the participation of new niche actors that possess the required resources, skill sets and capabilities, the network operator uses its attractiveness in offering a legal framework through its provision of SLAs, the new service development platform (NSDP), the Interorganisational New Service Development Framework (INSDF) and a business ecosystem based business model which offers attractive new revenue streams for such new niche actors. In effect, this provides the network operator with the ability to collectively chart the future service development roadmap for the ecosystem, indirectly sustaining the long-term viability of the ecosystem.

The preceding arguments supported by the evidence obtained from informants indicates the significance of the central actor and its important contribution to the viability of the new service development activities of the ecosystem. The refined proposition is therefore stated as follows:

P_3: The determinants of network centrality (framework of SLAs; new service development platform (NSDP); Interorganisational New Service Development Framework (INSDF); and the visibility and attractiveness of the network operator) rather than network interconnectedness enhance rich media mobile service development capability in the mobile service ecosystem.

Comments: The significance of a specific organisation in the overall structure of a network is critical for the well-being and the future prospects of the network (Freeman, 1979). A highly central organisation is connected to more organisations within a given network, which in turn may also indicate a relatively more central position than other organisation within the same network (Noorderhaven et al, 2002). Iansiti and Levien (2004) and Moore (1996, 2006) have all argued that central actors are the kind of organisations that serve as enablers and have a great impact on the whole ecosystem. Nevertheless, the research literature does not identify the determinants of network centrality. The evidence deduced from this thesis indicates that the determinants of network centrality (the framework of SLAs in the ecosystem guided by the primary SLAs between the primary actors, New Service Development Platform (NSDP) and the Interorganisational New Service Development Framework (INSDF)) provides for the visibility and attractiveness of the network operator as the central actor in the ecosystem. These are the determinants that help to extend current theory in explaining the effects of network centrality on rich media mobile service development capability in the mobile service ecosystem.

5.2.2.4. Structural Differentiation (RQ1: P^4)

Proposition P^4 suggests that structural differentiation in the business ecosystem is promoted by niche creation, which positively promotes the development of new rich media mobile services. Iansiti and Levien (2004) suggest that the business ecosystem consists of a combination of categories of actors, including niche actors, dominators and hub landlords. A ‘diverse’ business ecosystem, it seems, encourages continued innovation, ultimately ensuring its survival.

5.2.2.4.1. Creating and Sustaining Niches in the Ecosystem

Iansiti and Levien (2004) have argued that developing niches in the ecosystem is important for promoting innovation within the ecosystem. This in turn promotes the health and vitality of the business ecosystem. The majority of firms that make up the ecosystem are niche actors. Their aim is to develop specialized capabilities that differentiate their organisation (niche actors) from other organisations (central actors) in the ecosystem (Iansiti and Levien, 2004). By integrating and leveraging complementary resources from other niche actors or from an ecosystem’s central actor, the niche actor can focus its energies on enhancing its narrow domain of expertise. When the niche actors are allowed to thrive in such an interconnected network, they come to represent the majority of actors in the ecosystem and are responsible for most of the value creation and innovation. In pointing out the presence of niche actors in the ecosystem, one participant observes:

> *I would like to think that the way that we are set up is as an ecosystem with the Network Operator and ourselves [content aggregator], that we actually have multiple companies contributing to the outcomes [new services]. I certainly see that to be the case in our ecosystem [Mobile TV ecosystem]. I mean just look at this diagram and you can see the number of niches in the ecosystem. And this is only a partial ecosystem [the ecosystem presented like the one shown in Figure 5.1 is a partial ecosystem]. We [the network operator and the content aggregator] are just two actors representing two niches out of the many that we have in the ecosystem. I mean just look at the number of niches*

that are there. Just imagine all the specialized components they contribute to the end-to-end delivery of the service. They're all experts in their own domains (PAR 3 – Manager, New Media Platforms, Content Aggregator).

The content aggregator's perspective is that niches play a critical role in ecosystems in that they promote the level of innovation in the ecosystem. Innovation is seen to thrive through the specialist contributions organisations make to the collective development of the end-to-end service development. *Figure 5.1* depicts only a partial business ecosystem. A larger, more complex representation of the ecosystem would certainly reveal more niches, thus, reinforcing the fact that the business ecosystem is predominantly populated by niche actors. Niche actors effectively offer the flexibility in the business ecosystem that sustains innovation opportunities. Central actors represent only a fraction of the entire ecosystem. It is through the mix of the various niche components contributed by the various niche actors that ultimately makes possible the development and delivery of a complete end-to-end Mobile TV experience for the end-user[49].

Niche creation in the Mobile TV business ecosystem was apparent throughout the various stages of Mobile TV service development, from the conception of the service idea to the point at which the Mobile TV service was commercialized:

The initial vision for what we wanted to do would have been conceived about June 2005 [the time at which the Mobile TV idea was conceived by the network operator]. That was when we actually got some

[49] See Field Note 24 for evidence of the existence of niches and the critica role they play in the value creation process of the business ecosystem.

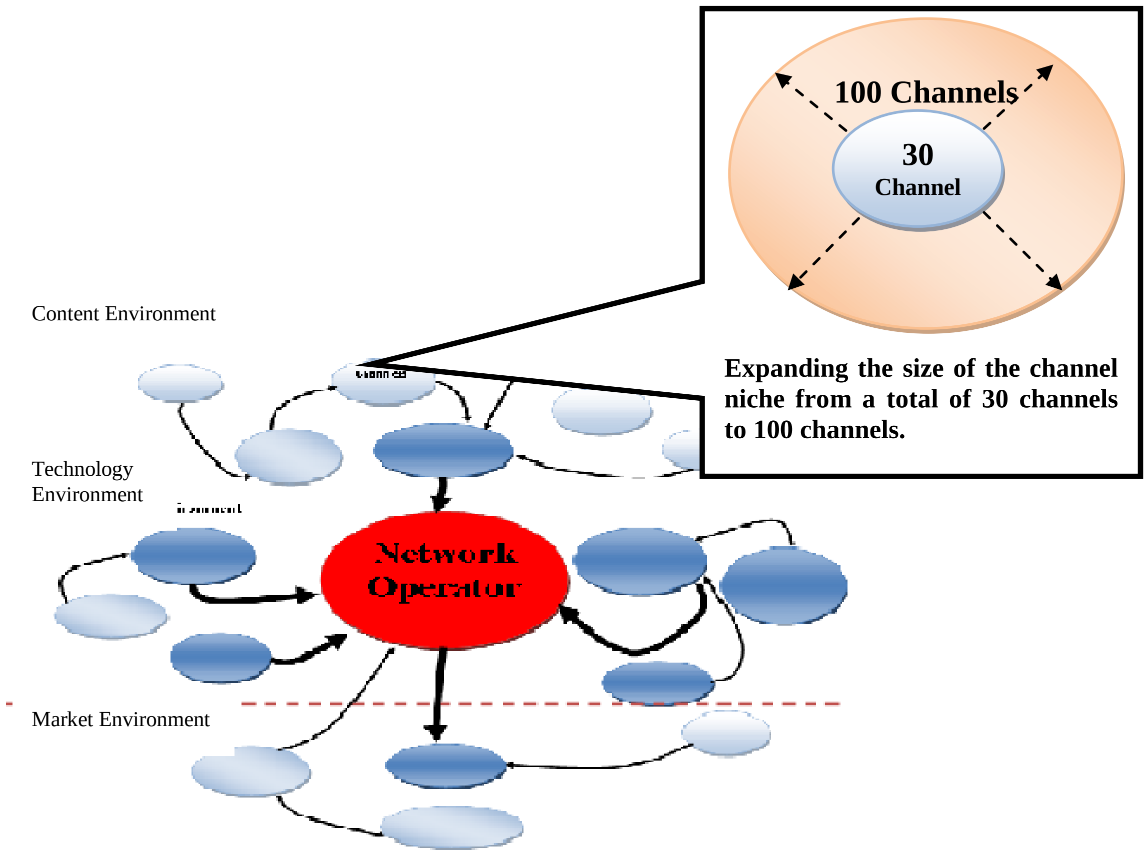
stuff working together. That was the DVB-H[50] (Digital Video Broadcasting - Handheld) trials we did then. But we have come a long way down the road and in the process we have added quite a number of features to our Mobile TV service. That required the creation of new niches within the ecosystem and selection of new actors with specific capabilities to populate these niches to assist in the provision of these new features … The first version of the service [Mobile TV Service] was first launched in October last year (2006) … When we first developed the Mobile TV service we had about 30 different kinds of services [i.e. channels]. On the second launch, in October 2007, we had about 100 different kinds of services [i.e. channels]. So that's an indication that content is adding on and new actors are coming into the ecosystem [the channel niches grew in size from 30 channels to 100 channels]. This means the ecosystem will have to grow in time to meet the demands of the market (PAR2 - General Manager of rich media services, network operator).

The evidence deduced here suggests that niches are not only created to provide certain necessary components of the end-to-end development and delivery of the Mobile TV service but also, and more importantly, that these niches are also nurtured and gradually developed over time to augment the new service development capacity of the ecosystem. In providing the example of the channel niche in the ecosystem, PAR2 indicates that, from the Mobile TV service's first introduction in October 2006 when the number of channels was only 30, the second introduction of the service a year later witnessed a drastic increase in the number of channels from 30 to 100. It appears that there is a persistent effort on the part of the primary actors (such as the network

[50] **DVB-H** (Digital Video Broadcasting - Handheld) is one of three prevalent Mobile TV formats. It is a technical specification for bringing broadcast services to mobile handsets. (http://en.wikipedia.org/wiki/DVB-H)

operator) in alliance with the content aggregator to continuously look at ways to augment the quality and variety of content offered to the end-user by increasing the number and variety of channels offering content through the ecosystem[51], as illustrated in *Figure 5.6*.

Figure 5.6: Augmenting NSD Capability through Niche Expansion



This seems to be consistent with the argument provided by Kemp et al. (1998), that the first step in the creation of niches in ecosystems is to distinguish the process of

[51] See Field Note 25 for evidence of the joint creation of niches by the network operator and the content aggregator.

identifying promising candidate technology and then to continue with the selection of these technologies in the creation of niches.

Through the leadership provided by the central actor (i.e. the network operator), the business ecosystem showed signs of deliberate attempts to facilitate development of niches in the business ecosystem. This included the identification and selection of promising technology candidates for implementation in the ecosystem. The attempt to facilitate the development of niches was based on the strategic needs facing the ecosystem, as informed by a systematic analysis of the gap in specialized capabilities required in developing an effective end-to-end Mobile TV solution. For example, a senior executive representing the network operator (PAR 2) responsible for the development of the Mobile TV service, indicated the existence of a systematic framework to facilitate the development of niches in acquiring the required specialized complementary resources, skill sets and expertise to fill the capability gap in developing an effective end-to-end Mobile TV solution:

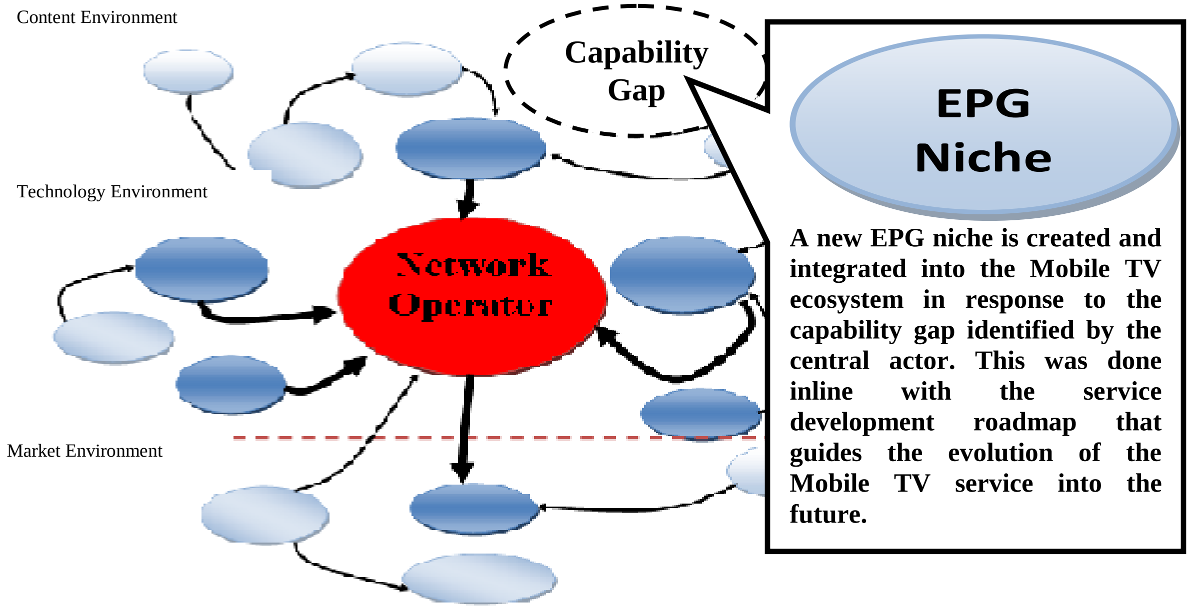
> *The thing is that there are more features that are wanted by customers [consumers] and you'll need to go out and seek other parties to make it happen. To handle this, we [network operator] have a strategic framework or what we call a service development roadmap [a strategic service development document developed by the network operator to guide the service development program of the ecosystem into the future] that looks at what capabilities are needed and then seek to develop those capabilities in the ecosystem through alliance with particular organisations that have these capabilities. So for example, we introduced the EPG (Electronic Program Guide), a capability built into the Mobile TV service that allows users to navigate, select, and discover*

content by time, title, channel, genre, etc. by use of their mobile phone keypad. EPG capability available to users via their mobile phones will enable users to remotely relay future scheduled recording instructions to their broadcast service decoders at home for a specific content to be recorded by a digital video recorder (DVR). And in order to develop the EPG capability in a mobile services context, we needed to have organisations like the EPG Provider that already have such capabilities in providing similar services to your TV sets. We need to bring them in and actually do that work because it's a very specialized skill that they possess. It's not a thing that we [network operator] can do ourselves. You got to develop the know-how over time (PAR2 - General Manager of rich media services, network operator).

It is clearly apparent from the particpant's comments that the service development roadmap is in fact a strategic document that partly functions as a document that analyses, identifies and recommends the inclusion of promising technology candidates through the development of niches for the evolution of the ecosystem into the future. This indicates that strategically planned attempts to facilitate development of niches in the business ecosystem are a critical part of the process of evolving rich media services such as Mobile TV into the future. Adding niches to the ecosystem directly affects the level of innovation and thus, the new services development capability of the ecosystem. The initiative of adding niches to the ecosystem simply augments the capability of the ecosystem to provide additional service features that would enable the ecosystem to effectively differentiate its services from other competing ecosystems in the marketplace[52]. This is illustrated by *Figure 5.7*.

[52] See Field Note 26 for evidence of how the service development roadmap developed by the network operator in collaboration with other strategic actors in the ecosystem would have an impact on the development of niches to increase the capability of the ecosystem to develop new services.

Figure 5.7: Augmenting NSD Capability through Niche Creation



Another example of capability development through the creation of niches in the provision of the Mobile TV service was the need for the development of Graphic User Interfaces (GUIs) for mobile devices. In providing rich media service such as Mobile TV services, one key component of the service delivery process that has the initial and the highest end-user exposure is the mobile devices' GUIs. The network operator realized the need to create a niche in the technological environment of the business ecosystem to develop competencies in GUIs for mobile devices. The content aggregator observes:

> *You know, certainly I know why the network operator went and spoke to a GUI developer for example, because I know that they make great Graphic User Interfaces (GUI) and front ends for the mobile phones. So you know that's why the network operator has gone and used that specific GUI provider and that's a great decision … And even before we started building this project right back at the start we saw for*

example, this particular GUI provider's user interface and other user interfaces that have been implemented around the world. They [GUI provider] stood out. So it's clear to see why the network operator went with them [GUI provider] (PAR 3 – Manager, New Media Platforms, Content Aggregator).

All three examples discussed above concerning the addition of new channel actors, the creation of niches to develop EPG capability, and development of GUIs for mobile devices within the content and the technology environments are clear indications of the importance of niche creation to sustain innovation in business ecosystems. In effect, niche creation augments the new service development capability of the Mobile TV ecosystem. Through the creation of niches in the ecosystem, new capabilities for the provision of a rich media service emerge. Through the additional capabilities of the Mobile TV business ecosystem in providing additional capabilities such as new channel alternatives, EPGs and mobile GUIs, the new service development capability of the ecosystem increases in real terms in comparison to other competing ecosystems offering similar services. The ecosystem is better able to differentiate its Mobile TV offerings relative to other competing business ecosystems offering similar services.

In the development of both the EPG and mobile GUI capabilities, the development initiative was very much guided by a strategic plan developed and facilitated by the central actor (i.e. the network operator) in the Mobile TV ecosystem. The strategic plan as outlined by the network operator (PAR2) is seen to be part of the service development roadmap that defines the evolutionary path of the Mobile TV service into the future. Hence, the creation of niches for the Mobile TV service is certainly an important aspect of ensuring the new service development capability of the ecosystem.

5.2.2.4.2. Trial and Error and Protection of Niches during the initial stages of their Life Cycle

Kemp et. al. (1998) refers to the deliberate approach by a particular party in the ecosystem to develop niches as Strategic Niche Management (SNM). SNM is a strategy for policy-driven regime transition based on the creation of spaces protected from market forces. The creation of protected spaces is fundamentally about the creation of niches for the development, production and use of new technologies. Protected niches are formed around innovative technologies to act as sites of experimentation and learning about their desirability, their directions of future development and the ways to accelerate their diffusion within the business ecosystem before the dismantling of protection, so that the system is able to withstand the forces of competition. Kemp et. al. (1998) further argue that there must be an appropriate external environment that stimulates experimentation. In other words, in such an environment, there may be a dominant regime with inherent instabilities that favors the development of new technologies indirectly (hungry for new technologies to satisfy a certain application need). In the context of this case study, these instabilities are exhibited by the maturity of the Mobile TV ecosystem. The ecosystem in this case is relatively new in that it has been in its present form only for the past year. Even the infrastructure (the Horizontal SOAs architectures) for the development of the Mobile TV service is relatively new (to the infocoms sector) and is representative of the transition experienced by the infocoms industry. Hence, this suggests that the instabilities created by the business environment make it conducive for the development of new technological capabilities through niches.

Kemp et. al. (1998) also suggest the necessity for protection to be given to newly emerging technology niches within ecosystems due to their fragile development in the initial stages of the life of these niches. This is largely due to their tendency to be prone to failure as a result of the ‘trial and error’ path of development associated with niche creations concerning new technologies in a particular market context (such as the Mobile TV ecosystem)[53]. The partcipants in this study supported this observation with their own remarks, such as the following:

> *... it was through sheer necessity [consistent with the service development roadmap] that we had to identify the niches and the key capabilities to form the ecosystem. I mean, these [i.e. peripheral actors] are very fluid actors. We had to identify and in some instances discover certain technologies, content and applications [through trial and error]; and then nurture their development over time [provide protection for these niches as they develop particularly during the infancy stages]. This is certainly not what it [the ecosystem] looked like when we first started. It [the ecosystem] has developed into a much more complex system through the progressive development of new niches over time … The network operator certainly came to us to understand how we ran our business. Upon understanding our technologies and processes they were then able to plan for certain technologies [putting in place a strategic niche management blueprint] that were necessary for the delivery of content onto mobile devices. One example of this would be the network operator adopting the EPG function. (PAR 3 – Manager, New Media Platforms, Content Aggregator).*

> *There was a lot more testing involved [testing of new technologies]. Because the network operator was launching an*

[53] See Field Note 27 for further details of the notion of trial and error in the Mobile TV business ecosystem

application of a mobile phone that allowed for a whole lot of extra features, like EPG and fast channel changing an all that sort of stuff which really improves the service 300%. But there was a vast amount of testing that we needed to go thorough. Most of these capabilities [were developed] through the trials we ran. It was mentioned to me that there were 10,000 test cases or some huge amount of test cases that needed to be got through to make sure that it was all going to run smoothly. So it was through trial and error that we ultimately arrived at the final service we have today (PAR2 - General Manager of rich media services, network operator).

As mentioned by the participants above, although there is evidence deduced to suggest that the creation of niches in the ecosystem is strategically planned, the evidence also indicates that the implementation of a new technology or a service feature through the development of these niches are very much dependent on a 'trial and error' basis. For example, the identification of the EPG capability for Mobile TV services was in fact a strategic initiative that was to be exploited by the ecosystem in differentiating its Mobile TV service from other competing ecosystems. However, operationalizing the EPG capability involved a substantial amount of trial and error. It is the vulnerability of the niche's continued existence caused by the trial and error phase that necessitates that such newly formed niches are to be protected and nurtured until such time that the actors in these newly formed niches are able to fend for themselves.

5.2.2.4.3. Joint Creation of Niches in the Ecosystem

Adamides (2009) suggests that niches in business ecosystems can be created in three principal ways. The first way involves the intentional central planning by the key actor within the ecosystem. The second involves a bottom-up market oriented process that is spearheaded by local authorities (e.g. government policy) by using instruments such as incentives and tax deductions to influence the behavior of organisations. The third way is the formation of alliances with potential network actors that are based on the technology, resources, skill sets and competencies they possess, and may position them to play a significant role in the innovation process of certain business ecosystems. The evidence in the Mobile TV case study suggests that support for niche creation through central planning by the key actor within the ecosystem is actually achieved jointly between the central actor (network operator) and other primary actors (such as the content aggregator). This is realized through the formation of alliances with potential networks actors (be they primary or peripheral actors) who possess certain key technologies, resources, skill sets and competencies for new technologies and niches to be developed in the ecosystem, as confirmed by the following remarks:

> *The network operator certainly came to us to understand how we ran our business. Upon understanding our technologies and processes they were then able to plan for certain technologies that were necessary for the delivery of content onto mobile devices. One example of this would be the network operator adopting the EPG as part of their feature of the Mobile TV service (PAR 3 – Manager, New Media Platforms, Content Aggregator).*

Far from the notion of niches being identified and created entirely by the central actor, the amalgamation of both the EPG and the mobile device GUI capabilities in the Mobile TV ecosystem are in fact points of capabilities developed jointly between the central actor and other key actors in the ecosystem. Although niche creation within ecosystems is initiated through strategic planning by the central actor based on the service development requirements facing the business ecosystem, the evidence suggests that niches are in fact jointly created by key actors within the ecosystem[54]. The researcher observed that central actors by themselves are not entirely capable of developing niches independently. Different participants have acknowledged the importance of joint creation of niches:

> *I see that cooperative behavior is critical to make sure that all parties that are involved in creating an ecosystem. The reason that this is important is that each of the different organisations that make up the ecosystem bring different capabilities to that ecosystem. Collectively these actors [niche actors] through their specialist understanding of the technology and applications can then jointly create niches that develop other capabilities required by the ecosystem to create new services (PAR6 – Senior Consultant and Project Manager, Systems Integrator).*

> *So it quite unique and it requires a very close interaction between ourselves and the network operator because if we start playing the loop [Mobile TV content to synchronize with the EPG details] at the wrong time, and the network operator start showing the guide at the wrong time, it's not going to work. So, you know, even today I was on the phone with the network operator talking to them about the EPG and to make sure that things were in sync (PAR 3 – Manager, New Media Platforms, Content Aggregator).*

For example, in developing EPG capability for the Mobile TV service, the network operator initiated the idea for the creation of a new niche within the content environment of the business ecosystem, specifically dedicated to the development of

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[54] See Field Note 27 for further details of the joint creation of niches in creating new capabilities such as EPG for the Mobile TV business ecosystem.

mobile devices EPG capability. However, the researcher observed that the network operator's capacity to independently oversee the development of the EPG seemed next to impossible due to the time, resources and competencies constraints they faced. This was largely due to the fact that the EPG technology involved a highly specialized field of knowledge. The network operator's embedded position in the telecommunications domain within the technology environment meant that their exposure to the content environment and the technical requirements of the content environment in particular was limited. This necessitated the involvement of the content aggregator and the systems integrator as strategic partners in their decision to employ and deploy EPG capability in mobile devices delivering the Mobile TV service, as acknowledged by the network operator:

> *I think it all comes about due to the complexity of these products … for one company to be able to do all of that [identify and develop a new technology through the creation of new niches] … well it would be impossible. We [network operator] wouldn't have been able to meet the time frames imposed on us and also keep up on the standards and so what we do is we seek out the best or the specialist in each of the fields [of technology or applications] and aggregate them together [in the context of the Mobile TV ecosystem] to provide a service, end-to-end (PAR4 – Technology Specialist, Content Engineering, Network Operator).*

Kemp et. al. (1998) indicated that, apart from the availability of protected spaces for incubation, the possibility for continuous evaluation and incremental improvement of the prospective technology in niches through trial and error, also indicated that the technology (in its present form) should be already attractive to be used (and used) for certain applications. As deduced from the evidence, the EPG, apart from already being used in the mainstream broadcast TV services, was certainly positioned for use in the Mobile TV service delivery. As the content aggregator (PAR3) suggests:

> *We [content aggregator] have been using the current EPG producer for our TV service for sometime now. So it wasn't much of a stretch to say that we would like to produce EPGs for mobile channels (PAR 3 – Manager, New Media Platforms, Content Aggregator).*

The EPG solution was already employed in the traditional TV market (i.e. the cable TV service market) in which the content aggregator is a dominant actor. However, in the Mobile TV market, EPG solutions were non-existent at the time of this research. This positioned the content aggregator to better support the initiative of the network operator in setting out the possible constraints in employing the EPG solution in a mobile context. This also positioned the content provider to jointly contribute to the development of the EPG solution for the Mobile TV ecosystem. On the other hand, the systems integrator was able to leverage their expertise to ensure that the EPG solution provided by the EPG software developer was compliant and compatible with the telecommunications infrastructure requirements and the mobile devices that were employed in the delivery of the Mobile TV service. In short, the EPG solution needed to be redesigned to the requirements of the other integrating systems and devices before it was formally adopted as a feature of the Mobile TV service. This joint effort between the network operator, the content aggregator and the systems integrator underscores the fact that joint dependence between these actors enabled the creation of the EPG niche.

From the evidence deduced from industry participants it is clear that the adoption of prospective technologies through the creation of niches directly augments the Mobile TV ecosystem's capability in producing new rich media services. In effect, these niches structurally differentiate the Mobile TV ecosystem's capability from other competing ecosystems. The capabilities that emerge as a result of these new niches directly impact upon the ability of the ecosystem to differentiate its services and in the process remain competitive in relation to other ecosystems offering similar services.

The preceding arguments supported by the evidence suggest that new niches are conceived through a thoroughly developed strategic initiative, which includes the systematic analysis and development of prospective technologies to fill a competence gap in the ecosystem's capability to develop new services. It has been observed that the process of niche creation is evident throughout all stages of the new service development process. Trial and error is a significant part of the niche creation process observed in the Mobile TV ecosystem. As the Mobile TV ecosystem system itself is in its infant stages of development, and in such a dynamic envornment as the rich media services, there seem to be inherent instabilities that indirectly favor the development of new technologies. Finally, new niches in ecosystems are created jointly between the central actor (i.e. the network operator) and other key actors who have existing knowledge of the technology being considered for niche development.

Having substantiated the significance of niche creation to the structural differentiation of the Mobile TV ecosystem and its important contribution to the viability of the new service development activities of the ecosystem, proposition P_4 is revised as follows:

P_4: The determinants of structural differentiation (strategic niche management, joint niche creation and trial and error of technology) rather than network interconnectedness contributes to the new rich media mobile service development capability in the Mobile TV ecosystem.

Comments: The theoretical contribution in regard to this proposition is the extension of the contribution made by Gulati and Gargiulo (1998). Gulati and Gargiulo (1998) define structural differentiation "as an emergent systemic property that captures the extent to which actors (organisations) come to occupy an identifiable set of network positions, each of them characterized by a distinctive relational profile" (p. 1450). The evidence provided in this thesis suggests that the emergent systemic property that actors (organisations) come to occupy in an identifiable set of network positions is in fact niches. The creation of niches according to the evidence deduced in this thesis indicate a joint niche creation initiative; a systematic effort in strategic niche management initiatives; and the diligent management of key technologies on a trial and error basis on the part of the primary actors in the Mobile TV ecosystem. As acknowledged in the literature, niche actors are critical in generating value in business ecosystems in terms of their specific role and capabilities in the development of services and applications. Due to their unique and specialized area of competencies, their propensity to create innovative services and applications based on the platform offered by the central actor is highly valued and widely acknowledged by the business ecosystem as a whole. This then promotes the necessity for business ecosystems to be on a constant search for such niche actors within and without the business ecosystem to ensure the vitality and the capability of the business ecosystem in creating new rich media services.

5.2.2.5. Co-opetition (RQ1: P^5)

Proposition P^5 suggests that organisational relationships between actors in the business ecosystem are affected by the dynamics between competitive and cooperative behavior. This notion of competitive and cooperative dynamics between actors is captured by the term ‘co-opetition’ (Brandenburger and Stuart 1996; and Brandenburger and Nalebuff, 1996). Co-opetition gives prominence to the dynamic nature of competitive and cooperative activities taking place concurrently between the same actors in the business ecosystem. The notion of cooperation is based on the need for collaboration among actors to share risk, resources, skills and know-how in order to exploit market opportunities that could not otherwise be solely achieved by any single actor. However, there is also the notion of competition between these same actors. Competitive dynamics between the actors reduces inefficiencies that might otherwise occur in business ecosystems that only display features of cooperative relationships. Competition promotes the leanness of the business ecosystem’s capability to develop new services. P^5 suggests that the forces of co-opetition ultimately facilitate the development of dynamic capabilities within the business ecosystem, increasing its competitiveness in developing new rich media services. Co-opetition between actors in the Mobile TV ecosystem is discussed in the following sections.

5.2.2.5.1. Co-opetition within Niches in the Mobile TV Ecosystem

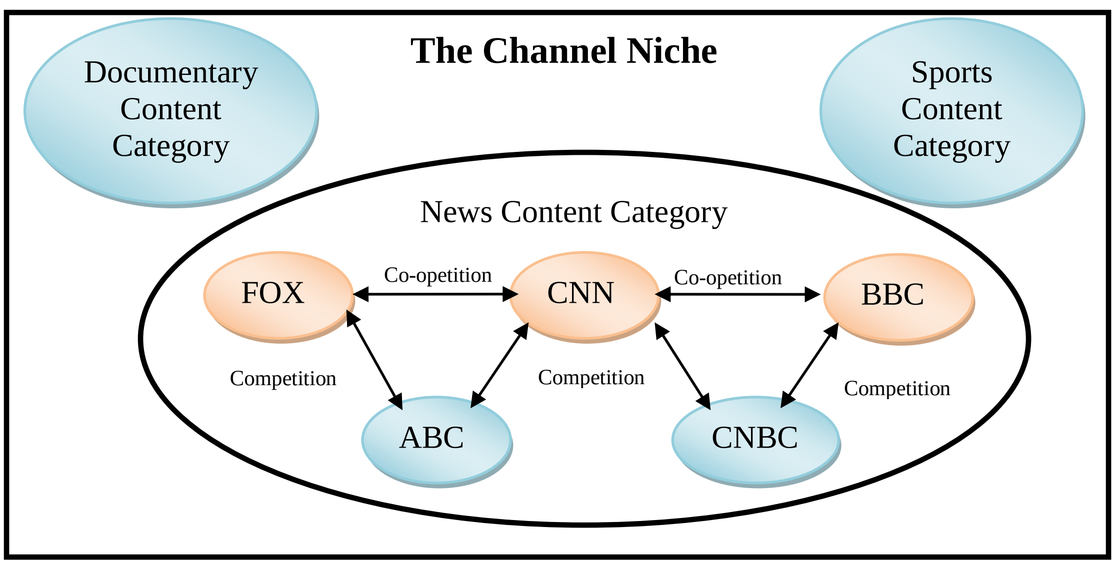
Evidence of the dynamics of co-opetition emerges in several niches within the Mobile TV business ecosystem. In the content environment, co-opetition was particularly prevalent among channel actors. At the time of the data collection, there were approximately 100 channels (i.e. actors) contractually obligated through SLAs to provide content in various categories (i.e. news, sports, entertainment, documentaries, children shows, music, etc.) via the content aggregator. Signs of co-opetition were evident in the form of *simple network co-opetition*, as discussed by the content aggregator (PAR3):

> *I think in a similar way we have seen perhaps the channels competing … They all want to be number one channels when you stack them up by channels listing and see who is most popular and who is not. But by the same token they are very keen to get listed as number one by content category [e.g. news, entertainment, documentary, etc.] … When we start packaging these channels even though they could not all be the number one channel, they [the channels] wanted to position themselves next to the other channel that they feel are very powerful … So there is intense jockeying for positions between them [competition] … when someone takes the news pack for example, they feel that their number of subscription is going to go up, if they are there with CNN [in the News category]. So you can sort of see that they are very competitive but they also want to get alongside their competitors when they know that their competitors are also strong [cooperation]. These other channels are willing to work with CNN for example to secure a 1^{st}, 2^{nd} and 3^{rd} position in the news packs, with CNN occupying the first position of course. They then lobby as a group [cooperation] to secure that 1^{st}, 2^{nd} and 3^{rd} positions … the key is that they wanted to be in the most popular positions and category obviously, because when it comes to payment, it's an important factor. You know I think that's a similar case for channels in other categories of content such as entertainment, documentary, sports, etc. … So we [content aggregator] actually worked with the network operator and decided what the listing order of the packaging was going to be for the service. We then went back and communicated that to the channels, which they don't have any say about, some of them*

were happy and some of them weren't. But the final decision lies with us [content aggregator and the network operator] (PAR 3 – Manager, New Media Platforms, Content Aggregator).

The evidence deduced indicates that, although channels within the same category are essentially competitors in the larger sense (in the traditional broadcast industry), they are nevertheless willing to form alliances with market leaders in their content categories to cooperatively develop solutions (in the form of content packages) to co-exist in the top three position of the category listing of the Mobile TV service. This is further represented in *Figure 5.8*.

Figure 5.8: Dynamics of Co-opetition within the Channel Niche of the Mobile TV Ecosystem



Co-opetition is a clearly observable phenomenon within the news channel category. However, co-opetition is not specific to the news channel category. As the content aggregator suggests, other categories of channels including entertainment, documentary, children shows and sports have also exhibited similar co-opetitive behaviors with otherwise direct competitors[55].

The dynamics of simple network co-opetition were also observed in the technology environment where co-opetition was particularly prevalent among the Devices OEMs (Original Equipment Manufacturers):

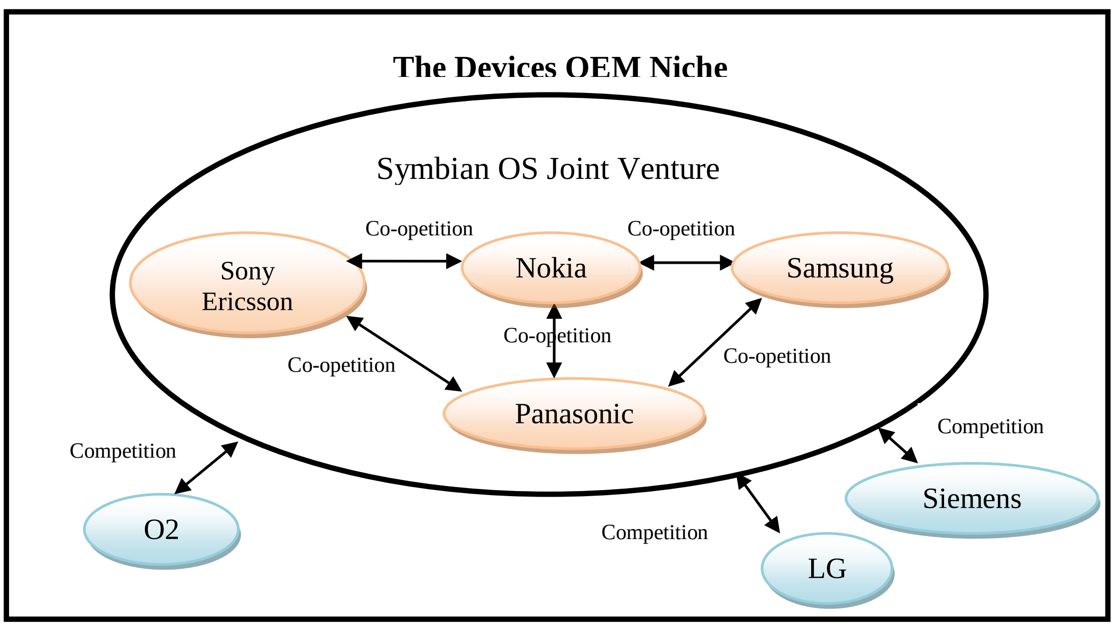
> *[The Device OEMs] could have some elements of co-opetition between them. Obviously the market for OEM device manufacturers are very cut-throat in nature at the moment [competition]. I guess the cooperative part of the relationships between these actors are rooted in the open source OS (operating systems) they are jointly developing. So there is specific clusters within the Devices OEM niche that exhibit this behavior. For example, Symbian consist among others Devices OEMs like Nokia, Sony Ericsson, Samsung and Panasonic. These are some of the Devices OEMs that supply handsets to us [network operator]. So they compete in devices manufacturing and cooperate in the area of OS (operating system) development. These Devices OEMs are forces to do this to counter new entrants such as Google a new comer launching their Android [a Google mobile devices operating systems], which is a open source platform [Operating System]. Apple is another new comer launching the iPhone with their platform [Operating System]. So yes they [the authorized devices OEMs in the Mobile TV ecosystem] are all trying to compete with each other but they do cooperate on certain issues to counter new entrants [such as Google and Apple] (PAR5 – Solutions Architect, Network Technology, Network Operator).*

The network operator (PAR5) indicates that, although Devices OEMs do compete vigorously with each other to be the preferred choice of Devices OEM of the

[55] See Field Note 28 for further evidence of jointly commissioned research by the network operator and the contet aggregator.

network operator for the Mobile TV service, these same Devices OEMs cooperate with each other in other value fronts (e.g. the Operating System domain) to collectively develop open source OS such as Symbian to offset the possibility of non-traditional entrants such as Apple and Google becoming a longer term threat to their survival[56]. A graphical illustration of the dynamics of co-opetition between actors within the Devices OEM niche is shown in *Figure 5.9*, which represents the manifestation of a simple form of network co-opetition.

Figure 5.9: Dynamics of Co-opetition within the Device OEM Niche of the Mobile TV Ecosystem



Apart from the channel and the mobile devices OEM niches, co-opetition dynamics in the Mobile TV ecosystem was also evident in the systems integration niche

[56] See Field Note 29 for the mention of Symbian OS as an example of co-opetition within the business ecosystem.

of the technology environment. As the systems integrator (PAR6) appointed to the Mobile TV project suggests:

> *Another perfect relationship of co-opetition in our context, although the relationship end up being a bit different is our [systems integrator] relationship with IBM in this project. IBM is our number one competitor. They have all the capabilities we have in terms of systems integration capabilities. They have a similar consulting setup like our company [the system intergrator]. But at the same time we also collaborate. We are also a very large customer of IBM. We buy and implement a lot of their software and hardware for this project [Mobile TV project]. They have good quality products. But it creates an interesting dynamic in our relationship because we started out competing for the same project to perform the same role [i.e. systems integrator] in this ecosystem. But the project got awarded to us. So we then built a relationship with IBM to buy some of the component products and services that IBM had to offer. So there is still a win-win situation there. There are times that you could be fierce competitors at the beginning and then we could work out a healthy working relationship [cooperation] that can then make it successful. But we remain fierce competitors for contracts in other ecosystems of similar nature around the world. So we could be cooperating within this ecosystem, but simultaneously fiercely competing on another project in another corner of the globe (PAR6 – Senior Consultant and Project Manager, Systems Integrator).*

However, the co-opetitive dynamics between the actors in the systems integration niche of the technology environment reveals a difference in that there were only two organisations (the appointed systems integrator and IBM) observed in the co-opetitive relationship. Hence, it appears that this is the only example of a simple dyadic form of co-opetition observed in the Mobile TV ecosystem.

The evidence deduced suggests that co-opetition is in fact a very real phenomenon between actors within the same niche. The evidence also suggests that both simple dyadic co-opetition and simple network co-opetition is observed in the Mobile TV ecosystem. It has also been observed that actors performing a particular role in one ecosystem can also be simultaneously performing a similar role in another business ecosystem. This is evidenced in role of the systems integrator in this case study and its competitor IBM. However, this research is not designed to analyze the impact of the involvement of the actors in multiple ecosystems will have on the capability of the Mobile TV ecosystem. This has been acknowledge as a limitation of this research and future research is certainly encouraged to ascertain the impact that these actors would have on a given business ecosystem given their involvement in multiple business ecosystems.

Therefore, it can be concluded that signs of the dynamics of competition and cooperation are concurrently present in the relationships between actors within these niches. This has been observed amongst firms within the content environment and the technology environment in the Mobile TV ecosystem[57].

5.2.2.5.2. Co-opetition between Niches in the Mobile TV Ecosystem

The evidence of co-opetition dynamics is not merely limited to specific niches within the ecosystem. Co-opetition dynamics have also been observed to occur between niches. One instance in which co-opetition dynamics has been observed between niches

[57] See Field Notes 29, 30 and 31 for examples of coopetitive dynamics within the content and technology environments of the mobile TV business ecosystem.

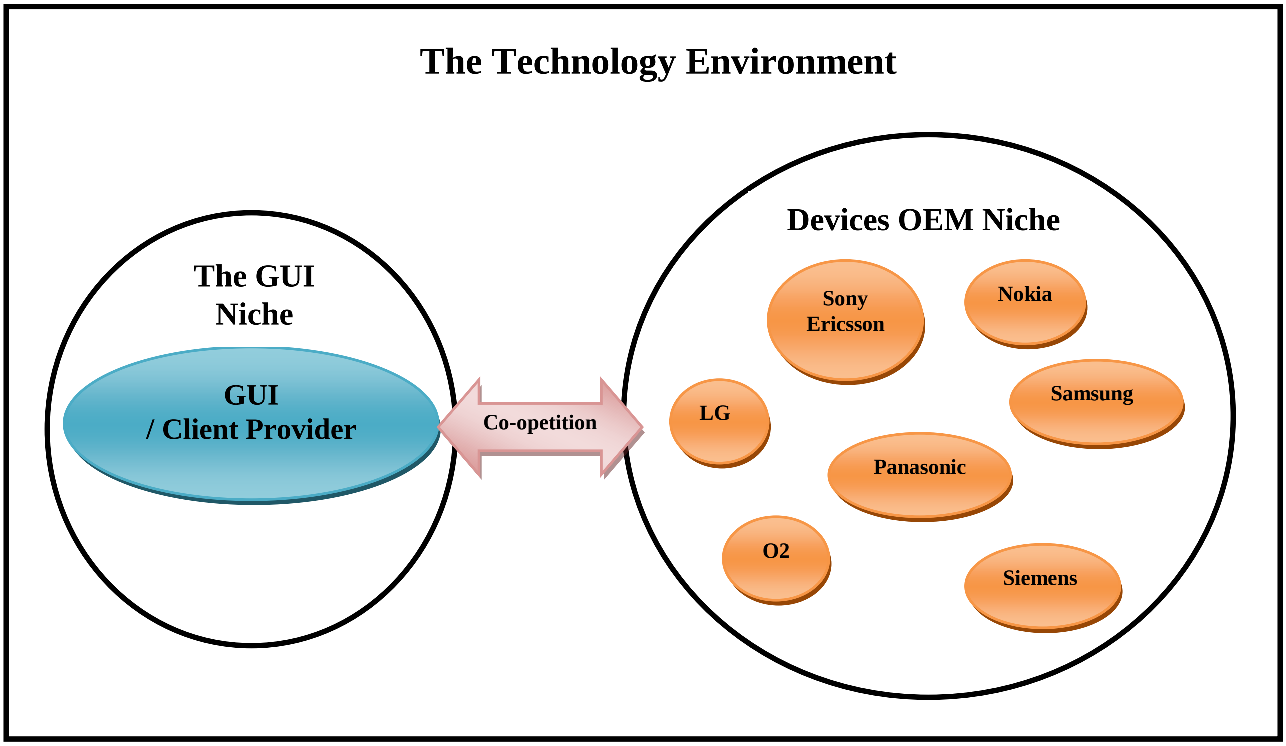
is in the activities represented by the relationship between the GUI provider and the mobile devices OEMs. This is discussed by the network operator (PAR5):

> *They [the mobile devices OEMs] work with the GUI provider to make sure that the application, the GUI provider application is the client of choice embedded in the handsets selected for the Mobile TV service … But the GUI provider is not a handset company. It develops GUIs for the Handsets. But then again the individual devices OEMs are entirely capable of developing their own GUIs as well. We [network operator] appointed a specialist GUI provider because we wanted to standardize the GUI or client as we call it, across all OEM mobile devices model available for the Mobile TV service. This enables us to deliver the Mobile TV service without encumbrance (PAR5 – Solutions Architect, Network Technology, Network Operator).*

It is clear that, although positioned in a different niche performing specialized niche functions in the context of the Mobile TV ecosystem, the various devices OEMs are, nevertheless, competitors due to their capability in providing mobile devices GUI. Despite performing different niche activities, both the devices OEMs and the GUI provider, are capable of providing the exact same solution. This effectively positions these actors with a competitive disposition to one another[58].

[58] See Field Note 30 for indication by participants that Device OEMs have inherent capabilities to develop their own clients or GUIs

Figure 5.10: Dynamics of Co-opetition between Niches in the Mobile TV Ecosystem



competitor in the GUI value provision activity. Both categories of actors share the same capability in that they have a substitutable capability and are therefore perceived as a threat to each other. However, having acknowledged the competitive disposition towards each other, both the GUI provider and the mobile devices OEMs work together under the supervision and facilitation of one of the network operator's business units, the Mobile Devices and Testing Unit. The Devices OEMs' cooperative activity with the GUI providers involves the embedding of the GUI on all models of mobile devices selected by the network operator for the Mobile TV service.

The dynamics of co-opetition have been observed in both the content and the technology environments of the Mobile TV ecosystem. However, it is not the dynamics of co-opetition that seem to ultimately contribute to the new service development capability of the Mobile TV ecosystem. Rather, the evidence suggests that beyond the dynamics of co-opetition lies the notion of *dynamic capabilities.* Dynamic capability emerges as a result of the co-opetition phenomenon that is characteristic of the Mobile TV ecosystem. The dynamic capabilities that emerge as a result of the value creation and capturing process of co-opetition between actors in the ecosystem are responsible for the increased new service development capability of the Mobile TV ecosystem.

5.2.2.5.3. Dynamic Capabilities Emerge from Co-opetitive Relationships in the Mobile TV Ecosystem

It appears that the cooperating forces between otherwise direct competitors create a larger business presence of these actors in the ecosystem. For example, the mobile OS domain has not traditionally been a typical business domain that can be associated with mobile devices OEMs. Mobile Devices OEMs have always been more confined to developing mobile devices (i.e. hardware) and have always in the past left the OS service (i.e. software) provision to other more specialized and independent organisations. However, due to the imminent threat posed by non-traditional actors in the OS space such as Apple and Google, Mobile Devices OEMs were forced to take preemptive measures to safeguard their business domain through their participation in the OS business domain in collaborative alliance with more established actors in the Mobile OS market including Psion and Microsoft (Ancarani and Shankar, 2002; Ancarani and Shankar, 2003). The collaboration of the Mobile Devices OEMs in developing open source mobile OS such as Symbian has in fact contributed to their capacity to renew their competencies so as to achieve congruence with the changing business environment. The the imminent threat the Devices OEMs face in the light of Apple's and Google's entry into the mobile services market with the iPhone and Android Operating systems respectively are example of events encouraging collaboration between Devices OEMs in developing open source mobile OS. By acquiring capabilities in providing mobile OS, the mobile devices OEMs effectively developed a capacity to ward-off the potential threat posed by organisations such as Apple and Google. It can then be argued that the wider competitive forces that threatened the long-term survival of the mobile devices OEMs industry actually triggered the dynamics of co-opetition. The dynamics of co-opetition enabled the mobile devices OEMs to renew and augment their competencies so as to achieve congruence with the changing business environment in the face of the ever increasing challenges posed by this dynamic environment. This striving to collectively renew existing capabilities is the hallmark of dynamic capability at work (Wang and Ahmed, 2007).

Similar evidence gathered during the interviews also explains the dynamic capabilities that emerge from the system integrator niche. The appointed systems integrator was in direct competition with IBM during the bidding stages of the project. Subsequent to winning the contract, the appointed systems integrator fully engaged with IBM to jointly develop capabilities that contributed to the possibility of making the end-to-end Mobile TV service a reality. For example, in providing the 'service orchestration' capability in the new service development platform (NSDP) of the Mobile TV ecosystem, the systems integrator worked collaboratively with IBM to adapt the IBM Tivoli® orchestration and provisioning software. The IBM package is a collection of methods, tools and processes necessary to transform an IT infrastructure into a self-assessing, dynamically provisioned, utility-centric computing environment using IBM Tivoli Provisioning Manager and the IBM Tivoli Intelligent Orchestrator software[59]. Through the adoption and customization of this software, the systems integrator and IBM were able to jointly construct the service orchestration capability.

The systems integrator and IBM are in fact arch rivals, having similar capabilities in the area of systems integration. However, due to their co-opetitive relational dynamics, the dynamic capability that emerged from this relationship made possible the joint development and delivery of the service orchestration component, a critical component of the new service development platform (NSDP). The availability of the service orchestration capability in the NSDP enabled subscription capabilities to be available to the network operator in managing the delivery of Mobile TV services.

The evidence deduced in the area of competition and cooperation indicates that co-opetition is in fact a real phenomenon characterizing rich media service developments such as Mobile TV services. However, it is not merely the forces of co-opetition that contribute to the new service development capability of the ecosystem. Co-opetition enables the emergence of dynamic capabilities. It is the emergence of dynamics capabilities that makes the contribution to increased new service development capability of the Mobile TV ecosystem. Therefore, proposition P_5 is revised to reflect this finding:

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[59] See Field Note 31for further details on the IBM Tivoli® orchestration and provisioning package.

P_5: Co-opetition between actors within niches and between niches brings to prominence the dynamics of both competition and cooperation in the business ecosystem. Co-opetition (between actors within niches and between niches) promotes dynamic capabilities within the business ecosystem. It is these dynamic capabilities rather than network interconnectedness that emerge, as a result of such co-opetition, to drive the rich media new service development capability of the Mobile TV ecosystem.

Comments: The term co-opetition was first coined in strategy research by Brandenburger and Stuart (1996) and Brandenburger and Nalebuff (1996). The dynamics of co-opetition have been observed in two different forms; namely, simple dyadic co-opetition and simple network co-opetition. A deeper analysis of both these forms of co-opetition reveals that the dynamics of co-opetition between actors is also prevalent both between actors within niches and actors between niches. However, it is not merely the dynamics of co-opetition that contribute to the new service development capability of the ecosystem. Rather the evidence suggests that the dynamics forces of a co-opetitive relationship between actors, be it in the context of a simple dyadic co-opetitive or a simple network co-opetitive context, enables the emergence of dynamic capabilities. It is the emergence of dynamics capabilities that makes the contribution to increased new service development capability of the Mobile TV ecosystem.

5.2.2.6. Lead Customer Knowledge (RQ1: P^6)

In the context of the Mobile TV ecosystem, the network operator emerges as the customer who purchases services and technology components from niche actors. This is supported by the very existence of agreements such as the Service Level Agreements (SLAs) between the network operator and other actors within the Mobile TV ecosystem.

Agreements such as SLAs form the basis of a business relationship between the customer (network operator) and the supplying organisations (primary and peripheral actors) in the Mobile TV ecosystem, as the content aggregator (PAR3) suggests in the following comments:

> *... because the network operator owns that relationship [with the other actors through the SLAs] . But you know from the view point of the content aggregator, we really think that the network operator is the customer in the context of the Mobile TV ecosystem [from a B2B context]. At the end of the day we sell aggregated content to them [the network operator]. In the technology environment it also appears that companies like the systems integrator, the network operator and others also have a supplier customer relationship through their respective individual agreements [e.g. the SLAs] with the network operator (PAR 3 – Manager, New Media Platforms, Content Aggregator).*

However, the evidence deduced from the data reveals that although the customer is essentially the network operator in the context of the Mobile TV ecosystem, the network operator does not qualify as a lead customer. This is due to the fact that industries such as telecommunications, media and computing were experiencing a process of deconstruction and subsequent reconstruction (Srivastava and Finger, 2005). What subsequently emerged from the reconstruction of the industry is what is known today as the 'infocommunications' sector, a transformation that was discussed in detail in chapter 2 (Barnes 2002; Kärrberg and Liebenau, 2005; Fransman, 2002).

This emerging landscape essentially forced traditional network operators around the world to travel a transformation route that involved significant investments in their network infrastructure through deploying IP-enabled systems and equipment commonly referred to in industry as the Next Generation Network (NGN). The adoption of such horizontally designed network architectures essentially enabled the major network operators in the world to bring advanced services – including rich media mobile services – to the marketplace. The emergence and adoption of NGNs based on IP technology has had a direct impact on how traditional telecommunications operators innovate in that it positions the network operator "as a flexible factory of innovative services" (Eduarado and Sato, 2008, p. 6).

The evidence suggests that the network operator that is the focus of this study is not the only network operator in the world that is currently undergoing an infrastructure transformation program to equip itself for the provision of rich media services. The following argument by the systems integrator suggests that the transformation process is a process that is global in nature and is affecting the very fabric of the infocoms industry:

> *The network operator is certainly a customer for us and for others in the ecosystem. But to say that they are a lead customer may not be entirely true. At this point in time in the industry, the network operator [under observation] is not the only network operator that is undergoing a transformation with regards to its network infrastructures and getting ready with its capability to deliver rich media service. I mean while we are involved in this project, we are simultaneously involved in working with other major operators in the world in their transformation efforts. I know of similar transformation projects happening in the Americas, Europe and Asia. Companies such as Vodafone, BT, Telecoms Italia, AT&T, NTT Docomo, just to mention a few have all undergone transformations and is continuing their transformation programs in other areas apart from mobile services including fixed line services. And we*

have been involved and in some cases still involved in such transformation programs around the world. So really it is the whole sector facing a transformation need. Network operators around the world would have to change or they would ultimately find themselves out of alignment with the business environment. They would need to have the next generation infrastructure put in place to compete in the future. They would not be prepared for the competition tomorrow if they don't get prepared for it today. Delivering content is not a business that is confined to a select few network operators. Today every operator will have to be able to in some form be able to deliver content to stay competitive. (PAR6 – Senior Consultant and Project Manager, Systems Integrator).

This transformation facing the global infocoms industry effectively indicates that the network operator observed in this case study of Mobile TV does not necessarily qualify as a lead customer as the shift towards horizontal network architectures for the development and delivery of rich media mobile services is a global phenomena and not confined to the Mobile TV case study observed by the researcher.

Thus, the likelihood that the network operator in this case study occupies the role of a lead customer remains remote given the definition of a lead customer provided by von Hippel (1986). Von Hippel (1986) argues there are two distinguishing features of lead customers. The first is the capability of lead customers to be particularly effective in articulating a future mass market need based on their current needs due to the fact that these types of customers are ahead of the market in terms of need related trends. The second feature is that they are motivated to develop a new invention ahead of general market needs so as to derive a significant innovation-rleated benefit (through both financial and non-financial means) by obtaining a solution to their current needs (von

Hippel, 1986). In the context of this case study, both characteristics seem to be distorted by the transformation affecting the infocoms sectors in general.

Until a sense of stability returns to the infocoms sector at the end of the transformation period, it will be rather difficult, if not impossible, to identify lead customers (due to the distortion presented by the transformation process experienced by the infocoms sector). Thus, one can argue that when stability in the infocoms sector is established, lead customers can then be clearly identified and subsequently examined for their impact on the rich media service development capability of ecosystems such as the Mobile TV ecosystem.

Therefore, based on the arguments presented in explaining the concept of 'lead customer', this research rejects proposition P^6 as stated below:

P^6: Lead business customer knowledge contributes to increased NSD capability in the business ecosystem.

Commentary: This working proposition claimed that the lead customer - which in the context of this study refers to network operators – is critical to the service development capability of the business ecosystem. However, the data obtained from the interviews suggests that the notion of a lead customer cannot be established under the current circumstances faced by the infocoms sector. The transformation involving the adoption of horizontally aligned infrastructures for the development of rich media mobile services is a sectorial wide initiative in the global marketplace. It can be argued that the market is therefore not experiencing a normal phase of development given the transformation that is currently in progress. This thesis argues that the notion of a lead customer is more clearly identifiable in a market situation that is more stable in nature and more reflective of certain network operators possessing lead customer characteristics when compared to other network operators. Given the circumstances facing the thesis, P^6 cannot be applied to the research context and is therefore rejected.

5.3. Summary of Validated Research Propositions

Table 5.1: Summary of Validated Research Propositions

Research Questions/ Research Concepts	Working Propositions Developed From Literature Review	Testable Proposition Developed from Data	Status of Proposition (Accepted, Rejected or Revised)
RQ1: Joint Dependence	P^1: Joint dependence in business ecosystems rather than network interconnectedness potentially enhances new rich media services development capability.	P_1: The determinants of joint dependency (embeddedness; mutual empathy and bilateral commitment; structural congruence; and familiarity and mutual forbearance) rather than network interconnectedness, enhance rich media development in the mobile service ecosystem.	Revised
RQ1: The New Service Development Platform (NSDP)	P^2: The SDP is the new service development platform (NSDP) that contributes to new rich media service development capability in business ecosystems.	P_2: SOAs such as SDF, the SDP and the Mobile TV platform all collectively form the new service development platform (NSDP) that underpins the business ecosystem's capability in developing Mobile TV services.	Revised
RQ2: Network Centrality	P^3: Network centrality in a business ecosystem contributes to new service development capability through the provision of a common direction for the other actors in the ecosystem.	P_3: The determinants of network centrality (framework of SLAs; new service development platform (NSDP); Interorganisational New Service Development Framework (INSDF); and the visibility and attractiveness of the network operator) rather than network interconnectedness enhance rich media mobile service development capability in the mobile service ecosystem.	Revised
RQ2: Structural Differentiation	P^4: Structural differentiation contributes to niche creation within a business ecosystem and in the process, positively promotes new service development capability.	P_4: The determinants of structural differentiation (strategic niche management, joint niche creation and trial and error of technology) rather than network interconnectedness contributes to the new rich media mobile service development capability in the Mobile TV ecosystem.	Revised
RQ2: Co-opetition	P5: The competitive and cooperative (co-opetitive) behaviors among actors promote new service development capability.	P_5: Co-opetition between actors within niches and between niches brings to prominence the dynamics of both competition and cooperation in the business ecosystem. Co-opetition (between actors within niches and between niches) promotes dynamic capabilities within the business ecosystem. It is these dynamic capabilities rather than network interconnectedness that emerge, as a result of such co-opetition, to drive the rich media new service development capability of the Mobile TV ecosystem.	Revised
RQ3: Lead Customer Collaboration	P^6: Lead business customers knowledge contributes to increased NSD capability in the business ecosystem.	N/A	Rejected

5.4. Thesis Review

A gap in the research literature regarding the major domains positioning this thesis – innovation, network and new service development – has been identified and explained based on a comprehensive review of literature and based on a theoretical triangulation that followed a comprehensive review of the literature.The theoretical triangulation process ultimately led to the conception of the overarching research question (RQ) as follows:

What factors affect interorganisational NSD capability?

Subsequent probing research questions (RQ1, RQ2, and RQ3) were then developed to more effectively guide the scope of this thesis at the point of time the research was undertaken. These research questions are as follows:

> ***RQ1: What are the concepts that define the notion of 'network interconnectednesses' in NSD activities between actors within business ecosystems?***
>
> ***RQ2: What are the concepts that define the nature of 'collaboration' in NSD activities between actors within business ecosystems?***
>
> ***RQ3: What is the nature of 'customer involvement' in NSD activities within business ecosystems?***

These research questions formed the basis of the inquiry in this thesis. The working research propositions developed from the literature review (see *Table 4.1* and the subsequent revisions featured in in *Table 6.1*) are indicative of the link between the various working research propositions and its contribution to the evolving theoretical framework guiding the thesis. The following is a review of the research questions (RQ1, RQ2 and RQ3) and the corresponding research propositions:

> **RQ1:** ***What are the concepts that define the notion of 'network interconnectednesses' in NSD activities between actors within business ecosystems?***

As indicated in *Table 6.1*, the study concludes that both joint dependence and new service development platforms (NSDPs) are critical contributors to the NSD capability of the business ecosystem. A framework for understanding the effects of joint dependence in ecosystems is based on analysis of determinants such as embeddedness; bilateral commitment and mutual empathy; structural congruence; and familiarity and mutual forbearance.

Contrary to the original assumption based on the literature review undertaken earlier in this research that network interconnectedness is a cornerstone concept defining the NSD capability of the business ecosystem, the evidence is conclusive that joint dependence rather than network interconnectedness enhances the development of new rich media services in ecosystems. This finding is based on the triangulation of data. The following characteristics collectively substantiate the importance of joint dependence in the development of new rich media mobile services: (1) the uniquely embedded position that each actor occupies in the ecosystem given their resources and capability profiles; (2) the bilateral commitment and mutual empathy that is manifested in relationships between actors as a result of their clearly defined roles in the ecosystem; (3) the nature of the technologies that are introduced into the ecosystem and the dependencies they create in the development of new services; (4) the structural congruence between actors that is required in interfacing assets, systems and business processes; (5) and the familiarity and mutual forbearance that prevails through maturity in relationships as actors realize these relationships profoundly hinge upon the dependencies between actors.

The theoretical contribution of this research is its extension of the contribution made by Gulati and Sytch (2004). Despite elaborating on the evolution of joint dependence from the notion of interdependence, Gulati and Sytch (2004) remain silent on the determinants of joint dependence. They mention the fact that joint dependence is anchored in the notion of embeddedness. However, their arguments do not include any detailed empirical evidence to support the notion of embeddedness in any given research setting. This thesis attempts to resolve that theoretical gap by analysing the determinants of joint dependence (embeddedness; mutual empathy and bilateral commitment; structural congruence; and familiarity and mutual forbearance) to account for joint dependence in rich media mobile service development.

The evidence suggests that SOAs such as the SDF, the SDP and the Mobile TV platform (the NSDP) collectively underpin the capability of the Mobile TV business ecosystem to develop new rich media Mobile TV services. The empirical evidence suggests that ecosystems promote joint dependence of actors through a common technological architecture – in this case study, the NSDP. The SDF and the SDP provide standardized reusable components such as billing, presence and identity, while the Mobile TV platform provides other Mobile TV service specific capabilities such as content management and remittance components. The Mobile TV platform enhances the joint dependence between actors in the business ecosystem through the intensive system integration between actors that is facilitated by the ‘open’ nature of the Mobile TV platform. The evidence suggests an underpinning importance of SOAs such as the NSDP in the provision of rich media services. The SOAs are in fact directly attributable to the service development capability of the Mobile TV ecosystem

The theoretical contribution of Peppard and Rylander (2006) regarding the significance of the NSDP is extended in this research. Peppard and Rylander (2006) take on the notion of platform in specifically identifying SOAs such as the SDP as a rich media mobile service platform. However, Peppard and Rylander (2006) stop short of describing the SDP as a component of the NSDP. The theoretical contribution of this research is the extension of Peppard and Rylander’s (2006) contribution to include SOAs such as the SDF, the SDP, and the Mobile TV platform as components of the NSDP underpinning the development of rich media services like Mobile TV. It appears that no single technology platform is solely responsible in providing the capability required by the business ecosystem to provide Mobile TV services. Although the SDP remains important to the development of rich media services, it nevertheless provides standardized reusable components that are important but not specific to the development of Mobile TV services. Instead, a combination of multiple SOAs such as the SDF, the SDP and, in this case study, the Mobile TV platform (NSDP), provide a new service development building-block for Mobile TV services. More importantly, this thesis argues that the types of SOAs that form the NSDP are likely to vary from one type of rich media service to another (e.g. Mobile TV, Mobile Music, Mobile Games, etc). Nevertheless, according to the evidence deduced from research, SOAs are emerging as the cornerstone technology that forms the basis of the NSDP for the development of rich media mobile services.

RQ2: *What are the concepts that define the nature of 'collaboration' in NSD activities between actors within business ecosystems?*

The thesis concludes that network centrality, structural differentiation and co-opetition are key concepts that underpin the NSD capability of the business ecosystem (as indicated in *Table 6.1*).

The concept of network centrality suggests that, through its central position within the ecosystem, the network operator commands the visibility and attractiveness to direct new service development projects. Through their visibility and attractiveness, the network operator is best placed to facilitate collaboration between actors from both the content environment (e.g. channels and content aggregators) and the technology environment (e.g. mobile devices OEMs). As a central actor, the network operator also plays a critical function in providing an evolutionary roadmap for the Mobile TV services that are developed in the ecosystem. The network operator is effectively able to perform this central function largely because of the visibility it commands from that central position and the attractiveness that it offers to the ecosystem through its legal agreements framework (e.g. the SLAs), the new service development platform (NSDP) and the Interorganisational New Service Development Framework (INSDF). This provides the network operator with the ability to collaboratively chart the future service development roadmap for the ecosystem, indirectly sustaining the long-term viability of the ecosystem.

The theoretical contribution of this research project regarding the concept of network centrality is the significance it attaches to the role of a specific organisation in the overall structure of a business ecosystem. This study highlights how such an organisation promotes collaboration and a concerted direction for the new service development initiatives of all actors in the business ecosystem. This role is critical for the well-being and the future prospects of the ecosystem. Iansiti and Levien, (2004) Moore, (1996) Moore, (2006) have all argued that central actors are the kind of organisations that serve as enablers and have a great impact on the whole ecosystem. However, research to date has failed to identify the determinants of network centrality. This thesis has deduced evidence indicating that the determinants of network centrality – the framework of SLAs in the ecosystem; the new service development platform (NSDP); and the interorganisational new service development framework (INSDF) – provides for the visibility and attractiveness of the network operator as the central actor in the ecosystem. These are the determinants that form the extension to current theory in the literature by explaining the effects of network centrality and its influence on collaborative efforts among actors in rich media mobile service development capability.

The creation of niches within the business ecosystem that is documented in this thesis provides evidence for the concept of structural differentiation. The evidence deduced indicates that the adoption of prospective technologies to augment the new service development capability of the business ecosystem is achieved through the creation of specific niches. Within these newly created niches are organisations which are then nurtured until such time they are able to fend for themselves in a competitive business ecosystem environment. The creation of niches within the ecosystem directly augments the Mobile TV ecosystem's capability to produce new rich media services. These niches structurally differentiate and add value to the business ecosystem's new service development capability, enabling the ecosystem to differentiate its services through additional service features and, in the process, remain competitive with other ecosystems offering similar services. The evidence suggest that the determinants that propel the creation of new niches within business ecosystems include; (1) a thoroughly developed strategic niche management blueprint; (2) a trial and error process of discovering particular niches (whether technologies or content) during the development stages of these niches and; (3) joint niche creation initiatives between key actors, particularly amongst actors with existing knowledge of the technology being considered for niche development in the business ecosystem.

The theoretical contribution of this research project to the concept of structural differentiation is the extension of the contribution made by Gulati and Gargiulo (1998), who define structural differentiation "as an emergent systemic property that captures the extent to which actors (organisations) come to occupy an identifiable set of network positions, each of them characterized by a distinctive relational profile" (p. 1450). The evidence provided in this thesis indicates that the 'emergent systemic property' in this case study is the tendency of actors (organisations) to occupy an identifiable set of network positions that are in fact *niches*. According to the evidence deduced in this thesis, the creation of niches indicates; (1) a joint niche initiative; (2) a systematic effort in strategic niche management initiatives and; (3) the diligent management of key technologies on a trial and error basis on the part of the primary actors in the Mobile TV ecosystem. As acknowledged in the research literature, actors in niches within the business ecosystem are critical for generating value in business ecosystems through their specific roles and capabilities in the development of services and applications. Due to their unique and specialized area of competencies, their propensity to create innovative services and applications based on the platform offered by the central actor is highly valued and acknowledged by the business ecosystem as a whole. This then promotes the necessity for business ecosystems to be on the constant look out for such niche actors both within and outside the business ecosystem to ensure the vitality and the capability of the business ecosystem to create new rich media services.

In the case of co-opetition, Brandenburger and Stuart (1996) and Brandenburger and Nalebuff (1996) have observed various forms of co-opetition. Nevertheless, the literature is vague about the actual element that generates the dynamics of co-opetition that contribute to the new service development capability of networks such as business ecosystems. In this thesis, the dynamics of co-opetition have been observed in two different forms; namely, simple dyadic co-opetition and simple network co-opetition. The evidence suggests that both these forms of co-opetition reveal that it is not merely the dynamics of co-opetition that contribute to the new service development capability of the ecosystem. Rather the evidence suggests that the dynamics forces of a co-opetitive relationship between actors, be it in the context of a simple dyadic co-opetitive or a simple network co-opetitive context, enable the emergence of dynamic capabilities.

It is the emergence of dynamic capabilities that contribute to the increased new service development capability of the Mobile TV ecosystem.

The notion of cooperation highlights the need for collaboration – even among arch-rivals – to share risk, resources, skills and know-how to exploit market opportunities that otherwise could not be solely achieved by any single actor. Competitive dynamics between the actors reduces slack or inefficiencies that otherwise might occur in business ecosystems only displaying cooperative relationship features. Competition promotes the leanness of the business ecosystem's capability to develop new services. This can be argued to contribute towards the ever evolving and dynamic capabilities of the entire business ecosystem, increasing its competitiveness in developing new rich media mobile services.

RQ3: *What is the nature of 'customer involvement' in NSD activities within business ecosystems?*

The shift from vertical silos to horizontal architectures for the development and delivery of next generation services such as rich media mobile services reflects a transformation of the global telecommunications industry. The majority of network operators around the world are engaged at some point of the transformation program. This effectively means that the network operator observed in the Mobile TV case study does not necessarily qualify as a lead customer. The shift towards horizontal network architectures for the development and delivery of rich media mobile services is a global phenomena within the telecommunications industry and not confined to the Mobile TV case study observed by the researcher.

Thus, the notion of the network operator occupying the role of a lead customer in this case study remains inconclusive in this case study, based on the definition of a lead customer. Von Hippel (1986) argues there are two distinguishing features of lead customers. The first is the capability of lead customers to be particularly effective in articulating a future mass market need based on their current needs due to the fact that these types of customers are ahead of the market in terms of need related trends. The second feature is that they are motivated to develop a new invention ahead of general market needs so as to derive a significant innovation-releated benefit (through both financial and non-financial means) by obtaining a solution to their current needs (von Hippel, 1986). In the context of this case study, both characteristics seem to be distorted by the transformation affecting the infocoms sectors in general. Therefore, the notion of customer involvement through lead customer knowledge cannot be conclusively established at this juncture of the evolution in the telecommunications industry worldwide.

In summary, RQ1 is answered with both joint dependence and NSDP emerging as concepts that support the connectedness between actors in the ecosystem. Joint dependence and NSDP are seen as concepts supporting the NSD capability of the ecosystem. However, the data also suggests that joint dependence rather than network interconnectedness is the primary factor contributing to the NSD capability of the ecosystem. RQ2 is addressed with all three concepts of network centrality, structural differentiation and co-opetition providing evidence to support the existence of collaboration in NSD activities between actors within business ecosystems. Network centrality promotes collaboration of actors within the business ecosystem through the visibility and attractiveness of the central actors, which translates into providing a concerted direction for all actors in the ecosystem to engage in NSD activities. Structural differentiation provides for the joint creation of niches by the primary actors in the ecosystem, indirectly promoting the NSD capability of the ecosystem. Co-opetition promotes collaboration among otherwise arch-rivals in specific value activities to contribute towards the NSD capabilities of the business ecosystem. RQ3 however, cannot be confirmed conclusively due to transformation phenomena experienced by the telecommunications industry globally. It is anticipated that once a norm of stability has returned in the currently disrupted environment experienced by the telecommunications industry, only then will research be able to establish if RQ3 can be verified.

Chapter 6
Conclusion and Future Research

6.1. Introduction

This chapter provides a concluding overview of the thesis. This chapter begins with a brief overview of the key issues in the thesis and the contribution to theory. In the light of developments in the telecommunications industry and the infocoms sector in general, this thesis develops theory to explain the business concepts that contribute to the new service development capability of complex business networks such as business ecosystems. In so doing, the thesis is grounded in NSD literature (Johne and Storey, 1998).

The chapter progresses to discuss the primary limitations of the research and points to future research directions. This chapter is then concluded with a discussion of the managerial implications of the research findings. The managerial implications highlight the important findings and indicate the meaning these findings will have to marketers in their new service development strategies. More importantly, the managerial implications bring to the attention of practitioners the wider marketing implications of the research findings.

6.2. Conclusion

Chapter 1 and Chapter 2 explains the significant metamorphosis the telecommunications industry has gone through as industry boundaries between telecommunications, broadcast and computing domains have broken down in favour of an ‘infocoms’ sector (Barnes 2002; Kärrberg and Liebenau , 2005; Fransman, 2002). Chapter 1 explains the motivation of the thesis going on to discuss the concept of the business ecosystem, its characterisitcs and its relevance as a core concept shaping the thesis. In applying the concept of the business ecosystem, the development and provision of rich media services and better understood. Chapter 1 then concludes with the theoretical positioning of the thesis.

Chapter 2 then focuses on the context of the research and discusses the theoretical domains of network, new service development and innovation theories which forms the underpinning theoretical scope of this thesis. In discussing these three theoretical domains, the research problem guiding the thesis is framed.

Chapter 3 reviews literature in the three theoretical domains identified in Chapter 2. Through literature review, business concepts are developed and clearly defined to better understand the development of new rich media services in the context of business ecosystems. In developing the concepts, working propositions are constructed to be verified during the data collection and analysis phases of the research.

Chapter 4 puts forward the rationale for a qualitative research investigation. The case study approach was chosen. This decision was influenced by the fact that rich media mobile services constitute a new business area and required an in-depth understanding of the phenomena affecting NSD in business ecosystems. Although semi-structured interviews formed the primary source of data, various data sources including documents and field notes were triangulated to qualify evidence.

Chapter 5 presented the data analysis of the Mobile TV Case study. This chapter dicussed the research findings to either accept, reject or amend the working proposition into testable proposition. The theoretical contributions of the thesis as provided in chaper 6 are as follows:

- Contrary to the assumptions drawn from the literature review, the research finding in Chapter 6 indicates that *joint dependence* rather than network interconnectedness is a cornerstone concept defining the NSD capability of the business ecosystem. However, Gulati and Sytch (2004) stop short of describing the determinants of joint dependence. *The findings in this thesis suggest that the determinants of joint dependence in the development of new rich media mobile services include: (1) the uniquely embedded position that each actor occupies in the ecosystem given their resources and capability profiles; (2) the bilateral commitment and mutual empathy that is manifested in relationships between actors as a result of their clearly defined roles in the ecosystem; (3) the structural congruence between actors that is required in interfacing assets, systems and business processes, and; (4) the familiarity and mutual forbearance that prevails through maturity in relationships as actors realize these relationships profoundly hinge upon the inter-dependencies between actors. The evidence suggests that joint dependence is manifested in other concepts identified and verified in this thesis, through business concepts such as NSDP, network centrality, structural differentiation and co-opetition.*

- This unique ability to create prodigious portfolios of rich media services without disrupting the underlying network architecture every time a new service is developed and introduced, suggests the importance of the *NSDP* to the network operator to rapidly assemble new services much like a manufacturer (Peppard and Rylander, 2006; Moller, et. al., 2005). The involvement of third party organisations or actors in a business ecosystem effectively positions the ecosystem to develop a plethora of niche services that can leverage the substantial investments committed by the network operator in developing the NSDP. However, Peppard and Rylander (2006) stop short of describing the SDP as a component of the NSDP. *The theoretical contribution of this thesis is to show that the NSDP transcends the the SDP. The evidence suggests that the NSDP provides standardized reusable capabilities which are building blocks that can be modeled within a 'workbench' environment. By leveraging the 'standardized reusable components' offered by NSDP, network operators now use 'building block' capabilities resident in the NSDP for seamless development of new rich media services. As network operators create a library of building blocks (e.g. capabilities such as presence, location and billing), these building blocks do not have to be duplicated each time a new service is developed. For example, VoIP, Mobile TV, Mobile Music and Location Based Services (LBS) each require their own sets of fundamental parameters around availability, order-taking and activation. However, overlap inherently exists in what each service requires. The active catalogue (i.e. library of building blocks available* *through the NSDP) helps network operators to leverage established interchangeable building blocks in the NSDP that can then be rearranged to support other services as well. Rather than having to write new codes to launch each new rich media mobile service, network operators can specify necessary attributes in reasonably basic forms so that one billing system, for example, is capable of handling many different services. This significantly increases the agility of the ecosystem in developing new services by reduces the new service development cycle times and increasing the NSD capability of the business ecosystem for new services.*

- As network operators continue to expose their NSDP environment to other key actors and to different departments and divisions within their organisations, the notion of a business ecosystem becomes pertinent to the development of new rich media mobile services. The network operators emerge as central actors within the business ecosystem. Iansiti and Levien (2004) and Moore (1996, 2006) have all argued that central actors have a great impact on the whole ecosystem. Nevertheless, the research literature is silent on the determinants of network centrality contributing to NSD capability. *The findings in this thesis suggest central actors command high levels of visibility and attractiveness in directing new service development projects. Through their visibility and attractiveness, the network operator is best placed to facilitate collaboration between actors in the business ecosystem. This is achieved through initiatives of the network operator such as: (1) providing an evolutionary roadmap for the development of new services; (2) the development of a legal agreement* *framework (e.g. the SLAs) in regulating the relationships between the actors in the business ecosystem; (3) exposing the capabilities of the new service development platform (NSDP) to the rest of the business ecosystem community, and; (4) providing a guiding interorganisational new service development framework (INSDF) for the synchronized development of new rich media services in the business ecosystem. This in effect provides the network operator with the ability to collaboratively chart the future service development roadmap of other key actors, indirectly contributing to the NSD capability of the business ecosystem.*

- The dynamism faced by the telecommunications industry in particular and the infocoms sector in general suggests that new technologies and niche applications are constantly emerging and augmenting the new service development capabilities of the business ecosystem. In extending the work of Gulati and Gargiulo (1998) and Iansiti and Levien (2004), *the findings of this thesis suggest that the structural differentiation of the business ecosystem is achieved through creation of new niches. The adoption of prospective technologies to augment the new service development capability of the business ecosystem for example, is achieved through the creation of specific niches. Within these newly created niches are organisations that are then nurtured until such time as they are able to fend for themselves in a competitive business ecosystem environment. These niches add value to the business ecosystem's new service development capability, enabling the ecosystem to differentiate its services through additional components including new technologies and, in the process, remain competitive* *in relation to other ecosystems offering similar services. New niches within business ecosystems are developed through initiatives like: (1) strategic niche management blueprints; (2) a trial and error process (in discovering particular technology or content niches), and; (3) joint niche creation initiatives between key actors, particularly amongst actors with specific technology knowledge*[60] *in the business ecosystem.*

- In addition to concepts such as joint dependence, NSDP, network centrality and structural differentiation, the new service development capability of an ecosystem also thrives through the presence of the dynamics of coopetition. Peppard and Rylander (2006), Iansiti and Levien (2004) and Moller, et. al., (2005) in acknowledging coopetition in business ecosystems highlights the need for collaboration even among arch-rivals to share risk, resources, skills and know-how to exploit market opportunities that otherwise could not be solely achieved by any single actor merely through cooperation alone. Iansiti and Levien (2004) suggest that competitive dynamics between the actors reduces slack or inefficiencies that might otherwise exist in business ecosystems that only display cooperative relationship features. Competition promotes the leanness of the business ecosystem's capability of developing new services. *However, the research findings in this thesis extends their contribution to theory in suggesting that coopetition although present in business ecosystem, does not directly contribute to the NSD capability of the business ecosystem. Rather it is the dynamic capabilities that result from the coopetitive dynamics between*

[60] For example, joint niche creation initiatives between the network operator and the content aggregator or between the network operator and the systems integrator, as observed in the findings of this thesis.

actors in ecosystem that contributes to its competitiveness in developing new rich media mobile services.

- The notion of customer collaboration in this thesis which is based (in this research) on the concept of lead customer knowledge, is difficult to ascertain under the current environment of the telecommunications industry. The transformation facing the global telecommunications industry suggests that the majority of network operators around the world are currently engaged at some point of the transformation program, transforming their network infrastructure from vertical silos to horizontal IP architectures. This effectively means that the network operator observed in the Mobile TV case study does not necessarily qualify as a lead customer. The shift towards horizontal IP architectures for the development and delivery of rich media mobile services is not confined to the Mobile TV case study observed by the researcher, but is a global phenomenon within the telecommunications industry. Thus, the notion of the network operator occupying the role of a lead customer in this case study remains inconclusive given the definition of a lead customer provided by von Hippel (1986) and the global environment in which the telecommunications industry is enmeshed.

6.3. Research Limitations & Future Research

This research was limited in several aspects. First and foremost, this study was undertaken at a point in time (i.e. a snapshot study). Given the dynamism presented by the transformation experienced in the telecommunication industry, a longitudinal study that analyses events that occur over time is very much needed. This thesis, for example, is not in a position to verify whether research concepts such as 'lead customer knowledge' affect the new service development capability of rich media business ecosystems. Longitudinal case studies over a three to five year period that are aimed at understanding the evolution of the telecommunications industry would be better placed to investigate the research concepts that could not be verified in this study.

Phenomena such as joint dependence, NSDP, network centrality, structural differentiation and co-opetition have all been found to have an impact on the capability of an ecosystem in developing new rich media services. These concepts describe the capability of a business ecosystem in providing rich media mobile services to the market place. However, the timing of the case studies is seen to have a crucial influence on the case study results. The business ecosystem selected as the case study for this thesis was merely 1 or 2 years into its life-cycle. The case study data collection process was performed between September 2007 and July 2008. This ensured that research concepts developed through the theory building process in relation to the Mobile TV case study were valid at the point in time during which this research was conducted. Therefore, a study of more mature projects (e.g. 3-5 years into their product life cycle) may reveal additional concepts that affect the capability of business ecosystems to develop new rich media services.

The notion of the same actors within a given ecosystem being involved in multiple other ecosystems has been identified in this thesis. Even the research finding supports this notion. However, given the scope of the research, it would not be possible to identify the impact that the participation of certain actors in multiple ecosystems will have on the development of services within the ecosystem under observation. In order to understand the impact of the participation and commitment of actors across multiple business ecosystems, a multiple case study approach would have to be undertaken. This research is not designed to understand the participation and commitment of actors across multiple business ecosystems. Instead, this thesis adopts a single case study approach. Furthermore, the ecosystem is intensely complex and in constant flux with actors constantly leaving and joining the ecosystem, this task certainly justifies a separate inquiry on its own.

Apart from actors participating in multiple business ecosystem, it has also been recognized that any given business ecosystem is in constant flux. Business ecosystems are in constant flux because actors enter and leave the ecosystem freely. It is usually the case that the key actors such as the network operator in particular who have vested interest in the success of the business ecosystem are the type of actors that remain in the business ecosystem for a very long period, possibility for the entire life of the ecosystem. However, peripheral actors, particularly niche actors are the type of actors that may not stay in an ecosystem for a long period of time. This aspect is not taken into account in this thesis. This is to a large extent due to the design of the case study in that it provides a 'snapshot' view of the dynamics of actors in the business ecosystem. A longitudinal study would better cater for a more complete understanding of the effects that the commitment of an actor could have on the business ecosystem based on the duration of their existence in the business ecosystem.

Given the context of the research, it was necessary to qualify case study selected as ecosystems. The pilot case study observed did not feature some of the key characteristics of an ecosystem as defined in literature. Therefore it could not be qualified as an ecosystem. However, it reaffirmed the need and provided guidelines to ensure that the selected case study (i.e. the Mobile TV case study) represented a business ecosystem. Using the selection criteria as depicted in section 4.4 is perhaps the only way to ensure that the case study observed in this thesis (i.e. Mobile TV case study) is respresentative of an ecosystem. Otherwise it defeats a fundamental purpose of the research – to ensure that the unit of analysis is an ecosystem. Nevertheless, in applying the characteristics of a business ecosystem to the case study selection process, characterateris such as coopetition and structural differentiation are deemed to emerge in the observed case study, introducing a degree of biasness in the selected case study. Having acknowledged this, however, the objective of the research is not to show evidence that concepts such as coopetition exist in the business ecosystem, but rather, to examine the impact of coopetition on the NSD capability of the business ecosystem.

Time and resource constraints as well as the degree of complexity characterizing each of the ecosystems in each of the cases researched meant that it was not possible for the researcher to solicit participants and conduct interviews in such a way as to ensure that each and every actor in the ecosystem was represented in the interviews. Actors with more central and critical role within the ecosystem were given importance. These included the various SBUs of the network operator, the content aggregator, the systems integrator and the project manager. This was further complicated by the fact that each project or case study was represented by actors that were significantly dispersed geographically. In a single case study, one would encounter situations where actors could be located in North America, Europe, Asia and Australia. This rendered impossible any prospect of an ideal scenario to interview representatives from every actor in the selected business ecosystem in a face-to-face context.

Caution must also be used to ensure the research concepts identified and verified in this thesis are reviewed through an experienced researcher's discretionary lens prior to the application of these concepts to other rich media service ecosystems. It is critical to understand the exact context of the rich media mobile services in question. For example, (1) Mobile TV and Mobile Music may differ in service category to Location Based Services such as Navigation or Mapping Services; (2) the underlying technologies that define the infrastructure for the development and the delivery of these services (i.e. network infrastructure technologies and architectures may differ from one network operator to another), and; (3) the business models adopted (e.g. subscription and non-subscription). These factors suggest that the results derived from this research cannot be generalized directly to other rich media services. Furthermore, the study findings might not be directly applicable to other markets across diverse geographical locations in the world. Therefore, further testing of the research framework should be conducted to verify the findings of this research given the challenges offered by the variation in the rich media service setting.

In regard to organisation-generated content (e.g. Mobile TV and Mobile Music) in a B2B context, the research findings also indicate a significant consumer appetite for services dependent on user-generated content (e.g. Youtube and Facebook). There appears to be a significant research opportunity in the Business-to-Consumer context in which consumers are actively involved in the development and ultimately the consumption of services. In cases where the content is user generated, there is a need for the actors in the ecosystem (including the network operator) to be in close communication with end-users as it is these consumers who essentially generate and consume content. The other actors in the ecosystem would then need to acknowledge the integral role of end-users as both the content providers and consumers of the service. This can be done by B2B actors providing the technology and infrastructure required for an environment that is conducive for the development and delivery of user-generated content to a community of consumers. This provides fertile ground to examine research concepts such as customer involvement in greater depth.

6.4. Managerial Implications

The concept of a business ecosystem applied in this thesis promulgates the importance of management to change their mindset of viewing the development of next generation services such as rich media mobile services from a linear system perspective to a system typified by complex interdependencies. Managers must now come to terms with the current realities that rich media mobile services are developed in network environments that are characterized by a complex network of actors, the business ecosystem. These actors represent multiple industries integrated through a common platform, such as the NSDP described in this thesis. The actors constellate in the context of a business ecosystem to ultimately realize end-to-end development and delivery of rich media mobile services such as Mobile TV and other forms of rich media mobile services.

This change in management mindset in viewing the development of rich media mobile services in the context of a business ecosystem suggest some far reaching implications in the way new service development projects will be managed in all the major industries that make up the infocoms sector (i.e. telecommunications, media and IT). For example, managers will now find the need to develop, manage and constantly evolve an interorganisational new service development framework (INSDF) for the successful development of new services. This framework will be more likely represented by a committee truly representative of the make up of the business ecosystem, i.e. where the major stakeholders are adequately represented. This calls for a re-evaluation of the 'walled garden'[61] approach currently practiced by network operators in the business ecosystem. Managers are likely to find that the only way to fully realize the true value creating potential of the business ecosystem is to ensure that the new service development program committee overseeing the implementation of the development of new services within the business ecosystem are represented by not only the network operator, but also the other major stakeholders from the other major industries such as information technology and the media. This framework is paramount in ensuring a synchronized development of new rich media services in the business ecosystem. An interorganisational new service development committee functions to coordinate and manage the development of new services through its pipeline. This committee will ultimately be responsible to direct the flow of resources, skills and competencies within the confines of the business ecosystems to where it is required the

[61] In order to hedge their position within the mobile services value network, network operators have sought to develop 'walled garden' portals to ensure that content creators are kept well away from end-customers (Peppard & Rylander, 2006). This practice is based on the old conception of the value chain, with its value creating logic as a linked chain of activities, a perspective that leads to the development of strategies focused on controlling the chain. With the digitization of both content and the value chain this logic appears dated and requires a fresh perspective given that relationships and alliances within business ecosystems offer the means to project a complex network of multiple vertical value systems, horizontally integrated through common platforms such as IP based NGNs (Peppard & Rylander, 2006; Möller et.al. 2005).

most in realizing end-to-end development of new services. This committee will also have an active role in identifying capability bottlenecks which hinder the capability of the business ecosystem in developing new rich media services. Through identifying capability bottlenecks, the business ecosystem is well positioned to either develop these much needed capabilities organically from within the business ecosystem or alternatively arrange to acquire these new capabilities through the participation of new actors that possess the required capabilities. This ensures that the business ecosystem has a constant and healthy flow of new services to compete with other business ecosystem offering similar service portfolios.

The implications of joint dependence being a key concept affecting the capability of the business ecosystem in providing new services should be fully understood by management of individual actor organisations in the business ecosystem. For example, the notion of structural congruence resulting from actions of actors to foster joint dependence among them imply that adequate management thought is necessary in allocating assets, designing systems and business process within the business ecosystem for the purpose of developing new services. This involves strategic thinking in the way their organisations will operate in the future. Management will now have to identify and project investment needs in new assests that are congruent to the needs of the other actors they interface in the business ecosystem. This is necessary as congruent assests would allow for a seamless integration of individual organisation business processes and systems within the wider business ecosystem (i.e. how components required in the creation of a service like Mobile TV service flows through the value creation process before reaching its final form) and ensure member of the business ecosystem are well interconnected.

Management will also be forced to think of the implications of their increased involvement within the context of the business ecosystem will have on their current business systems and processes. As it stands, actors such as content producer like CNN have traditionally depended on selling their content to typical broadcasters. This implies that their involvement in the activities of the Mobile TV business ecosystem is not their sole source of revenue. However, as each individual actor’s commitment to the business ecosystem increases, these actors will find the need to synchronize their systems and business process to that of the wider business ecosystem. The very assests such as computer networks and other forms of content and technology assets they provide to the equation of the wider service development initiative of the business ecosystem will increase their interconnectedness with the other members of the business ecosystem. This calls for management to be aware of the future investements they make from their individual organisational perspective, and understand how this contribute towards increased congruence of their systems and business processes to that of the wider business ecosystem in reducing the operational friction among actors in the ecosystem in developing new services.

The central actor apart from providing the NSDP to the wider ecosystems has a fundamental role in making sure that the business ecosystem’s NSD capability is constantly augmented not only by the tehnology upgrades they bring through the NSDP, but more importantly though identifying actors with specialized and unique competencies. The management of central actor such as the network operator must realize they offer a modular platform to the rest of the business ecosystem. Modular technologies is especially important when the business environment is very dynamic and there is a high degree of both technological and market uncertainty. In these circumstances new firms which enter the business ecosystem to occupy newly created niches will therefore be in a better position to contribute new ideas and more readily integrated into the NSDP and contribute to the new service development capability of the business ecosystem. To this extent, then, a modular system may progress faster technologically, especially during periods of uncertainty and fluidity.

This ensures that the NSD capability of the ecosystem is constantly augmented through the participation of such niche actors with unique capabilities. For example, introducing interactive capabilities in Mobile TV services will require the participation of an actor organisation which is capable of providing such interactive software solution in the context of the Mobile TV service. This again is consistent with the notion of achieving greater structural differentiation within the business ecosystem. Such niche creation initiatives by the network will have to be strategically developed. Niche creation blueprints, consistent with the future development of services such as Mobile TV will be among the strategic documents that are pivotal to the sustenance and development of the business ecosystem. Central actors being the actor with the best visibility of the resources, capabilities and future direction of the business ecosystem is in the best position to develop and maintain such strategic documents. Through the availability of such documents, central actors such as network operator can be better guided to carve out much needed niches within the ecosystems. This ensures that the ecosystem is constantly vitalized with new capabilities and eliminates capability bottlenecks as it evolves.

However, the implications provided by the concept of business ecosystem in developing rich media mobile services are not limited to service development activities. The notion of a business ecosystem will also have repercussions to marketers in the various organisations and the variety of industries they represent. The plethora of services that emerge form the business ecosystem also implies that marketers representing the network operators will need to re-evaluate their marketing strategies. Particular attention should be focused on the way market segments are profiled, defined and developed. Such information is available to central actors, in particular the network operator. The network operator being privy to a rich source of end user information is the link to other member of the business ecosystem improving the NSD capability of the ecosystem. Network operators will have to show an increased willingness to share information with other strategic actors in the business ecosystem. In order for this to happen, a form of a knowledge sharing system should be formed to facilitate the flow of information between actors in the ecosystem. Through such initiatives, strategic resources and capabilities can be identified and put to use to augment the NSD capability of the business ecosystem. For example, through of such knowledge sharing system, actors privy to that information may be able to identify a capability that already exist within the business ecosystem. This capablity can be directed towards the development of a new service. On the contrary, if such resources and capabilities are not available in the business ecosystem, then the necessary effort is made to acquire those capabilities through identifying organisations with such capabilities outside the ecosystem, with a view to secure their participation in the business ecosystem to plug the capability gap. Hence, through the availability of such knowledge sharing system, the role of NSD capability development within the business ecosystem is not wholly centred on the network operator.

Coopetition is a natural phenomenon characterizing the business ecosystem. Actors exhibit both cooperative and competitive dynamics simultaneously in their relationships. It is important that the management, particularly of key actors such as the network operator and the content aggregator harness the dynamic capabilities generated from coopetitive behaviours among actors in augmenting the NSD capability of the business ecosystem. Through coopetitive behaviours actors which otherwise display distructive behaviours can actually simultaneously display constructive behaviours to work together on a specific task in developing a new capability. As dicussed in the research finding, traditional competitors in the Devices OEM category have jointly developed operating systems for the benefit of the ecosystem – an inidication that dynamics capabilities do emerge from coopetitive behaviours. But it requires that central actors show diligent leadership in the business ecosystem to reap the benefits of coopetitive behavior particularly among niche actors in the business ecosystem. Similarly, central actors should explore the possibilities in identifying niches (e.g. content niches and other specific technology niches) where such coopetitive dynamics exist and use such dynamic capabilities to the advantage of the wider business ecosystem. The ability to balance the competitive and cooperative behavior among actors will be an important source of NSD capability for the business ecosystem.

In the case of content providers such as channels and media companies, the impact of their participation in the development and delivery of rich media mobile services to the market place via business ecosystem arrangements have a more profound impact on their distribution strategies. For example, media channels such as CNN and BBC which have traditionally been active in the broadcast industry will find themselves increasingly operating outside the broadcast industry domains and in the process finding new sources of revenue from new sources of distribution channels such as mobile networks. Record labels such as EMI, Sony BMG, Universal Music and Warner Music which have been typically used to managing the distribution of physical CDs to retail outlets, will also increasingly find their organisations facing new challenges in managing the distribution of their 'digital music content', through network infrastructures provided by network operators. This implies that content providers will have to reorganize their central marketing operations to incorporate new functions such as 'digital marketing department' which will be better resourced with the marketing talent to understand the intricacies of managing the distribution channel requirements of providing digital content for distribution through the mobile networks. Content providers will now have to develop close liaison with network operators to gain access to first hand marketing data in better understanding the customer profiles that characterize the market to effectively segment and target particular market segments through their variation of content offering (i.e. music, documentaries, movies, etc.). Through this in-depth understanding of the content market, marketers representing the content providers will then be better placed to recommend the development of niche services and open new avenues of revenue streams for the content providers themselves, the network operator and other members of the business ecosystem.

The network infrastructure providers and systems integrators on the other hand will also have to shed their ‘typical telecommunications network mentality’[62] to a ‘service architecture mentality’[63]. This implies that business marketers representing the network infrastructure provider and systems integrators will now have to provide architectures with modular capabilities – i.e. based on scalable ‘building block’ that enable network operators to add more capacity as and when the need arises, based on the new services introduced and the traffic or usage for each service. Business marketers representing the network infrastructure providers will have to work closely with the marketers representing the network operator in understanding the emerging marketing needs of the current consumer and business markets. In identifying the market needs and subsequently translating these needs into new service ideas in collaboration with marketers representing the network operator, business marketers representing the network infrastructure providers will be better placed to suggest a complete network architecture or even technology component to augment the network operator’s network infrastructure. This will mean that infrastructure investments are made on a modular basis after careful considerations given to these emerging market needs, placing the network operator to better respond to market demands through new service development initiatives. Gone are the days where business marketers would typically suggest network infrastructure investments to the network operator, based purely on the technological

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[62] Providng network infrastructure based on a Lock, Stock & Barrel concept.

[63] Providing a scalable SOA architecture which is modular in nature and always evolving to cater for new service requirements.

need of the network operator. The future requires that network operators, network infrastructure providers and system integrators work hand in glove in translating market needs into strategic choices in network infrastructure technology.

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Appendix 1

Business Ecosystem Actor Description

Actors	Description	Category
Device OEMs	Provide the physical mobile devices coupled with operating system, micro browser, embedded software (mobile phone, PDAs with wireless cards) to end users that enable them to access a mobile network and to run mobile applications. These actors' main channels of distributions typically include device retailers and network operators' distribution channels. Their core activities are research and development, product design, production and marketing. Examples of such actors include organisations such as Nokia, Sony Ericsson, Siemens, Motorola, Samsung, Palm and HP.	Technology
Network Infrastructure Providers	Provide the physical core mobile network infrastructure (comprising air interfaces, base stations, routers, switches and backbone transport technologies) and the logical infrastructure required to operate and manage the network (including network management systems, billing systems, network management systems, application and service platforms, etc). They also offer infrastructure related services such as network design, evolution planning, integration, implementation, optimization and operation. These organisations focus on R&D, production, system development, infrastructure related service provisioning. These Equipment vendors purchase from component vendors and application developers, assemble a variety of network equipment and systems and sell them to network operators, with whom they often partner and tightly collaborate. They must also collaborate with other equipment vendors to ensure network interoperability and offer multi-vendors solutions; for the same reason, they usually are influential in the standardization of technologies. In order to promote the adoption of	Technology

	new generations of mobile networks, they actively support and partner with application developers and content providers. They sometimes partner or are integrated with device manufacturers. Examples of companies that fall under this category are Ericsson, Nokia, Motorola, Siemens and Alcatel-Lucent.	
Content providers	Provides relevant data and information products (such as news, music, video, location-based information, etc.) and distribute them using the mobile channel. The value proposition often integrates a multi-channel distribution offering that enables to broaden the reach and exploit the complementary characteristics of different channels. Content aggregators, syndicators and portals (which bundle content from different sources together and re-distribute it to end customers), and the end-customer itself through direct distribution. Content providers often partner with a variety of content aggregators and portals in order to broaden the reach of their products and with content owners, press agencies and other media companies in order to get preferred access to information. Other useful partners include network operators to agree on a profitable revenue sharing business model and payment agents for micro-payment services. There might be partnership agreements with application providers for content management platforms. These Actors are preoccupied with predominantly content collection, content processing and formatting, content publishing, content distribution, distribution agreements management, etc. Organisations that would typically qualify under this category would include press agencies (e.g. Reuters), media companies (e.g. CNN) and content aggregators (e.g. Foxtel)	Services
Application provider (i.e. Systems Integrator)	Provide mobile applications and platforms (such as middleware and application servers). The value proposition may include different application related services such as remote access to a variety of applications that are managed in a central location, with hosting, implementation, integration, support and maintenance services. Target customers include a variety of actors in the	Services

	mobile value chain such as network operators, portals, businesses, device manufacturers and consumers. Application providers often partner with network operators, in order to ensure a sufficient quality of services and gain access to essential network services (i.e. location information) and have a privileged contact with their customer base. They also partner with device manufacturers, in order to ensure compatibility with the different existing and future devices and as a sales partner (to exploit their brand). If they do not develop their own applications, application providers purchase fromother application developers or establish a partnership with them. Other application providers and system integrators are also useful partners to provide broader solutions and offer a single point of contact to customers. Their core activities include application development, integration, application management (versioning, portability checking, etc.), infrastructure operation, support and consulting services. Examples of such organisations would include large consulting organisations such as IBM and Accenture but also smaller organisations, rather unknown start-ups such as iTerra, Geoworks, In-Fusio, Shockfish, etc.	
Payment Agents	Provide a method of payment to end-users for cash-free purchases of goods and services via the mobile phone. They can also provide payment platforms to other businesses. Their target customer would typically include end users, different service providers. Payment agents usually partner with different financial institutions (i.e. banks, credit card companies) for payment processing and gain access to their customers accounts. Other valuable partners can be network operators (for billing and collection services), device manufacturers (device interoperability and special payment features), hardware providers and application developers (security solutions) and other service providers. Their core activities include billing and collection, payment platform development and management. Companies would fall under this category would include payment agents, banks,	Services

	credit card companies and smartcard companies. Examples include PayPal, PayBox, Sonera and Visa.	
Mobile Network Operators	Provide ubiquitous communication services (physical connectivity) to end users, giving them access to their network and other network operators' networks and the Internet. Provide also various network-related services such as location information, user identification and billing services to third parties. Their target customers include end customers, businesses, application providers, virtual operators, ISPs, etc. Operators purchase from infrastructure vendors in order to build their networks. They must set traffic agreements with other network operators and ISPs in order to let their customers to access other networks (i.e. other operators' networks, the Internet). They also subsidy and distribute handsets in order to build their customer base. Given their central role in the mobile business, they are required to partner with a great number of other actors including content providers, application providers, service providers, virtual operators and portals. These actors are essential to develop the market for 3G services, thus increasing operators' revenues, and the operator can help them with revenue sharing agreements and access to network-related services (i.e. through open APIs, such as OSA-Parlay). Network operators have a typical value network configuration (Stabell, 1998). Their main activities are network promotion and contract management (customer care, sales, problem handling, invoicing,...), service provisioning (service development and operations, quality management,...) and infrastructure operation (network planning, deployment, maintenance, systems management,...). Examples of companies would include Swisscom, Vodafone, Orange, Telstra, Optus, etc. This category also includes virtual operators such as Tele2 (who provide services through networks of other operators). Other kinds of wireless networks operators also exist, such as WiFi operators (Jippii, Monzoon) and satellite network operators (Globalstar).	Network

ISPs	Provide access to the Internet network.Typical customer would include Network operators, other ISPs (traffic agreements) and end users. ISPs purchase from infrastructure vendors for Internet equipment in order to build their part of the network and the gateways to other networks. They must set traffic agreements with network operators in order to gain access to customers and with other ISPs in order to let their customers access the whole Internet. They also may partner with content and application providers in order to differentiate their offering. Their core activities would to large extent be similar to operators, their main activities are network promotion and contract management activities, service provisioning activities and infrastructure operation activities. Wireless ISPs include WiFi operators such as Jippi and Monzoon, as well as wired ISPs such as Switch	Network
Industry Regulators	Regulation-related actors include government, regulation authorities, and standardization groups. These actors will set the legal environment in which mobile business will grow and may have a huge influence on other actors. Set the legal framework which provides the population and the economy with a wide range of competitive telecommunications services. Regulation authorities interact and consult all the implied parties in order to develop an adequate legislation that best satisfies their diverging needs. They are supervised by the government and are influenced by different lobbies. Their core activities include legislation development, frequency allocation management, service licenses management, market monitoring to ensure compliance with legislation and antitrust requirements.	Regulation
User	End-users, both corporate and consumer, are also important actors in this game, because they ultimately can determine the success or failure of mobile business. It might be useful to consider some “vertical” actors with particular mobility needs separately, like those of the travel, logistics, healthcare, retail and car electronics sectors. It seems that no expert mentions consumer groups as actors, yet some of them are very active against electronic smog and will have	User

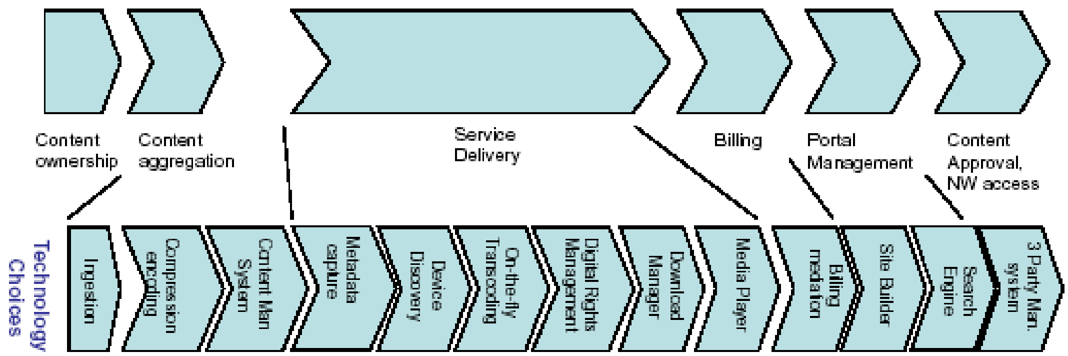
	a true impact on some decisions, such as the deployment of UMTS infrastructure and antennas.	
Studios	A **movie studio** is a company which develops, equips and maintains a controlled environment for the making of a film. This environment may be interior (sound stage), exterior (backlot) or both.	Content
Channel	These are independent companies and offers the main genres of: Comedy, Entertainment, Music, Documentaries, Kids programming and user-submitted content. Whilst many of the channels take on the branding of regular channels (for example, CNN, BBC, National Geographic, MTV and Nickeleodeon), the content is actually a "loop" of programming that tends to be updated once a week, rather than the full content available through digital television or cable services.	Content
Content Aggregator (I.e. part of content provider)	A content aggregator is an organisation that gathers content (and/or sometimes applications) from different online sources for reuse or resale. Content media aggregators essentially maintain subscriptions to feeds that contain audio or video media enclosures. They can be used to automatically download media, playback the media within the application interface, or synchronize media content with a portable media player.	Content
Dealers	Dealer include authorized agents representing the network operator in marketing mobile services plans including services such as Mobile TV, Mobile Music and other forms of both voices and rich media services through bundling services into specific plans suitable for the end users. Te services marketed y these dealers include both subscription and non-subcription mobile services plans.	Market
Competitors	Competitors will consist of predominantly other network operators and members of their business ecosystem providing similar services in the rich media services domain. For example, in a country, there could be three major network operators, each of which provides rich media services including Mobile TV and Mobile Music. These network operator will also be associated with business ecosystems with the capability to	Market

	provide end-to-end rich media services to the market place. With the rise of globalization, network operators not only find themselves competing against domestic ecosystems, but increasingly with business ecosystems lead by network operators with a global presence.	

Adapted from Camponovo, G., and Pigneur, Y. 2003. "Business Model Analysis Applied to Mobile Business" In 5th International Conference on Enterprise Information Systems. Angers, France., pp. 5-9.

Appendix 2

Technologies Underlying the SDP



Source: Kärrberg, P., and Liebenau, J., (2005), Mobile Service Delivery Business Models in Europe and Japan: The shift from "wherever and whenever" to "right here and now" The 18th Annual IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC'07), http://stuff.carstensorensen.com/mobility/PIMRC07-IEEE-DeliveryBusinessModels.pdf, Accessed on 20th May 2008.

Ingestion: Analogue and digital contents converted into suitable digital format

Compression: Digital raw contents need to be trans-coded into all needed formats fitting the numerous handsets

Content management system (CMS): When compressed into the digital right formats [for example in the case of audio or video files from content owners], contents are stored in a content management system. Here operators would in most cases employ the services of an aggregator to act as a 'middle-man' – as with the wholesale distributors in the supermarket business. This offers important benefits, such as simplifying the process of sourcing products from multiple suppliers around the world. Users can access services through brandable ’white label’ portals featuring content proven to drive traffic and to strengthen operator brands – with global, regional and local content.

Meta data capture: Content is wrapped in descriptive data, such as “title”, “file name”, “author” etc, that is needed when displaying and managing it correctly.

Device discovery: From the user agent, the SDP can identify the handset.

On-the-fly transcoding: For images, an on-the-fly trans-coding can be done from one raw file into the format fitting a certain user profile.

Digital Rights Management (DRM): Before being delivered to mobile devices, contents are wrapped in metadata deciding what rights the user has (e.g. forward-lock, not allowing peer to peer sharing of a content). Depending on handset capabilities, this should be acted upon by the SDP upon request from the user mobile device.

Download manager: It is necessarily to handle unstable connections, communication between java clients and the SDP, and the actual download mechanism that varies.

Media player: To deliver streaming, MMS contents and other special formats to the handset for the user’s consumption. This could include a standard media player such as Microsoft Mobile Windows Player or a native media player specific to mobile device brand.

Billing mediation: To check if the user has money to spend, and log his purchases with the carrier who provides the monthly statement/subtracts from prepaid user accounts.

Site builder: To avoid coding in multiple mark-up languages, or simply drag-and-drop design systems. Site-builders automate this process.

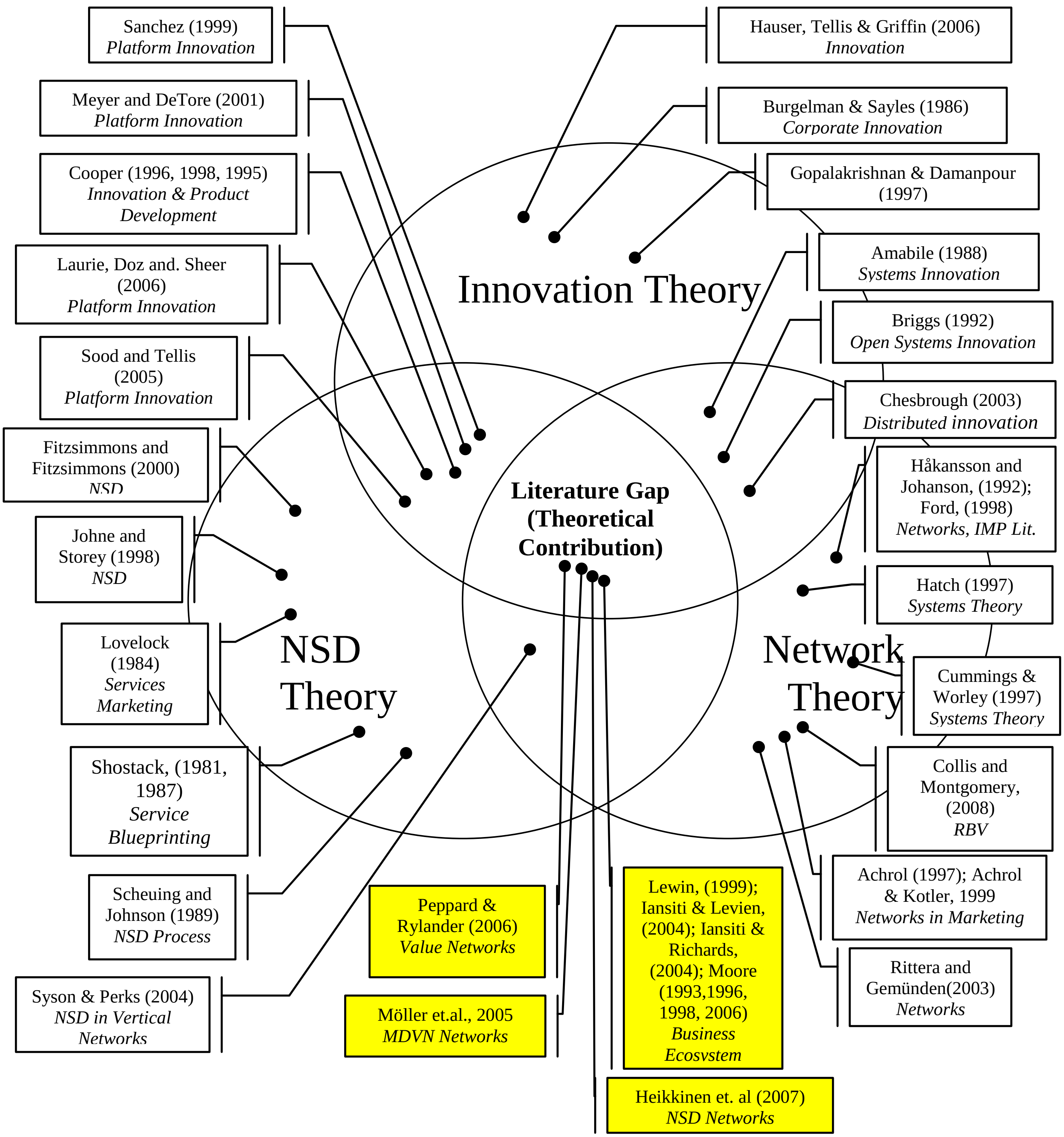
Search engine: When new content is added, it is being registered in the search engine, content providers can bid for key words, and users easily find what they look for

Third party management: Carriers and MVNOs (Mobile Virtual Network Operators) with tens of suppliers can automate the sign-up process of suppliers, enforcement of SLAs (Service Level Agreements) for bandwidth usage among others.

Source: *Source: Kärrberg, P., and Liebenau, J., (2005), Mobile Service Delivery Business Models in Europe and Japan: The shift from "wherever and whenever" to "right here and now" The 18th Annual IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC'07), http://stuff.carstensorensen.com/mobility/PIMRC07-IEEE-DeliveryBusinessModels.pdf, Accessed on 20th May 2008.*

Appendix 3

Primary Theory Informing the Thesis



Appendix 4

Summary of Working Propositions

P[1]: Joint dependence in business ecosystems rather than network interconnectedness potentially enhances new rich media services development capability.

P[2]: The SDP is the new service development platform (NSDP) that contributes to new rich media service development capability in business ecosystems.

P[3]: Network centrality in a business ecosystem contributes to new service development capability through the provision of a common direction for the other actors in the ecosystem.

P[4]: Structural differentiation contributes to niche creation within a business ecosystem and in the process, positively promotes new service development capability.

P5: The competitive and cooperative (co-opetitive) behaviors among actors promote new service development capability.

P[6]: Lead business customers knowledge contributes to increased NSD capability in the business ecosystem.

Appendix 5

Industy Practitioner Interviews[64]

Participant	Company Code	Type of Company	Designation Of Participants	Date of interview	Duration of Interview
Carlos Trujillo	OP1	Network Operator	General Manager	10/08/06	1 hour
Robbie Kruger	NP1	Network Infrastructure Provider	Chief Technlogy Officer	15/09/06	1 hour
Cathy Edwards	OP1	Network Operator	Emerging Technology Manager	02/03/07	1 hour

Pilot Case study Interviews: Voice Over Internet Protocol (VoIP) Services for Small and Medium size Enterprises

Participant	Company Code	Type of Company	Designation Of Participants	Date of interview	Duration of Interview
Dr. Steen Krogh Nielsen	OP2	Network Operator	Head of Network Strategy	10/09/07	2 hours
Lars Nielsen	NP1	Network Infrastructure Provider	Chief Operating Officer	11/09/07	2.25 hours
Hendrik Banvbek	OP2	Network Operator	Head of Business Services	12/09/07	2.25 hours

[64] The industry practitioner interview involved senior personalities responsible for strategic functions of the network operator and network infrastructure provider. These personalities were instrumental is providing a much needed overview of the telecommunications industry in general. This helped the researcher articulate important themes that would later guide the literature review and the questionnaire design initiatives.

1st Case study Interviews: Mobile TV

Participant	Company Code	Type of Company	Designation Of Participants	Date of interview	Duration of Interview
Freddie Jansen van Nieuwenhuizen	OP1	Network Operator	Director - Product Management & rich-media services, Wireless Consumer Services	09/11/07	1 hour
Scott Taylor	OP1	Network Operator	General Manager - Rich Mobile Media, Wireless Consumer Services	08/11/07 & 14/11/07	1 hour + 2 hours
Jason Rumble	CA1	Content Aggregator	Manager - New Media Platforms	20/11/07	2 hours
Jim Gatsios	OP1	Network Operator	Technology Specialist, Content Engineering	29/01/08	2 hours
John Nguyen	OP1	Network Operator	Solutions Architect, Network Technology	18/02/08	1.5 hours
Andrew Walduck	SI1	Systems Integrator & Project Manager	Senior Consultant & Project Manager	04/04/08 & 09/04/08	0.5 hours + 1.25 Hours

Greg Leja	SI1	Systems Integrator & Project Manager	Project Manager 2	03/05/08	0.75 Hours

Appendix 6

List of Documents Used In this Research

1. Network Operator's Internal Service Development Methodology (Service Development Process)[65] – Obtained from the Network Operator.

2. Product Catalogs describing both the Mobile TV and Mobile Music Services.

3. Field notes for both Mobile TV and Mobile Music case studies.

Field Notes (Mobile TV Project)

No.	Field Note
FN1	It appears that there are in fact legal agreements that bind these actors together. This is further substantiated in a later part of this interview (interview with PAR 2) when there is mention of SLAs. It however, seems that due to the initial stages at which this project is positioned in its life cycle, and the nature of "trial and error" that dictates service development projects such as this (i.e. venturing into new service domains), a clear summary document indicating the specific roles of each actors in the ecosystem is still non-existent. When prompted for a possible example of a SLA (i.e. a samplem SLA), the respondent objected on the grounds of confidentiality.
FN2	PAR3 representing the content aggregator has also confirmed the existence of agreements such as SLA between the content aggregator and the channels. The content aggregator in turn seems to have a separate SLA with the network operator. The participant objected to a sample of the SLA on grounds of confidentiality.
FN3	The participant takes the researcher for a brief tour of the FOX 8 channel studious. He briefly explained the various roles of specific people working within the channel. The roles of these specific departments within FOX 8 (a wholly owned subsidiary of the content aggregator). Among the key roles of some of these staff of FOX 8 was to negotiate content rights with content owners for a

[65] Due to confidentiality purposes, the participants representing the network operator has requested that this document not be disclosed in this document.

	price. These are people with specialized skills – understanding the levers of negotiating the best content price for specific types of content.
FN4	It seems that the content aggregator and network operators are also driven by the performance factors such as the revenue model which sustains the business ecosystem revenue system. To a prompt question for a look at the revenue model defining the ecosystem, the respondent cited confidentiality as the issue preventing disclosure. However, the participant was willing to verbally share some elements of the revenue model without disclosing the details such as percentages attributed to each actor in the ecosystem.
FN5	In identifying the adoption of certain technologies such as the EPG (Electronic Program Guide) solution and the actual systems and processes such as content ingestion from content providers and the delivery of content to mobile devices on the end users. This implied that important investments were needed in the form of relation specific assets and a framework for the exchange of knowledge which lead to utilizing complementary resources and capabilities in unique ways. This statements seems to be consistent with the answer provided earlier by the participant representing the content aggregator (PAR3) indicating investments in assets such as FTP servers to receive content from content providers, EVS system for the playback of streamed content to the network operator and the routers and all the other IS infrastructure that enables the content aggregator to be structurally congruent with both the content provider systems and the network operator systems.
FN6	These are all perfect examples of relation specific assets to put in place the interfaces for otherwise independent but complementary business processes between the content providers, the content aggregator and the network operator. These assets in effect promote lesser friction in operations and a more congruent disposition between the actors in the ecosystem. This ultimately enables the provision of a quality Mobile TV service to the market.
FN7	There seems to be signs of the presence of a committee made up of key actors representatives in the Mobile TV ecosystem. This includes key representatives from the content aggregator, the various business units of the network operator, system aggregator, and the network infrastructure provider. Committee members meet on a monthly basis to discuss resources, marketing intelligence and other specific issues concerning the development of the Mobile TV service.
FN8	Here it seems that knowledge concerning the selection of handsets is being relayed from the meetings between the network infrastructure provider and the mobile devices OEMs to the product development committee of the Mobile TV service. The network infrastructure provider seems to be in the best position to advise the committee on the exact brand and model of mobile devices that has the required features and capability for the successful provision of the Mobile TV service. This also seems consistent with what was said by the participant representing the content aggregator with regards to the content aggregator in the best position to provide specialist knowledge on the Mobile TV service content packaging. This also fits in well with what was mentioned by a previous participant representing the product division of the network operator with regards to the testing of mobile devices from OEMs, with each mobile devices selected

	having the right screen size and resolution and the ability to handle multiple video formats among others.
FN9	The participant (PAR4) was late by a few minutes for his interview appointment with the researcher due to his prior engagement with a representative from the systems integrator's office. The participant had in fact met with the researcher prior to dropping off some material that featured the systems integrators letterheads and project materials relevant to the Mobile TV project at his office table. The interview then commenced in designated interview room.
FN10	This is due to the parallel distribution systems that the content provider operates within. The first and the more typical channel of distribution for content distribution are through the broadcasting industry. In these industries they have been accustomed to larger margins due to the fewer number of actors or intermediaries involved. The second distribution system, the ecosystem however, involved much more actors and they all feed from the same revenue pool. Apart from that there appears to be a significant pressure on the part of the network operator to not price the ecosystem's mobile TV services out of the market. Therefore the unit price of mobile TV content will have to be even more competitive than non-ecosystem based TV services. The Mobile TV service unlike the traditional broadcasting industry remains advertising free, hence the pressure on margins allocated to content providers. The participant seems to appear particularly unhappy about this behavior exhibited by the content providers.
FN11	Although the party that holds the right to the content holds captive power in the equation of the ecosystem, the customer seem to strongly indicate that this captive advantage is not at all exercised by the content aggregator. The elements that define joint dependence seem to be more amplified here. Joint dependence seems to take precedence over opportunistic behavior. The participant seem to suggest that beyond agreements such as SLAs, mutual forbearance, bilateral commitment and the interfaces provided by structural interfaces between these actors seem to override opportunistic behavior.
FN12	The notion of a building block seems to be consistent with the concept of a platform articulated in the literature review. When probed further the participant reveals that the building block referred to is the SDP and the SDF. This statement is also consistent with what leading industry experts such as David Croslin and Brian Levy have said regarding SOAs.
FN13	This articulates few key capabilities provided by the SDP. The first being the elimination of duplicating effort, resources and time to develop capabilities such as billing, identity and presence. These are common capabilities that one created should serve as common capabilities to all subsequent new services being created. This reduces time to market and costs of developing new services. It acknowledges that the SDP as a common platform is very important for the service development capability of the ecosystem as a whole. The notion of multiple interfaces leading back to the platform indicates that platforms such as SDP promote the network interconnectedness of the ecosystem.

	All that is said here corresponds rather well with what leading industry experts such as David Croslin and Brian Levy have said regarding SOAs.
FN14	In explaining the SDP architecture within the network operator, PAR4 lets the researcher have brief view of the actual SDP architecture to understand the various components that reside within the SDP framework. In another document which provides a more macro diagrammatic view of the entire SOA architecture, the document provides a clear illustration of how the SDF is indeed an overarching platform providing standardized common capabilities through the SDP not only for the Mobile TV service but also for other rich media services offered within the rich media portfolio of services of the network operator. The document shows how the capabilities residing in the SDP such as service orchestration is connected to service specific platforms such as the Mobile TV platform. The Mobile TV platform is in fact a platform that is specifically dedicated to the development and provision of Mobile TV service. Similarly, other rich media services such as Mobile Music would have their service specific platform. A copy of the document could be obtained by the research due to its confidentiality.
FN15	It seems that there is a remittance system in place within the subscription engine residing in the Mobile TV Platform. This remittance system effectively distributes the share of revenue to the relevant actors in the ecosystem based on the agreements (e.g. SLAs) between these actors. This systems is fundamental to sustaining the collaboration and viability of the Mobile TV ecosystem.
FN16	It appears that apart from systems such as remittance capability provided the mobile TV platform, it really the systems integration interfaces developed between the content providers and the Mobile TV platform residing in the network operator that ensure the remittance system works. This signifies the importance of interconnecting the various actors in the ecosystem.
FN17	Just like PAR2, PAR 4 seemed very convinced with his answer to the question of if there was a central actor in the ecosystem and which actor would qualify for that capacity. PAR4 subsequently provides examples such as the SLA and the New Service Development Platform as evidence to the central position of the network operator in the ecosystem relative to other actors.
FN18	Just like PAR2 and PAR 4, PAR 5 seemed to share the same reply in indicating that the network operator is in fact the central actor in the ecosystem.
FN19	The participant looking at the diagram of the partial ecosystem provided by the research comments of the actors based on their degree of criticality to the ecosystem based on their contribution as well as the degree to which each actor are entrenched deeper in relation to others. Some actors according to the participant seem to have a higher stake in the sustainability of the ecosystem in relation to other more peripheral actors. For example, the respondent pointed out that channel in fact services more than one ecosystem and it is in their interest to serve as many ecosystem as possible because of the direct positive impact it would have on their revenue and profitability. Channels are not committed

	exclusively any one content aggregator or ecosystem. In fact it is in their best interest to make available their content to as many competing ecosystem as possible to the best they can in revenue and profitability. On the contrary the content aggregator and the network operator for example are exclusive to the ecosystem.
FN20	The PAR6 clearly indicates that the actors with the highest stake in the Mobile TV ecosystem lie with the network operator. It was the network operator that initiated the project in the first places, putting the necessary investments in place and going further to assemble the various actors for the provision of an end-to-end mobile TV solution.
FN21	Using the Mobile TV ecosystem diagram produced by the researcher, PAR4 indicates the primary and peripheral SLAs that are in effect between the various actors. On the request for a sample SLA, the participant declined on the issue of confidentiality.
FN22	This corresponds with the explanation given by PAR4 on the complexity of the business processes that characterizes the ecosystem. In using the systems architectural drawing representing the SDF, the SDP and the Mobile TV Platform, PAR4 briefly explains some of the business processes that define the Mobile TV service. The final business process design was developed by the network operator with inputs from the primary actors in the ecosystem. But the ultimate decision on the design of the business processes depends almost entirely on the network operator with guidance from systems integrator on the technical boundaries that limits certain aspects of the planned business processes. A final technology architecture then emerges to support the agreed business process.
FN23	The indication provided by PAR2 during the interview is that the XZYPD provides a guiding framework but not the details of the various stages of the process. For example, the testing phase of the
FN24	The fact that PAR3 has pointed out the diagram representing the Mobile TV ecosystem is partial and not complete in itself is testimony to the number of other niches that are not represented in the partial ecosystem diagram. This simply mean number of niches in the total ecosystem would in fact be larger than that represented in the partial ecosystem diagram. This means that niches are a significant part of the ecosystem and are certainly positioned to drive the value creation process through innovation within the ecosystem in the development of new services.
FN25	During the way out of the interview premises, being accompanied by the participant, PAR 2 revealed the active role played by the network operator in collaboration with the content aggregator in seeking to increase the number of quality channels and creating more interactive programs. Interactively Mobile TV in itself can be seen to require the creation of another niche with specialist capabilities. This is yet another examples of pushing the boundaries of innovation in the Mobile TV offering which involves the creation of new niches. This conversation was however not recorded as it took place after the interview duration.
FN26	The service development roadmap as mentioned by PAR2 in fact is congruent

	with the comments he mad about the provision of a leadership role by the network operator for the evolution of the Mobile TV service in consensus with other key members of the ecosystem. It makes sense that part of that roadmap in fact involves the identification of the strategic needs of the ecosystem in terms of capabilities to evolve the service in the right direction over time according to market demand. So the creation and development of niches in the ecosystem is in fact part of the function of the service development roadmap as mentioned by PAR2.
FN27	The participant seems to suggest the notion of trial and error when he mentions the word "discover" in his reply. When probed further by the researcher, the respondent did clarify the notion of discover as "trial and error", in essence involving the adoption of a particular technology to increase the capability of the ecosystem in terms of its new service development capability. This according to the participant equips the ecosystem to differentiate its service in relation to competing ecosystems offering similar types of services. When he say " this is not how exactly how the ecosystem looked like when it first started" he was pointing to some of the niches that were not present during the first launch of the Mobile TV service in October 2006. This corresponds with what PAR2 said about trial and error with the EPG. The notion of "nurture" as termed by the participant simply means facilitating and protecting the development of niches in the light of a highly competitive market during the initial stage of its development. The participant seem to also be suggesting a joint initiative in the development of niches when he point to both the network operator and the content aggregator with his fingers in explaining the joint creation of the EPG niche capability for the ecosystem
FN28	When prompted about the channel packaging consideration after the duration of the interview (i.e. while the participant walks the researcher out of the interview room to the lifts), PAR3 mentions of a detailed consumer market study in collaboration with the network operator. This same study was also mentioned by PAR2 in a prior interview. This study was designed to basically assist in the decision making process of the network operator in collaboration with the content aggregator to decide on the best sequence of Mobile TV channels by the various categories. The decision was made based on the information obtained from the commissioned research.
FN29	The mention of Symbian by PAR5 is a classic example of co-opetition in the mobile devices space. **Symbian OS** is an operating system designed for mobile devices, with associated libraries, user interface frameworks and reference implementations of common tools, produced by Symbian Ltd. More details of Symbian can be obtained from http://en.wikipedia.org/wiki/Symbian. The dynamics of co-opetition between the organisations that comprise the Symbian alliances is well documented Ancarani & Shankar (2002, 2003) as referenced in this thesis.

FN30	As pointed out by PAR2 before that the mobile devices OEMs does in fact have capabilities to develop their own clients or GUIs. The statement by PAR5 seems to be consistent with what PAR2 has said earlier about the capabilities of devices OEMs. This therefore certainly positions the mobile devices OEMs and the GUI provider as potential competitors although belonging to two separate niches in the ecosystem.
FN31	This indicates co-opetition. Looking beyond this is the emergence of dynamic capabilities. Dynamics capabilities can be seen through the joint solutions that emerge from the competitive and collaborative relationships between these two companies. During a brief chat with PAR6 after the duration of the interview, the research was referred to the following website: http://www.accenture.com/Global/Services/ Alliances/IbmTechnology.htm At this website, a brief description is given of the collaborative dynamics of the Accenture – IBM relationship. PAR6 also mentioned that IBM, although a direct competitor of Accenture, remains a very attractive partner largely because of the high quality technologies that they offer as part of the solution. Accenture he says, takes a very vendor neutral approach – in that they are willing to work with any organisations including arch rivals for a quality technology solution.

Field Notes (Mobile Music Project)

No.	Field Note
FN32	The content according to PAR1 were in several formats according to the OMA (Open Media Alliance) standards. The researcher was referred to the OMA resource on the internet by the participant for further information of the various kinds of formats that were the agreed standards for music content by the industry. They include WAV, MP3 and AAC++ to mention a few. Here, PAR1 seems to suggest a degree of interdependence through explaining the flow of content involving the various parties from the content providers to the end consumers. The participant took the initiative to sketch out a brief diagram of the Mobile Music ecosystem. This sketch was revised with every subsequent interview with other research participants in the Mobile Music project. This sketch became the basis upon which Figure 5.4 was developed.
FN33	PAR 2 in emphasizing the notion of interdependence in the provision of the service also developed a separate diagram. This diagram although not exactly similar to that developed by PAR1 did appear to indicate interdependence facilitated by the DAMS (i.e. what PAR2 refers to as the backend) that integrates all actors in the ecosystem to operationalize the interdependence between these actors to provide the Mobile Music service end-to-end.

FN34	The mention of agreements such as SLAs in the ecosystem indicates that the roles, responsibilities an scope of work attributed to each actor in the ecosystem is present. The SLA records a common understanding about services, priorities, responsibilities, guarantees and warranties. Each area of service scope should have the 'level of service' defined. The SLA may specify the levels of availability, serviceability, performance, operation, or other attributes of the service such as billing. The 'level of service' can also be specified as 'target' and 'minimum', which allows customers to informed what to expect (the minimum), whilst providing a measurable (average) target value that shows the level of organisation performance. In some contracts penalties may be agreed in the case of non compliance of the SLA. (http://en.wikipedia.org/wiki/Service_level_agreements)
FN35	In a casual discussion with PAR1 after the formal interview, it was mentioned that Universal Music for example has invested heavily in IT for mobile and online content delivery to Telco, mobile devices OEMs and content aggregator. This comment made by PAR1 seems to be consistent with the way Universal Music is evolving. As of 2002, the record label established a new division known as Universal Music Mobile International. The division is tasked to expand the record label's market beyond the traditional (i.e. music stores). Universal Music today is in business with Telcos around the world, multiple global mobile devices OEMs and content aggregators through the market development initiatives of Universal Music Mobile International (http://www.wirelessweek.com/universal-music-launches-u-s.aspx)
FN36	PAR1 took the trouble to sketch out a brief description of the two formerly parallel content delivery systems meant for PCs and the Mobiles. Subsequently she described on that same A4 size paper how both content delivery systems were converged to arrive at a single common platform for both PCs and the Mobiles.
FN37	PAR2 in referring to her diagram drawn on the electronic whiteboard points to the components in the DAMS that forms the building block for new mobile music services. These components included the CMS, the NAS, the central library and the user permissions among others. These are common capabilities for the reason they do not have to be duplicated each and every time a new music service is development and introduced to the marketplace. This is consistent with what PAR1 has mentioned in the previous interview about the increased speed of service development as a result of the DAMS in place. The speed to market is mainly contributed by the reduction in duplication of processes and systems.
FN38	Examples such as the SLA and the New Service Development Platform as provide by PAR1 and PAR2 are evidence to the central position of the network operator in the ecosystem relative to other actors.

FN39	The ESS (Enhanced Services System) that is mentioned by PAR2 offers a centralized billing facility for the entire ecosystem. It appears that the ESS is in fact an ad hoc system that was designed separately from the DAMS. It is nevertheless connected to the DAMS to providing for billing solutions. Although not part of the DAMS, it is nevertheless seen to be part of the New Service Development Platform for mobile music services. in the context of the mobile music case study.
FN40	PAR1 produces the exact same service development model that was provided for during the Mobile TV case study interviews.
FN41	PAR1 provides examples of two other ecosystems within the national market that seem to have a similar arrangement where the network operator emerges as the central actors through providing a common service development process framework.
FN42	PAR 1 pointed directly to the new capabilities whether it is content or new technologies that are needed for the delivery of mobile services. Examples such the mobile client technology is one example specific to the development of mobile music service.
FN43	The existence of product managers in the telecommunication industry indicates that as services become commercialized as a standard product the manager is responsible over the whole line of services requirement management, defining of products and their releases and this with the consultation of all internal and external stakeholders involved. This was confirmed by product mangers of both the Mobile TV and the Mobile Music projects.
FN44	The mobile client capability was only incorporated during the testing stages of the Mobile Music service.
FN45	The fact the PAR4 has recognized *Symbian Foundation* behind the mobile devices OEMs suggest that the participant is well aware of the coopetitive dynamics that define the relationships between otherwise arch competitors such as Nokia, Samsung, Sony Ericsson, etc.
FN46	Record labels such as Universal Music Group (UMG) have developed their capability in content management and content ingestion. The long-term agreement develop with Accenture is designed to help Universal Music further adapt its business processes and systems to continue to stay ahead of the explosive demand for digital content and services, giving the music company an even more consolidated, efficient and flexible technology platform to continue growing its digital services revenues. The technology platform will collate and store Universal Music Group's audio and video content, artwork and metadata to distribute to the music company's mobile and digital business partners. The technology platform should further enable Universal Music to launch new digital products more quickly, react to changes in the marketplace faster, provide clients with a higher level of service, and reduce the unit cost to create, manage and distribute music and video releases. (http://newsroom.accenture.com/article_display.cfm?article_id=4652)
FN47	This is consistent with industry development where the major Record Labels have gone DRM free. Sony BMG would become the last of the top four music labels to drop DRM as of Jan 2008, following Warner Music Group (WMG),

	which in late December 2007 said it would sell DRM-free songs through Amazon.com's (AMZN) digital music store. EMI and Vivendi's Universal Music Group announced their plans for DRM-free download earlier in 2007. (http://www.businessweek.com/technology/content/jan2008/tc2008013_398775.htm)

Appendix 7

Video Resources

No.	Video Title	Summary	Source
VR1	 **Brian Levy, VP & CTO, CME, HP**	The new CTO of the Communications, Media and Entertainment division of HP discusses state of the industry, and looks forward to innovative developments that will shape the way we communicate.	Telecom TV http://web20.telecomtv.com/pages/?id=e9381817-0593-417a-8639-c4c53e2a2a10&vidid=1994&view=video
VR2	 **David Croslin, Chief Technologist HP CME**	HP CME's Chief Technologist, David Croslin, discusses the value of SDP, IMS network and the role of innovation. Published by: TelecomTV Wireless 3.0 on 27/04/2007	Telecom TV http://web20.telecomtv.com/pages/?id=f7e62028-1ab4-490d-8adb-dfc93628f845&vidid=1075&view=video
VR3	 **Business Control Systems**	Some of the possibilities created by business control systems include the ability for users and service providers to create bandwidth-on-demand.	Telecom TV http://web20.telecomtv.com/pages/?id=959ddeaa-d869-422f-871e-dace425807d4&vidid=1679&view=video
VR4	 **Executive Insight (1): Sol Trujillo, CEO, Telstra**	Following his keynote on the first day of the TM Forum's Management World 2008, Sol Trujillo talks to TelecomTV's Guy Daniels about the process of transforming Telstra's regulatory focused culture into one that is customer & market driven.	http://web20.telecomtv.com/pages/?id=e9d62593-c1d1-422f-a071-c76e1a694eaa&vidid=2876&view=video

VR5	 **Executive Insight (2): Sol Trujillo, CEO, Telstra**	In November 2005, Telstra announced a new proposal that would ultimately change both the company and the operator's network. Now half way down the line, the company's CEO talks to TelecomTV's Martyn Warwick about progression of the project. He also reveals how they are now ready to share insights with other Telcos as their high speed broadband wireless capability, aka NextG, is rolled out to customers.	http://web20.telecomtv.com/pages/?id=96a0e6f6-cca6-4ae3-a4d6-c4c9ffd86d86&vidid=2750&view=video
VR6	 **Executive Insight: Mark Selby, VP Industry Collaborations, Nokia**	Long live the citizen!! Nokia's Mark Selby explains why the communications industry needs to learn how to communicate and why it is time for operators to lose the concept of "consumer" ownership.	http://web20.telecomtv.com/pages/?id=e9381817-0593-417a-8639-c4c53e2a2a10&vidid=3360&view=video

Appendix 8

Pilot Case Study

The IMS based IP Centrex Solution

The service examined in this case study is an IMS (IP Multimedia Subsystem)[66] IP Centrex service. It is predominantly a VoIP (Voice over Internet Protocol) service, a hosted voice service of carrier-grade provided by a network operator based in Europe. However, voice is merely one of the many services offered through the IP Centrex solution. The solution is a complete set of personal and group services, with the addition of multimedia support such as video telephony, conference calling, sharing of documents and web pages (collaboration), presence management, instant messaging, e-mail integration and support for remote workers (e.g. sales personnel).

These services are particularly tailored for the communications needs of small and medium-sized businesses located in Europe. Instead of either upgrading their existing conventional phone system to IP compatibility or purchasing a new IP PBX[67] phone system, Small and Medium Enterprises (SMEs) have the option of using a managed, or hosted IP Telephony service, also known as IP Centrex[68].

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[66] The **IP Multimedia Subsystem** (**IMS**) is an architectural framework for delivering internet protocol (IP) multimedia services. It was originally designed by the wireless standards body 3rd Generation Partnership Project (3GPP), as part of the vision for evolving mobile networks beyond GSM.

[67] An IP (Internet Protocol) PBX (Private Branch Exchange) is a business telephone system designed to deliver voice over a data network and interoperate with the normal Public Switched Telephone Network (PSTN). (http://en.wikipedia.org/wiki/IP_PBX)

[68] Centrex is a set of specialized business solutions (primarily, but not exclusively, for voice service) where the equipment providing the call control and service logic functions is owned and operated by the service provider and hence is located on the service provider's premises. IP Centrex refers to a number of IP telephony solutions where Centrex service is provided to a customer who transmits their voice calls *to the network* as packetized streams across a broadband access facility. (http://www.ip-centrex.org/whatis/index.html)

IP Centrex service is a hosted phone solution offered by the network operator that provides PBX like functions to a group of users without the need for a PBX phone system to be installed in their office premises. Despite having individual single-line phones connected to the central office, users are able to dial each other by extension number and transfer calls easily. The network operator usually charges users a fixed monthly fee per user license. The IP telephony call control and feature applications are owned, hosted, and managed by the network operator within its own network, and that capacity is shared across multiple customers. The end-user simply requires good quality IP handsets. Whereas most telephone systems require connections to public trunks for voice, hosted IP PBX is delivered via Broadband IP or SIP[69] channels.

The IP Centrex solution offers basic voice features like a PBX system, but with the deployment flexibility and reduced initial cost of ownership of a hosted network solution. Both the SME market and very large enterprises have emerged as the early adopters of the hosted IP telephony service. The hosted solutions appeals to small, rapidly growing businesses unwilling to make large infrastructure investments. They also appeal to businesses with a large number of small sites, such as retailers or organisations with a disparate voice-based services infrastructure across many sites (and in all likelihood a broad mix of PBX systems installed). Traditionally both of these types of organisation have had to pay a large PBX maintenance bill. In adopting the IP Centrex solution, these businesses are able to circumvent the required investment in internal PBX infrastructure.

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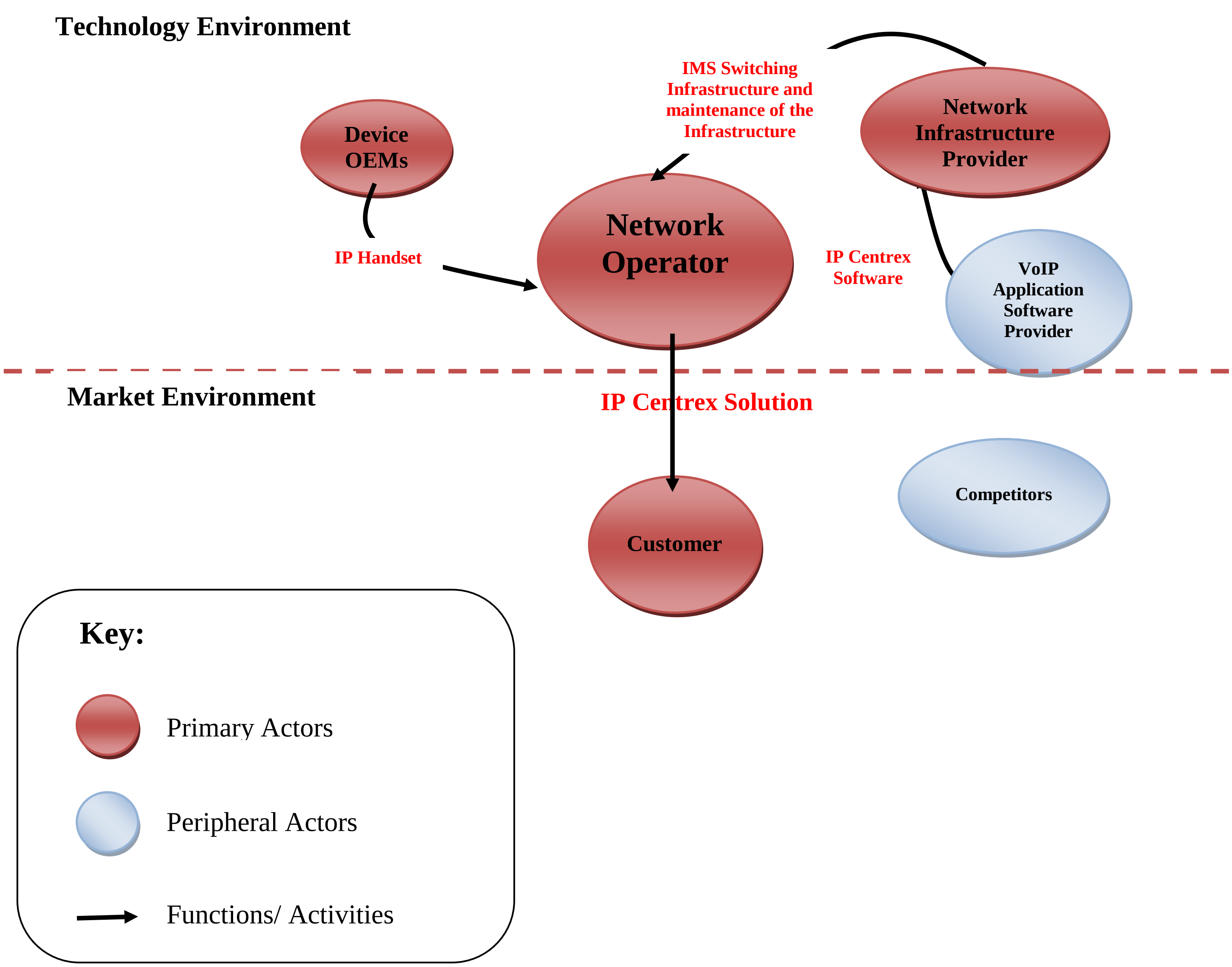
[69] A SIP (Session Initiation Protocol) connection is a service offered by many ITSP (Internet Telephony Service Providers) that connects a company's PBX to the existing telephone system infrastructure (PSTN) via Internet using the SIP VoIP standard. (http://en.wikipedia.org/wiki/SIP_connection)

Through hosting the infrastructure for the provision of VoIP service, the network operator is able to guarantee the Quality of Service (QoS)[70]. Voice services have guaranteed priority over data packets across the network and this determines a high quality of speech signal. The result is that applications identified as critical to businesses can be allocated the necessary priority and bandwidth levels to run efficiently. Applications that are identified as less than critical can be allocated 'best efforts' bandwidth and will run at a lower priority. Essentially this means that voice communications packets are prioritized to ensure a continuous stream is transmitted over a defined bandwidth whilst data packets are queued. Consideration is also given to network congestion. The network performance is evaluated constantly with voice traffic given priority so that the voice quality of the service always remains at a high level. In addition, sufficient bandwidth is also made available for non-voice applications such as videoconferencing, conference calling, presence management and instant messaging. *Figure 5.2* is a simple illustration of the organisations involved in the development and deployment of the IP Centrex solution.

[70] QoS is a generic term for a number of techniques that intelligently match the needs of specific applications to the network resources available. This can be achieved by accurately identifying the applications running on the network and then allocating an appropriate amount of network resources such as bandwidth and relative priority.

The Partial IP Centrex Business Ecosystem



The IP Centrex solution, although IMS-based service technology provided on a NGN (Next Generation Network), is nevertheless predominantly a technology-based solution. The services are not dependent on content provided by third parties, hence the reason for the absence of a content environment in the provision of the IP Centrex solution (as depicted in the figure above, in which no content environment is represented). The technology environment appears to be the dominant environment in the provision of the IP Centrex solution. The major actors responsible for the realization of the IP Centrex solution in the marketplace include the network infrastructure provider, network operator, devices OEMs (Original Equipment Manufacturers) and the VoIP software applications provider. The customer accesses the services through VoIP enabled devices located in their office premises through the IMS-based network infrastructure and the IP PBX hosting solution provided by the network operator.

Compatibility of the Case Studies with the Overarching Research Question

The overarching research question identified in chapter 2 that guides the development of the thesis is as follows:

What factors affect interorganisational NSD capability?

Subsequent examination of literature (see chapter 3) within the confines of the overarching research question reveals some fundamental selection criteria relevant to the selection of cases. In analyzing the IMS-based IP Centrex pilot case study, the evidence that emerged suggests that the selection of final case studies for the purpose of fulfilling the above overarching research question is dependent on the following characteristics: (1) the presence of a well developed content environment as part of the ecosystem (i.e. Rich Media Mobile Content); (2) the presence of a horizontal and abstract service layer – SOAs (the New Service Development Platform); (3) the presence of the dynamics of co-opetition between actors; and (4) the presence of structural differentiation reflected in niche creation initiatives within the ecosystem.

1) The Presence of a Well Developed Content Environment as Part of the Ecosystem (i.e. Rich Media Mobile Content)

The data deduced from the pilot case study interviews suggest that a well-developed content environment is important to the development and sustainability of an ecosystem. After all a business ecosystem is represented by the diversity of its actors that make up the ecosystem and much of the diversity is represented by the different types of content producer (i.e. news, games, entertainment, sports, documentaries and other forms of rich media mobile content). A mature content environment provides for a constant stream of applications and content made available to the rest of ecosystem. Content is fundamental to the development of rich media mobile services. This enables the ecosystem to then develop end-to-end new rich media mobile services for the consumption of the market as suggested by the comments of one informant:

> *If I look at it from a fixed line perspective [fixed line services particularly voice service], in this case the IP Centrex solution [predominantly a voice service], we do not have a content environment at all. This is purely a voice service [with additional services such as video conferencing, conference calling, presence management and instant messaging – all of which are non-content based services] … In the case of an ecosystem, there would certainly be a better developed content environment. It is the diversity of services that makes the ecosystem attractive. If we don't add advanced service capabilities [content and application] on top of our basic products [voice services] then we [network operator] are limiting our service development capability given the [opportunities offered by the] ecosystem. So the provision of advance*

services [rich media services] possibilities has something to do with content. But the IP Centrex solution is not a content-based service. It's a voice-based service. So we don't have a developed content environment as you call it. (PAR1 – Head of Network Strategy, Network Operator)

2) The Presence of a Horizontal and Abstract Service Layer – SOAs (the New Service Development Platform)

The abstract service layers such as that offered by SOAs like the SDP and the SDF are underlying platforms that provide the interface between the network operator's infrastructure and the content and applications provided by content providers. The presence of SOAs like the SDF and the SDP in effect provides a for a horizontal network architecture that is fundamental to the development of rich media mobile services, as indicated in the following observations:

We're not there yet [an abstract service layer such as SOAs have yet to be introduced in the fixed line services business – the fixed line business has always been accustomed to vertical silo architectures]. It's [horizontal infrastructure architecture] coming now and in the coming year I think we will begin to see the standards emerge for such layers [horizontal infrastructure architectures] to then become commonplace in service provision. But up to now it has not been really leveraged to introduce full fledged IP solutions where we have a real value, where we can get a layering in our functionality [horizontal flexibility provided by a horizontal architecture], in our transport regime, and our service regime [the various horizontal layers of the network infrastructure]. (PAR1 – Head of Network Strategy, Network Operator)

In discussing the significance of the horizontal technology layers present in the form of SOAs, the network operator's Head of Network Strategy anticipates the important role SOAs such as the SDP and SDF would have in sustaining an ecosystem of services:

> *Yes, I think one of the important roles of the SDP [an example of a SOA commonly identified within horizontal systems architecture] is actually to enable the network operator to play a part in the wider ecosystem. Because it can expose its services to third parties [content and application providers; and technology providers]. It can connect [the network operator's infrastructure] to services offered by third parties. So that's a very important thing … Another very important capability the SDP brings is a much easier and versatile service development [shorter time to market of services due to flexibility offered by the horizontal systems architecture]. By having SOA (service oriented architecture) based architecture [horizontal architectures] with strong development tools [building blocks], that would enable us to model all the capabilities in a modular fashion where then we can put them together for the purpose [the intended market need for which the service is designed] you want to bring to the market. So there is the data side and as we say the orchestration side [a technology component of a horizontal service layer architecture such as the SDP] in enabling effective product development [new rich media service development]. I think those are very important. That's why we need such SOAs. But the IP Centrex solution offered here is really a voice service based on the IMS platform (PAR1 – Head of Network Strategy, Network Operator).*

3) The Presence of Co-opetition between Actors

The evidence deduced from the interview for the pilot case study also suggests the absence of the dynamics of co-opetition within the framework of Figure 5.1 as seen from the arguments provided below:

An ecosystem as I see it is a more open system and I think you would typically have competition [and also cooperation] within an ecosystem … But we are not there yet if you're talking about the IP Centrex project [the organisational network arrangement behind the development of the IP Centrex service hinges on a partnership model rather than an ecosystem]. We have a very highly collaborative [cooperative] relationship with the other actors in the project. I don't think they compete … I think an ecosystem works differently [in that the dynamics of both competition and cooperation coexist]. And they are not totally controllable in my opinion. That's more like nature against a zoo for example. In our case we have a partnership model in place so I would certainly not classify this project [the IP Centrex project] as an ecosystem. I would rather refer to it as a partnership model. (PAR1 – Head of Network Strategy, Network Operator).

When probed further to examine the notion of competition and cooperation both coexisting within the context of the ecosystem, the participant puts forward the following argument:

There are two different dimensions [involved in the ecosystem], cooperation and competition. If you don't have cooperation but just competition I would not call that an ecosystem. Because then you are independently pursuing your own business goals [without concern for the collective objectives of the ecosystem]. And vice versa, if there is just cooperation and no competition then you will see competitors basically only as competitors and not potential collaborators [the notion of competitors collaborating with competitors – i.e. collaborating on one value activity and competing on another activity simultaneously]. Then competitors are kept out of the equation. … my vision of an ecosystem is that you have a lot of forces that make up the ecosystem and that makes it dynamic [the ecosystem in constant flux] and it evolves over time and you *have peaks and dips in the business etc. Like in nature you have cycles etc. In an ecosystem, if you only have cooperation [typified by a vertically integrated system] then you wouldn't get those cycles [the dynamism] that characterize an ecosystem. It will just be one where everyone succeeds [similar to the concept of a value chain – i.e. a typical vertically integrated system]. You don't have the various market dynamics. So when I think about an ecosystem, I think of it as more like wild nature [the complexity provided by an organisational network that exhibits both vertical and horizontal integrations]. And that is what you see for instance in the Internet. You have an ecosystem, you have a lot of partners that are relying [dependent] on each other but at the same time they are also competing [with each other] (PAR1 – Head of Network Strategy, Network Operator).*

The above arguments reveal the significance of the dynamics of co-opetition in the make-up of an ecosystem. As the informant suggests, an ecosystem is far more complex and dynamic than a mere value chain relationship. An ecosystem is both vertical and horizontal in its structural make-up. In a typical value chain relationship the actors that make up the chain function by complementing each other, thus, their tendency to cooperate and not compete against each other. However, in organisational network relationships as complex as an ecosystem, the presence of both cooperating and competing dynamics indicate the horizontal and vertical structures that typify relationships between organisations that make up the ecosystem. The vertical structure contributes to the cooperative character of the ecosystem while the horizontal structure permits organisations to coexist with otherwise competing organisations in the same ecosystem. Thus, this phenomena then allows for the dynamics of competition and cooperation (co-opetition) to coexist and simultaneously take effect in relationships between two otherwise competing organisations within the context of an ecosystem.

4) The Presence of Structural Differentiation through Niche Creation

The data observed also suggest that ecosystems are not merely represented by vertical and horizontal organisational network structures. Rather, ecosystems seem to exhibit niches, a key component of the ecosystem that drives innovation from within the ecosystem. The importance of niches in ecosystems is reflected in the following comments:

> *The ecosystem I don't think you could divide into entirely different categories of horizontal or vertical. It [ecosystem] is much more diverse than that. It's better to refer to it [ecosystem] as made up of different niches. I mean some [actors] are good at making IMS (Internet Protocol Multimedia Subsystem) end user devices [voice devices – i.e. hardware]. Some [actors] are good at making IMS applications [software]. So what we have here are organisations that specialize according to their area of expertise and competencies. And the niches that make up the ecosystem are in constant flux. Niches are created through the introduction of new actors with specific expertise and competencies into the ecosystem. But niches also sometimes erode in relevance and disappear from the radar of the ecosystem because of the obsolescences of a technology that these actors are associated with. So there are dynamics there with regards to the emergence and sometimes the disappearance of niches in the ecosystem. So that's how I see the ecosystem (PAR2 – Chief Technology Officer, Systems Integrator / Network Infrastructure Provider).*

In providing examples of niches and specialist organisations that occupy such niches in the context of ecosystem, the same participant provides the following illustration:

> *KPN [a fixed line and mobile network operator based in the Netherlands] is an example of an operator that has proven that IMS is an open system and they are now developing their ecosystem through adding niches. So they have one vendor as the System Integrator (SI) and I think that's Lucent, and then the business trunking [a component of the network operator's network that connects PBXs to the public IMS network] is bought from Ericsson which is an application, the ATSS and the CSCF (Call Session Control Function) [The CSCF provides session control for subscribers accessing services within the IM (IP Multimedia) network] they are bought from Nortel. So there you have the specialization and niches that emerge as a result of that specialization within the ecosystem. (PAR2 – Chief Technology Officer, Systems Integrator / Network Infrastructure Provider).*

However, the Chief Technology Officer argues that although the IP Centrex service is a first step towards the formation of an ecosystem for the provision of other services based on the capabilities of the IMS technology, the notion of an ecosystem within the context of IP Centrex is still very much in its embryonic stages. This implies that niche creation initiatives although critical in an ecosystem is still very much absent within the context of the IP Centrex service. This much is acknowledged in the following comments:

> *I mean the network operator … if they [network operator] only did IP Scale, they could have just as easily gone to Broadsoft [IP Centrex Software Provider] which is a company we are working with very closely*

on this project. The application [IP Centrex technology] for the IP Scale project comes from an American company called Broadsoft. And if they [network operator] only wanted to deploy that [IP Centrex service], they [network operator] could have just as easily gone to Broadsoft and say they wanted the IP Centrex application … we put it on the Internet just like that. You don't need the IMS technology for that. What we have done from the systems integrator's side is to provide this IMS ground work and then we put Broadsoft Application [IP Centrex technology] on top [as a service layer on top of the IMS network core] … So IP Scale is only the first product that the network operator is launching … it's only the tip of the iceberg. They [network operator] will have to gradually open their network [including the IMS core] to third parties and create an ecosystem where multiple third party applications [other than IP Centrex] can be incorporated and delivered to the market through the same infrastructure [creation of niches]. This is where the true potential of the IMS technology in terms of its service development capability starts to be fully realized (PAR2 – Chief Technology Officer, Systems Integrator / Network Infrastructure Provider).

In summary, the pilot case study revealed four main characteristics that were of fundamental significance when selecting cases studies for the data collection phases of the thesis:

- The presence of a mature content environment.

- The presence of a horizontal and abstract service layer – SOAs (Service Oriented Architectures) in the network operator's infrastructure architecture.

- The presence of the dynamics of both cooperation and competition among actors (co-opetition).
- The propensity to create niches within the business ecosystem.

Other characteristics that were subsequently decided to be included as criteria for the selection of case studies for the data collection phases of the thesis are:

- A project that is based on the third generation of radio access technologies, commonly known as the 3G standard, regardless of the protocols they are based upon (i.e. namely the Universal Mobile Telephone System (UMTS), Code Division Multiple Access (CDMA), and (Wideband-CDMA).
- The project involves all other core members of the business ecosystem as indicated in Peppard and Rylander (2006). This includes the Network Operator, Content Providers, Content Aggregators, Operating System Providers, and Devices OEMs.

Appendix 9

EXPLANATORY/ INFORMATION LETTER

PROJECT TITLE: INTERORGANISATIONAL NEW SERVICE DEVELOPMENT (NSD) CAPABILITY IN THE MOBILE COMMUNICATIONS VALUE NETWORK

Dear Sir/ Madam,

My name is Stephen Singaraju and I am a PhD research student at Monash University in Melbourne, Australia.

I am conducting research into the dynamics of interorganisational new services development capability with regards to the mobile communications services ecosystem concerning the rich media mobile communications services and would welcome your assistance. The research would involve a personal interview session and should take no more than two hours of your time.

This research has been partially funded by Ericsson AG to cover my travel and accommodation expenses.

The proposed research attempts to contribute to the existing stream of research in B2B (Business-to Business) new service development (NSD) programmes particularly from an inter-organisational perspective. The research attempts to examine interorganisational NSD capability from two primary dimension namely, network interconnectedness and customer collaboration.

The study is expected to contribute significantly to the domain of horizontal inter-organisational NSD programme arrangements. This has been made possible by the emergence of horizontal technological platforms such as the Service Delivery Platform (SDP) and IP Multimedia Subsystem (IMS) within the context of NSD programmes in the delivery of rich media mobile communication services.

If you are interested in participating in the proposed research, I'll be obliged if you could complete the *informed consent form* provided within this information pack and return it to the address printed in the prepaid envelope provided. I can also be contacted according to the details provided in this information pack. Alternatively, if you would need any further confirmation pertaining the research, my main supervisor, Professor Mark Gabbott will be more than pleased to be of assistance. His contact details are also provided in the information pack.

Finally, I would like to highlight the fact that you are under no obligation to participate in this research. However, should you decide to participate in this research, the contribution both you and your organisation will make to this domain of research will be significant.

If you would like to contact the researcher about any aspect of this study, please contact the Chief Investigator:	If you have a **complaint** concerning the manner in which this research is being conducted, please contact:
Stephen Singaraju Telephone (Office): +61399032653 (ext: 31554) Telephone (Mobile): [redacted] Telephone Home: [redacted] Email : Stephen.Singaraju@buseco.monash.edu.au or [redacted]	Human Ethics Officer Standing Committee on Ethics in Research Involving Humans (SCERH) Building 3e Room 111 Research Office Monash University VIC 3800 Tel: +61 3 9905 2052 Fax: +61 3 9905 1420 Email: scerh@adm.monash.edu.au

Thank you.

Yours sincerely,

Stephen Singaraju
Doctoral Candidate
Department of Marketing
Faculty of Business and Economics
Monash University
Telephone (Office): +61399032653 (ext: 31554)
Telephone (Mobile): [redacted]
Telephone Home: [redacted]
Email : Stephen. Stephen.Singaraju@buseco.monash.edu.au or [redacted]

MONASH University

INFORMATION LETTER QUESTIONS AND ANSWERS

INTERORGANISATIONAL NEW SERVICE DEVELOPMENT (NSD) CAPABILITY IN THE MOBILE COMMUNICATIONS ECOSYSTEM

(MONASH HREC APPROVAL NUMBER : CF07/1219-2007/0331LIR)

WHO IS DOING THE RESEARCH?

This research will be conducted by ***Stephen Singaraju***, a PhD researcher at Monash University. This research will be supervised by ***Professor Mark Gabbott*** (Main supervisor) and ***Dr. Samir Gupta*** (Associate Supervisor).

WHAT IS THIS RESEARCH ABOUT?

The research attempts to contribute to the existing stream of literature in Business-to-Business (B2B) new service development (NSD) programme capability particularly from an inter-organisational perspective. The research attempts to examine the deployment of individual organisational skills and resources within the context of the mobile communications ecosystem into an aggregate portfolio of skills and resources at an inter-organisational level to achieve a desired new service end.

The central problem of the research involves addressing the issue of the specific concepts affecting inter-organisational "NSD Capability" within the context of a mobile communications services ecosystem. The subsidiary questions that relate to this core research problem includes – Is there a relationship between "network interconnectedness" and "NSD capability" in an inter-organisational NSD Context? – What are the concepts that affect "NSD capability" in the provision of rich media services within the context of a mobile communications ecosystem? – Is "customer collaboration" critical in augmenting NSD capability in an inter-organisational NSD Context?

This research is structured in ***six (6)*** phases. The following are brief descriptions of the issues to be discussed in each of these phases:

Phase 1: The Rich media Communications Industry - The New Landscape

- The ***evolution*** and ***changes*** experienced by the telecoms industry
- The forces of ***convergence*** affecting the industry at various levels (i.e. network, devise and market levels)
- Redefinition of the telecoms ***industry boundaries***
- The ***Next Generation Networks*** (NGNs)
- The emergence of an ***ecosystem*** in the delivery of rich media mobile services.

- Typical ***actors*** within the ecosystem
- The emergence and the significance of a ***unifying platform*** in the ecosystem
- The emergence of a ***dominant standard*** in the provision of NG services

Phase 2: Inter-Organisational New Service Development Capability

- The concepts that affect NSD Capability from a inter-organisational perspective

Phase 3: Network Interconnectedness

- The ***co-operative behavior*** of actors within the ecosystem in the development and provision of NG services.
- The existence of a ***horizontal network*** facilitating the degree of interconnectedness between various actors.
- ***Roles*** each actors perform in contribution to network interconnectedness
- The function the ***SLAs (service level agreements)*** provide in harnessing the interconnectedness between actors.
- The various ***exchange processes*** involved between actors in the ecosystem in contributing towards network interconnectedness
- The ***position*** each actor occupies in the ecosystem and the impact this will have on interconnectedness between various actors.
- The focus of the ecosystem – the actor occupying ***central position*** of the network.
- The element of ***power*** in exchange relationships
- Distribution and concentration of skills and expertise within the ecosystem
- Contribution of ***structural differentiation*** of each actor to the degree of interconnectedness between various actors in the ecosystem.
- The ***movement of strategic resources across*** organisational boundaries within the ecosystems in realizing the objectives of inter-organisational NSD projects.
- The presence of ***paradoxical relationships*** – i.e. both ***co-operative*** and ***competitive*** within the ecosystem.

Phase 4: Customer Collaboration

- ***Critical dimensions*** reflecting customer collaboration in NSD projects within the ecosystem.
- ***Categories of customer*** that provide the highest value for collaboration.
- ***Lead Users*** and the contribution they make to inter-organisational NSD projects.
- ***Technology*** as enablers for customer collaboration.
- The role of ***forums*** for customer collaboration in inter-organisational NSD projects.

Phase 6: Concluding Questions

- ***Other issue*** applicable to this research not covered during the interview (i.e. to be raised by respondents)

The study is expected to contribute significantly to the domain of *horizontal inter-organisational NSD programme* arrangements. This has been made possible by the emergence of horizontal technological platforms such as the Service Delivery Platform (SDP) in the delivery of rich media mobile communication services. This research is therefore expected to be a prelude towards the stream of literature in the future contributing towards horizontal inter-organisational NSD programme arrangements.

WHO ELSE WOULD BE POTENTIALLY PARTICIPTING?

Consistent with the global outlook of the industry being analyzed, a selected number of the major mobile telecommunications network operators in the world will be contacted for their participation in this research.

The mobile telecommunications network operators that have agreed to participate in the research will then decide on a particular project for the research. Peripheral organisations (e.g. content providers, content aggregators, terminal manufacturers, infrastructure providers) associated with this project can then be identified for interview arrangements. The inclusion of the mobile telecommunications network operator and the associated peripheral organisations in the delivery of rich media services will be critical for this research. This will enable the central research problem concerning specific variables affecting "inter-organisational NSD Capability" within the context of a mobile communications ecosystem (i.e. the unit of analysis) to be captured in its totality.

IF I SAY YES, WHAT WILL IT INVOLVE?

The researcher will be conducting a personal interview with participants of the research for duration of approximately 2-hours with an optional 1-hour follow-up interview at a later stage in the research, if required. The 1-hour follow-up interview to be conducted subsequent to the initial 2-hours personal interview will be implemented through the telephone with the objective of clarifying certain issues captured during the initial 2-hours personal interview. Research instruments such as questionnaires, recording devices such as MP3 recorders and video recorder will be used during the interview session (i.e. with the prior consent of the participants) for the systematic capture of data.

ARE THERE ANY RISKS?

There are very few if any risks because the research has been carefully designed with much thought given towards issues such as confidentially and privacy of each participant. With these issues in mind, a model non-disclosure agreement (NDA) has been prepared to ensure that participants are duly protected for the information disclosed for the purpose of this research. The NDA developed is merely a model and could be further modified to accommodate any other requirements that may be important to each participant and the organisation they represent prior to the commencement of the interviews.

HOW IS THE DATA STORAGE AND USAGE ISSUES HANDLED?

Storage of the data collected will adhere to the University regulations and kept on University premises at all times in a locked cupboard/filing cabinet for 5 years. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report. Only the chief researcher and the supervisor will have access to the data collected for the purpose of this research. The data obtained for the purpose of this research will only be used solely for the purpose of this research.

WHY HAVE I BEEN ASKED?

As mentioned earlier in this document, the unit of analysis is essentially the mobile communications service ecosystem. The ecosystem in turn is viewed as a group of organisations brought together by the forces of interdependence to enable the production and delivery of rich media services. The mobile telecommunications network operator in the context of this ecosystem is viewed as a central organisation.

Having explained the nature and objectives of the research in earlier sections, it is necessary to highlight the category of participants most suitable for this research. The participants will typically be associated to departments as diverse as Marketing, Business Development, Business Strategy, Project Management, Technology and Operations Management.

DO I HAVE TO SAY YES?

You don’t have to say yes. Participation in this research is entirely voluntary. Todate, there has been no substantive research conducted to assess the dynamics brought forward by the emergence of the mobile communications service ecosystem and the NSD business models required for the provision of rich media services to the end users. Therefore, each participant and the organisation they represent will be making a significant contribution to knowledge in the domain of NSD capability in the context of rich media services.

WHAT WILL HAPPEN IF I SAY NO?

The researcher will thank you for your time extended so far and will not attempt to contact you again should you choose not to be contacted again for this research. Alternatively, you might be interested to participate in the research at a later time, the researcher will indicate a time frame during which your option to participate in the research still remains open should circumstances change.

IF I SAY YES, CAN I CHANGE MY MIND LATER?

You can change your mind at any point in time during the course of this research prior to the data processing stage (i.e. a research timeline will be provided to keep all participants informed of the progress of the research). If you choose to withdraw from the research anytime prior to the data processing stage, you will not have to categorically state the reason for the discontinuation of your participation. The researcher will thank you for your time extended so far and will not attempt to contact you should you choose not to be contacted again for this research.

WOULD I BE ABLE TO GET A COPY OF THE RESULTS OF THE RESEARCH?

If you would like to be informed of the aggregate research finding, please contact Stephen Singaraju on Telephone (Office): +61399032653 (ext: 31554), Telephone (Mobile): +61402833453 or EMAIL Stephen.Singaraju@buseco.monash.edu.au. The findings will be made available to you upon request.

WHAT IF I HAVE CONCERNS OR A COMPLAINT?

If you have concerns about the research that you think might need further clarifications before, after or during the research, the researcher can be contacted as per the following details:

Stephen Singaraju
Telephone (Office): +61399032653 (ext: 31554)
Telephone (Mobile): [redacted]
Telephone Home: [redacted]
Email : Stephen. Singaraju@buseco.monash.edu.au or [redacted]

Alternatively, you will also be able to contact *Professor Mark Gabbott*, the main supervisor of this research via his Personal Assistant Ms. Gail as per the following details:

Telephone (Office): +61399031307

Email: Mark.Gabbott@buseco.monash.edu.au

If you would like to talk to someone who is not directly connected with the research, you may contact the ***Human Ethics Officer***, Standing Committee on Ethics in Research Involving Humans (SCERH), Building 3e Room 111, Research Office, Monash University VIC 3800

Tel: +61 3 9905 2052 Fax: +61 3 9905 1420 Email: scerh@adm.monash.edu.au
and quote this number – MONASH SCERH APPROVAL NUMBER : **CF07/1219-2007/0331LIR**

Appendix 10

Consent Form for Persons Participating in Research Projects

FACULTY OF BUSINESS AND ECONOMICS

DEPARTMENT OF MARKETING

PROJECT TITLE: INTERORGANISATIONAL NEW SERVICE DEVELOPMENT (NSD) CAPABILITY IN THE MOBILE COMMUNICATIONS VALUE NETWORK

Name of participant:

Name of investigator(s): Stephen Singaraju

SCERH approval number : CF07/1219-2007/0331LIR

1. I consent to participate in the research project named above, the particulars of which have been clearly explained to me, including details of the research problem and objectives, the research context, the proposed research model, issues concerning the research methodology such as the research design, data collection instruments and methods such as questionnaire, video or audio taping and interview structures, data storage and the people who will have access to it. The potential research contribution arising from this research was also communicated to me effectively. A written copy of the information has been provided to me for reference purposes.

2. I authorize the researcher or his assistant to use the information that will be provided during the course of the research. I am confident that the information provided for the purpose of the research will be handled with care and confidentiality both during and upon completion of the research.

3. I consent to interviews being audio and/or video taped for the purpose of the research. I acknowledge that copies of these interview transcripts will be returned to the participant for verification prior to processing of such data.

4. I agree that the research data gathered from this project may be published in a form that does not identify me or my employer in any way. I have been informed that participants of the research will be to be referred to by pseudonym or identified by codes in any publications arising from the research.

5. I have been made to understand that in instances where a dependent relationship is involved confirmation that participation or non-participation in the research will have no affect on grades/assessment/employment.

6. I am aware that I can contact *Stephen Singaraju* or his supervisor(s) *Professor Mark Gabbott* or *Dr. Samir Gupta* of Monash University (i.e. as per contact details in the Explanatory Letter) if I have any concerns about the research.

7. I acknowledge that:

(a) The possible effects of the research have been explained to me to my satisfaction;

(b) I have been informed that I and my employer are free to withdraw from the project at any time prior to the processing of data without explanation or prejudice and to withdraw any unprocessed data previously supplied;

(c) The project is for the purpose of research and not for treatment; *(for medical research)*

(d) I have been informed that the confidentiality of the information I provide will be safeguarded subject to any legal requirements.

Signature Date

(Participant)

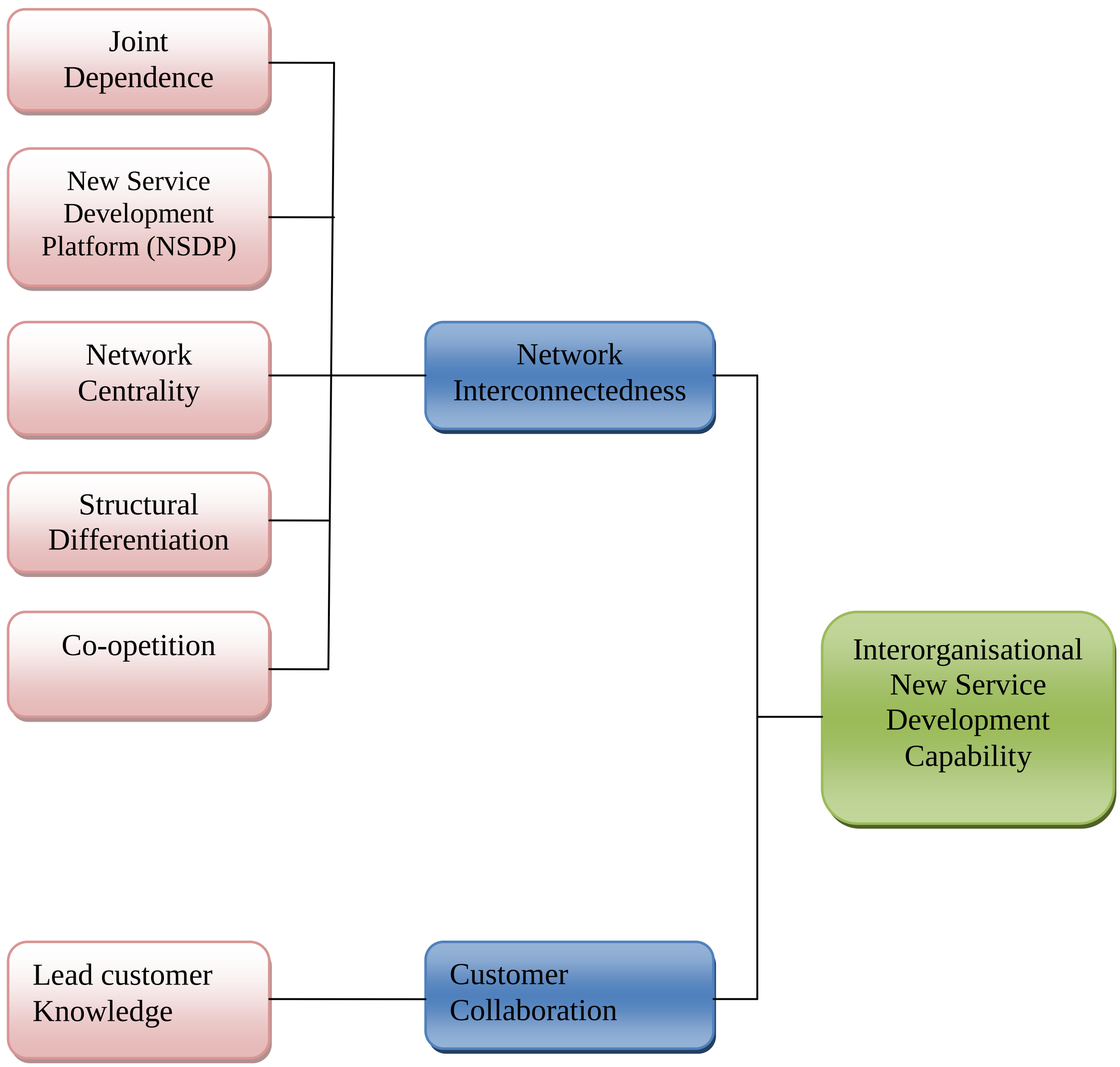
Signature Date

(Witness to consent)

NOTE: This study has been approved by Monash University, Melbourne, Human Research Ethics Committee. If you have any complaints or reservations about any aspect of your participation in this research which you cannot resolve with the researcher, you may contact the Ethics Committee through the Research Ethics Officer (ph: +61-3-99052052). Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Appendix 11

Final Code Template – Tree Node Structure



Appendix 12

Abbreviations

2G

Also known as Personal Communications Services (PCS), second generation wireless service refers to the digital mobile phone technologies that emerged and were deployed during the 1990's, delivering both voice and data transmissions. 2G technology standards include Code Division Multiple Access (CDMA), Time Division multiple Access (TDMA), and Global System for Mobile Communications (GSM).

3G

The third generation wireless service promises to provide high data speeds, always-on data access and greater voice capacity. The high data speeds enable full motion video, high-speed internet access and video-conferencing, and are measured in Mbps. 3G technology standards include UMTS, based on WCDMA technology (quite often the two terms are used interchangeably) and CDMA2000, which is the evolution of the earlier CDMA 2G technology. UMTS standard is generally preferred by countries that use GSM network. The data transmission rates range from 144 kbps to more than 2 Mbps.

ASP

An **application service provision (ASP)** is an activity of providing computer-based services to customers over a network. Software offered using an ASP model is also sometimes called **On-demand software (or applications)** or **software as a service (SaaS)**. In the mobile decives context, this would mean providing updates of software or an application via the wireless network to the mobile devices. The most limited sense of this activity is that of providing access to a particular application program (such as Mobile TV) using a standard protocol defined by the network operator.

CDMA

Code Division Multiple Access. Also called “spread spectrum techniques,” a technique for multiplexing digital transmission of radio signals in which each voice or data cell uses the whole radio band, and is assigned a unique code.

EDGE

Enhanced Data rates for GSM Evolution. The final stage of the GSM standard. Although technically a 3G network technology, it is generally classified as the unofficial standard 2.75G, due to its lower network speed. EDGE uses a new modulation schema to enable theoretical data speeds of up to 384kbit/s within the existing GSM spectrum.

EMS

Enhanced Messaging Service. An application-level extension to Short Message Service (SMS) for cellular phones available in GSM, TDMA and CDMA networks. An EMS enabled mobile phone can send and receive messages that have special formatting (such as bold or italic), animations, pictures, icons, sound effects and special ring tones.

EPG

An electronic program(me) guide (EPG) or interactive program(me) guide (IPG) or electronic service guide (ESG) is a digital guide to scheduled broadcast television or radio programs, typically displayed on-screen with functions allowing a viewer to navigate, select, and discover content by time, title, channel, genre, etc. by use of their remote control, a keyboard, or other input devices such as a phone keypad.

EVS Broadcast

EVS manufactures live outside broadcast digital video production systems. Its recorders have become the dominant standard for broadcasters worldwide. Their XT[2] production video servers enable the creation, editing, exchange and playout of audio and video feeds. The programming of the television networks consists primarily of broadcasting prerecorded images which, until very recently, were stored on tapes. But *linear editing* (or editing on tape) is being replaced by digital media or *non-linear editing*. Today, digital technology on hard disk (non-linear, by definition) is the common alternative. There has been clear confirmation of a migration towards this technology for some years, even though it will still take another 5 to 6 years or so for the hard disk penetration rate to increase from 30% to 70%. Television stations began migrating to tapeless interoperable computer platforms beginning in the late 1990s. Video recorders are rarely used nowadays for live productions. EVS type digital media servers are the norm in Broadcasting.

FTP

File Transfer Protocol (FTP) is a network protocol used to transfer data from one computer to another through a network such as the Internet. FTP is a file transfer protocol for exchanging and manipulating files over a TCP computer network. An FTP client may connect to an FTP server to manipulate files on that server.

GSM

Global System for Mobile communications. The most popular digital mobile cellular standard in the world.

GPRS

General Packet Radio Service. A packet-switching technology that enables high-speed data transmission of up to 115kbps. An enhancement for GSM, often described as 2.5G.

HTTP

Hypertext Transfer Protocol is a communications protocol for the transfer of information on intranets and the World Wide Web. Its original purpose was to provide a way to publish and retrieve hypertext pages over the Internet.

HSDPA

High-Speed Downlink Packet Access (HSDPA) is an enhanced 3G (third generation) mobile telephony communications protocol in the High-Speed Packet Access (HSPA) family, also coined 3.5G or 3G+, which allows networks based on Universal Mobile Telecommunications System (UMTS) to have higher data transfer speeds and capacity.

HSPA

High Speed Packet Access (HSPA) is a collection of two mobile telephony protocols High Speed Downlink Packet Access (HSDPA) and High Speed Uplink Packet Access (HSUPA) that extend and improve the performance of existing WCDMA protocols.

HSUPA

High-Speed Uplink Packet Access (HSUPA) is a 3G mobile telephony protocol in the HSPA family with up-link speeds up to 5.76 Mbit/s. The name HSUPA was created by Nokia.

ICT

Information and communication technologies (ICT) is an umbrella term that covers all advanced technologies in manipulating and communicating information. The term is sometimes used in preference to information technology (IT), particularly on these two communities: education and government. The common usage ICT is synonymous assumed the fact that IT or ICT encompasses all mediums, to record information (magnetic disk/tape, optical disks (CD/DVD), flash memory etc. and arguably also paper records); technology for broadcasting information - radio, television; and technology for communicating through voice and sound or images - microphone, camera, loudspeaker, telephone to cellular phones. It includes the wide varieties of computing hardware (PCs, servers, mainframes, networked storage).

IMT-2000

International Mobile Telecommunications-2000. The global standard for third generation (3G) wireless communications, defined by a set of interdependent International Telecommunication Union (ITU) recommendations.

JAVA

An object-oriented programming language developed by Sun Microsystems. Programs authored in Java do not rely on an operating system, as long as a Java Virtual Machine (JVM) is installed on the destination device on which they are running.

J2ME

Java 2 Platform, Micro Edition. A technology that allows programmers to use the Java programming language and related tools to develop programs for mobile handsets. J2ME consists of programming specifications and a special virtual machine (Java Virtual Machine, or JVM) that allows a J2ME-encoded program to run in the handset.

LBS

Location Based Services. A range of services that are provided to mobile subscribers based on the geographical location of their handsets within their cellular network. Handsets have to be equipped with a position-location technology such Global Position

System (Global Positioning System) to enable the geographical-trigger of service(s) being provided. LBS include driving directions, information about certain resources or destinations within current vicinity, such as restaurants, movie theaters, etc. LBS may also be used to track the movements and locations of people, as is being done via parent/child monitoring services and mobile devices that target the family market.

MMS

Multimedia Messaging Service. Standard for telephony messaging systems that enable the sending of messages that include multimedia objects (images, audio, video, rich text). May or may not include normal text.

OS

An **operating system** (commonly abbreviated as either *OS* or *O/S*) is an interface between hardware and user. An OS is responsible for the management and coordination of activities and the sharing of the resources of the computer. The operating system acts as a host for computing applications run on the machine. As a host, one of the purposes of an operating system is to handle the details of the operation of the hardware. However, in the context of this research, OS is attributed to mobile devices.

A mobile operating system, also known as , a Mobile OS, a Mobile platform, or a Handheld operating system, is the operating system that controls a mobile device—similar in principle to an operating system such as Linux or Windows that controls a desktop computer. However, they are currently somewhat simpler, and deal more with the wireless versions of broadband and local connectivity, mobile multimedia formats, and different input methods. Examples of Mobile OS include Palm WebOS ,Symbian OS, RIM's BlackBerry, Windows Mobile, Familiar Linux, Palm OS, The Ångström Distribution, Maemo and the iPhone OS.

OSS

Operations Support Systems (also called Operational Support Systems or OSS) are computer systems used by telecommunications service providers. The term OSS most frequently describes "network systems" dealing with the telecom network itself, supporting processes such as maintaining network inventory, provisioning services, configuring network components, and managing faults.

BSS

Business Support Systems (BSS) are the components that a telephone operator or telco uses to run its business operations towards customer. BSS and OSS platforms are linked in the need to support various end to end services. Each area has its own data and service responsibilities. The role of Business Support Systems in a service provider is to cover four main areas including product management, customer management, revenue management and order management.

P2P

Peer-to-peer. A computer network that uses diverse connectivity between participants in a network and the cumulative bandwidth of network participants rather than conventional centralized resources where a relatively low number of servers provide the core value to a service or application.

PDA

Personal digital assistant. A handheld computer, but has become much more versatile over the years.

Push-to-talk

A method of conversing on half-duplex communication lines, including two-way radio, using a momentary button to switch from voice reception mode to transmit mode.

SDF

A service delivery framework (SDF) is a set of principles, standards, policies and constraints used to guide the design, development, deployment, operation and retirement of services delivered by a service provider with a view to offering a consistent service experience to a specific user community in a specific business context. An SDF is the context in which a service provider's capabilities are arranged into services.

The term service delivery framework (SDF) has been used interchangeably with the term service delivery platform (SDP), which is a set of technology components that provide capabilities. An SDF governs and guides the use of SDP capabilities.

SDP

The term **Service Delivery Platform** (SDP) usually refers to a set of components that provide a service's delivery architecture (such as service creation, session control & protocols) for a type of service. As SDPs evolve, they will often require integration of telecom and IT capabilities and the creation of services beyond technology and network boundaries. SDPs available today are optimized for the delivery of a service in a given technological or network domain (examples of such SDPs include web, IMS, IPTV, Mobile TV, etc.). They will typically provide a service control environment, a service creation environment, a service orchestration and execution environment, and abstractions for media control, presence/location, integration, and other low-level communications capabilities. SDPs are applied to both consumer and business applications. The business objective of implementing the SDP is to enable rapid development and deployment of new converged multimedia services.

SIP

The Session Initiation Protocol. An application-layer control (signaling) protocol for creating, modifying, and terminating sessions with one or more participants. It can be used to create two party, multiparty, or multicast sessions that include Internet telephone calls, multimedia distribution, and multimedia conferences.

SLA

A **service level agreement** (frequently abbreviated as **SLA**) is a part of a service contract where the level of service is formally defined. In practice, the term *SLA* is sometimes used to refer to the contracted delivery time (of the service) or performance. A service-level agreement (SLA) is a negotiated agreement between two parties where one is the customer and the other is the service provider. This can be a legally binding formal or informal 'contract'. The SLA records a common understanding about services, priorities, responsibilities, guarantees and warranties. Each area of service scope should have the 'level of service' defined. The SLA may specify the levels of availability, serviceability, performance, operation, or other attributes of the service such as billing. The 'level of service' can also be specified as 'target' and 'minimum', which allows customers to be informed what to expect (the minimum), whilst providing a measurable (average) target value that shows the level of organisation performance. In some contracts penalties may be agreed in the case of non compliance of the SLA.

SMS

Short Message Service. A standard for telephony messaging systems that allow sending messages between mobile devices that consist of short messages, normally text only content. 160 characters is a maximum length of short messages.

SOA

In computing, **service-oriented architecture** (**SOA**) provides methods for systems development and integration where systems group functionality around business processes and package these as *interoperable services*. A SOA infrastructure allows different applications to exchange data with one another as they participate in business processes. Service-orientation aims at a *loose coupling* of services with operating systems, programming languages and other technologies that underlie applications.

In telecommunications, SOAs can be used as an application integration technology within an SDP but are best served when used in the lower performance functions such as connections between the transactional OSS and BSS applications and the SDP.

Symbian

An advanced open standard operating system for data enabled mobile devices (i.e.mobile handsets).

Streaming

An internet derived expression for the one-way transmission of video and audio content.

.

UMTS

Universal Mobile Telecommunications System (UMTS) is the European term for one of the third generation (3G) wireless services. UMTS networks in many countries have been or are in the process of being upgraded with High Speed Downlink Packet Access (HSDPA), sometimes known as 3.5G. Currently, HSDPA enables downlink transfer speeds of up to 21 Mbit/s. Work is also progressing on improving the uplink transfer speed with the High-Speed

Uplink Packet Access (HSUPA). Longer term, the 3GPP Long Term Evolution project plans to move UMTS to 4G speeds of 100 Mbit/s down and 50 Mbit/s up, using a next generation air interface technology based upon Orthogonal frequency-division multiplexing.

VoIP

Voice over Internet Protocol is a protocol optimized for the transmission of voice through the Internet of other packet switched networks.

WAP

Wireless Application Protocol. An open international standard for applications that use wireless communication. Its principal application is to enable access to the internet from a mobile phone or PDA. Can be used to deliver content to mobile devices.

WCDMA

Wideband Code Division Multiple Access. A high speed 3G mobile wireless technology with the capacity to offer higher data speeds than CDMA and therefore can transmit and receive information faster and more efficiently.

WiFi

Also known as Wi-Fi. A wireless-technology brand owned by the Wi-Fi Alliance, promotes standards with the aim of improving the interoperability of wireless local area network products based on the IEEE 802.11 standards. Common applications for Wi-Fi include Internet and VoIP phone access, gaming, and network connectivity for consumer electronics such as televisions, DVD players, and digital cameras.

XML

Extensible Markup Language. A general-purpose markup language primarily used to facilitate the sharing of data across different information systems, particularly via the Internet.

XHTML

Extensible HyperText Markup Language. A markup language. It is a reformulated, upgraded version of HyperText Markup Language (HTML), but still conforms to the Extensible Markup Language (XML)

Source: Based on Mobile Marketing Industry Glossary 2007, Wikipedia 2008, CDMA Development Group (www.cdg.org) 2008

Appendix 13

Key Definitions

The definitions of the key concepts of this study include the following. Some of these concepts are based on previous literature; others are developed in this study.

New Service Development: "… the development of service products which are new to the supplier" (Johne and Storey, 1998; p. 185)

Business Ecosystem: "… business ecosystem and its plural business ecosystems, refer to intentional communities of economic actors whose individual business activities share in some large measure the fate of the whole community' (Moore, 2006; pp.34).

Joint Dependence: while dependence asymmetry invokes the logic of *power*, joint dependence brings attention to the logic of *embeddedness* (Gulati and Sytch, 2004)

Platform: "a set of tools or components that provide building blocks for application providers" (Iansiti and Richards, 2006, p. 81)

Structural Differentiation: "an emergent systemic property that captures the extent to which actors (organisations) come to occupy an identifiable set of network positions, each of them characterized by a distinctive relational profile" (Gulati and Gargiulo, 1998; p. 1450)

Mobile TV service innovation: A service innovation that is provided by combining two existing products: a mobile telephone and a television. It brings television and other broadcasting services over a public network to a mobile phone.

Diffusion: "The process by which an innovation is communicated through certain channels over time among members of a social system." (Rogers 1983)

Other relevant concepts are defined within the text.

Appendix 14

Rank	Company	Main Markets	Technology	Subscribers (proportionate, in millions)	Subscribers (total, in millions)
1	China Mobile (China)	China (inc. Hong Kong) & Pakistan	GSM, GPRS, EDGE TD-SCDMA	500.59 [1] (June 2008)	436.12 [2] (30 Sep 2008)
2	Vodafone (United Kingdom)	United Kingdom, Germany, Italy, France, Spain, Romania, Greece, Portugal, Netherlands, Czech Republic, Hungary, Ireland, Albania, Malta, Northern Cyprus, Faroe Island, India, USA, South Africa, Australia, New Zealand, Turkey, Egypt, Ghana, Fiji, Lesotho, Mozambique	CdmaOne CDMA2000 1x, EV-DO GSM, GPRS, EDGE UMTS, HSDPA LTE (planned)	260.5 [3] (April 2008)	
3	Telefónica / Movistar / O_2 (Spain)	Spain, Argentina, Brazil, Chile, Colombia, Ecuador, El Salvador, Guatemala, Mexico, Nicaragua, Panama, Peru, Uruguay, Venezuela, Ireland, Germany, UK, Czech Republic, Morocco, Slovakia	D-AMPS CdmaOne CDMA2000 1x GSM, GPRS, EDGE UMTS, HSDPA LTE (planned)	188.9 [4] (September 2008)	188.9 [5] (September 2008)
4	América Móvil (Mexico)	USA, Argentina, Chile, Colombia, Paraguay, Uruguay, Mexico, Puerto Rico, Ecuador, Jamaica, Peru, Brazil, Dominican Republic, Guatemala, Honduras,	D-AMPS CdmaOne CDMA2000 1x, EV-DO GSM, GPRS, EDGE	172.5 [6] (September 2008)	172.5 [7] (September 2008)

		Nicaragua, Ecuador and El Salvador	UMTS, HSDPA		
5	Telenor (Norway)	Norway, Sweden, Denmark, Hungary, Montenegro, Serbia, Russia, Ukraine, Thailand, Bangladesh, Pakistan, Malaysia	GSM, GPRS, EDGE UMTS, HSDPA	143 [8] (December, 2007)	150 [9] (June 2008)
6	China Unicom (China)	China (inc. Macau)	GSM, GPRS	127.6 [10] (June 2008)	127.6[11] (June 2008)
7	T-Mobile (Germany)	Germany, USA, UK, Poland, Czech Republic, Netherlands, Hungary, Austria, Croatia, Slovakia, Macedonia, Montenegro, Puerto Rico, and U.S. Virgin Islands	GSM, GPRS, EDGE UMTS, HSDPA LTE (planned)	126.6 [12] (September 2008)	126.6 [13] (September 2008)
8	TeliaSonera (Sweden)	Norway, Sweden, Denmark, Finland, Estonia, Latvia, Lithuania, Spain, Central Asia	GSM, GPRS, EDGE UMTS, HSDPA	115.0 [14] (December, 2007)	115 [15] (June 2008)
9	Orange / France Télécom (France)	France, UK, Switzerland, Poland, Spain, Romania, Moldova, Slovakia, Belgium, Liechtenstein, Israel, Egypt, Ivory Coast, Jordan, Cameroon, Botsawa, Madagascar, Mali, Senegal, Mauritius, Réunion, Martinique, French Guiana, Saint Kitts and Nevis, Dominica, Dominican Republic	GSM, GPRS, EDGE UMTS, HSDPA LTE (planned)	111.884 [16] (March 2008)	111.884 [17] (March 2008)

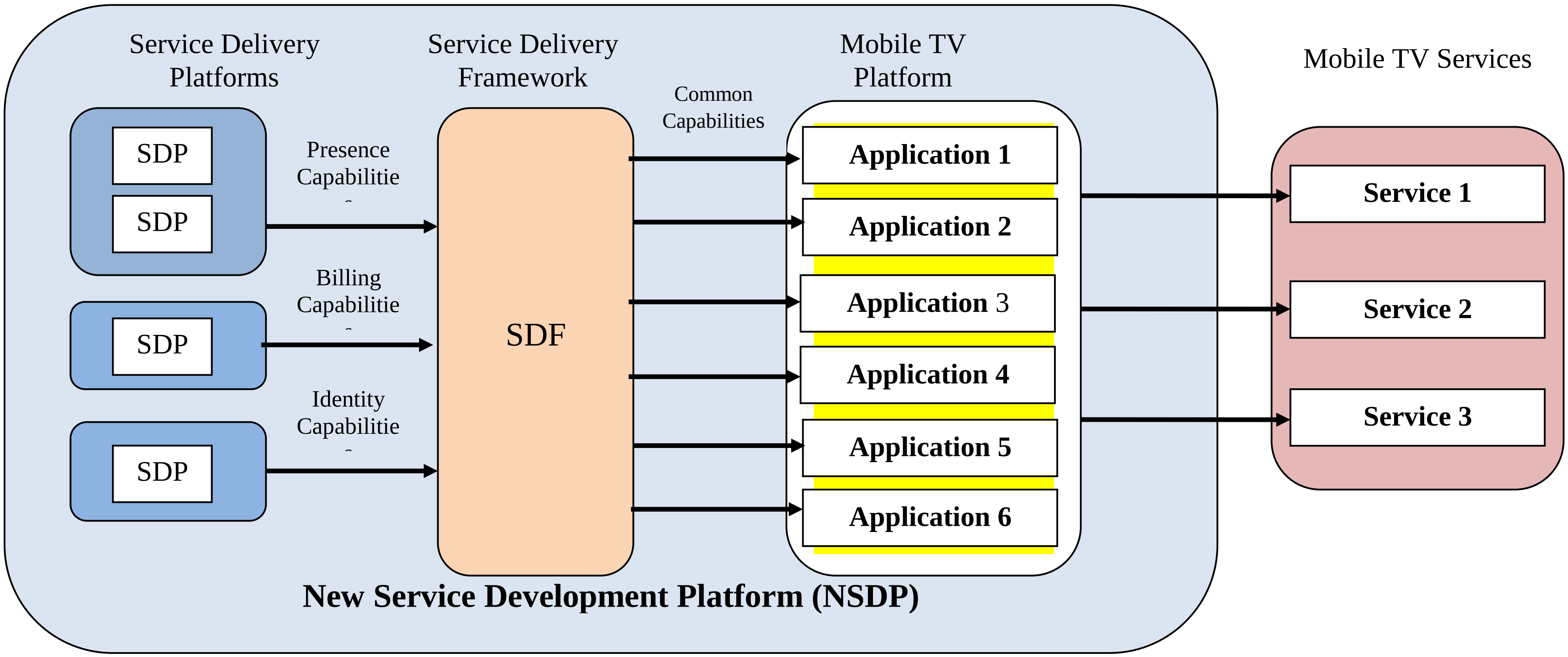
10	MTS (Russia)	Russia, Ukraine, Belarus, Uzbekistan, Turkmenistan, Armenia	GSM, GPRS, EDGE UMTS	86.94 (July 2008)	86.94 [18] (July 2008)
11	MTN Group (South Africa)	Afghanistan, Benin, Botswana, Cameroon, Republic of Congo, Cote d'Ivoire, Cyprus, Ghana, Guinea Bissau, Republic of Guinea, Iran, Liberia, Nigeria, Rwanda, South Africa, Sudan, Swaziland, Syria, Uganda, Yemen, Zambia	GSM, GPRS, EDGE UMTS, HSDPA, HSUPA	80.74 (September 2008)	80.74 [19] (September 2008)
12	AT&T Mobility (United States)	United States, Puerto Rico and US Virgin Islands	GSM, GPRS, EDGE UMTS, HSDPA, HSUPA LTE (planned)	74.9 [20] (October 2008)	74.9 [21] (October 2008)
13	Bharti Airtel (India)	India, Seychelles, Jersey, Guernsey, Sri Lanka	GSM, GPRS, EDGE	72.07 (July 2008)	72.07 [22] (July 2008)
14	Verizon Wireless (United States) -Excludes Alltel	United States	CdmaOne CDMA2000 1x, EV-DO LTE (planned)	70.8 [23] (September 2008)	70.8 [24] (September 2008)
15	SingTel (Singapore)	Singapore, Australia, India, Indonesia, Thailand, Philippines, Bangladesh, Pakistan	GSM UMTS, HSDPA	70.76 [25] (Aug2008)	198.71 (Aug 2008)
16	Telecom Italia / TIM	Italy, Brazil, San Marino,	D-AMPS GSM, GPRS,	70.6 (September	70.6 (September

	(Italy)	Vatican City	EDGE UMTS, HSDPA LTE (planned)	2008) [26]	2008) [27]
17	Etisalat (United Arab Emirates)	Afghanistan, Benin, Burkina Faso, the Central African Republic, the Ivory Coast, Egypt, Gabon, Indonesia, Niger, Nigeria, Pakistan, Saudi Arabia, Sudan, Tanzania, Togo and the United Arab Emirates	GSM, GPRS, EDGE, UMTS, HSDPA	63.0 (April 2008)	63.0 [28] (April 2008)
18	Orascom Telecom (Egypt)	Algeria, Bangladesh, Egypt, Pakistan, Tunisia, Zimbabwe	GSM, GPRS, EDGE	62.9 (September 2008)	77.0 [29] (September 2008)
19	VimpelCom (Russia)	Russia, Kazakhstan, Ukraine, Uzbekistan, Tajikistan, Georgia, Armenia	D-AMPS GSM, GPRS, UMTS	53.7 (August 2008)	53.7 [30] (August 2008)
20	NTT docomo (Japan)	Japan, Bangladesh	GSM, GPRS, PDC FOMA, HSDPA LTE (planned)	53.54 [31] (May 2008)	53.54 [32] (May 2008)

Source: http://en.wikipedia.org/wiki/List_of_mobile_network_operators

Appendix 15

The New Service Development Platform (NSDP)



Platform: A foundation composed of related technologies that host reusable capabilities

Framework: A supported set of principles and rules governing the use of platform capabilities for a broad range of business opportunities

Application: A software or content that satisfy a market demand

Service: A coherent package of application and customer experience to meet a specific market need.

Appendix 16

Interorganisaional New Service Development Framework (INSDF)[71]

INSDF Phases	Description
1.0 Idea Development	• Idea development consultancy initiated • A product idea is generated • The Idea Statement is development • The Concept of the product developed • The Actor that would form the ecosystem are identified • The product idea and concept discussed with the critical actors in the proposed ecosystem
2.0 Solution Definition	• Initiating program of work (Programme Management Plan) • Initiate the project • Definition of Business Requirements (Business Requirement Document) • Definition of High Level Solution (Solution Impacts, Business Case Impact and Readiness) • Development and Approval of the Business Case
3.0 Design & Build	• Developing and finalizing the Project Plan • Project Requirement Definition (Requirements Definition Document, Operational Readiness Checklist, Business Process Solution) • Definition of Solution Architecture (Systems architecture and detailed Business Process documents, testing – i.e. very technical in nature) • Design of the Solution Architecture (Systems Requirements, High Level Design and Detailed Design) • Build & Acquire Solution (Business Process solutions and Technical solutions) • Testing the Solution (Components, integration and solution testing) • Confirm solution configuration • Preparation of solution deployment

[71] The framework provided here is based on documents provided by the network operator during the interviews. However, due to confidentiality reasons, participants have requested that these documents not be disclosed in this thesis. Instead, Appendix 16 provides a brief summary of the INSDF based on the verbal summary description provided in the interviews by several participants representing the network operator.

INSDF Phases	Description
4.0 Solution Implementation	• Market testing of the service • Obtaining approval for launch of the solution • Deployment of the solution • Implementation of marketing and other promotional and non-technical campaigns to support the launch of the solution • Project certified and approved by the operations department • Closure of project
5.0 Solution Effectiveness	• Operation and Maintenance of the Solution (Change management, Problem Management, Configuration Management) • Life cycle management • Periodic evaluation of the solution • Retire the Solution

Interorganisaional New Service Development Framework (INSDF)

(Ecosystem Actor Involvement)

INSDF Phases	Actors involved/ Roles Performed
1.0 Idea Development	• ***Network Operator* -** Idea development consultancy initiated – critical actors identified for the formation and delivery of the solution in the context of the ***ecosystem***. A ***business case*** emerges for the provision of the end-to-end rich media service. Other divisions within the network operator involved: o ***Product Management*** o ***User Centered Design, Consumer Products*** o ***Network & Technology*** • ***Systems Integrator*** – Systems Integrator is consulted by the network operator on possibility of developing and deploying the rich media solution.
2.0 Solution Definition	• ***Network Operator*** – Initiates the Service development project – the actual systems architecture and platforms that will support the solution is discussed with the systems integrator. • ***Systems Integrator*** – Provides a tentative quotation for end-to-end systems integration and project management work, time frame and other Key Performance Indicators (KPIs) for resources to be allocated for the project. • ***Content Aggregator*** – Provides a quotation for the content aggregation services, the ingestion process design and investments in software and hardware and the timelines required to complete negotiations with content providers. • ***Device OEMs*** – Provides checklist of device capabilities and a quotation for the supply of these devices • ***Network Infrastructure –*** Provides a quotation for the Rich media platform required as part of the end-to-end solution delivery • ***GUI Provider* -** Provides a quotation for the provision of the mobile client/ graphic user interface.

INSDF Phases	Actors involved/ Roles Performed
3.0 Design & Build	• ***Network Operator*** – internal departments within the network operator (i.e. Network & Technology and Product Management are given work order to commence the development of the service delivery architecture. The final architecture is tested. • ***Systems Integrator*** – Th network operator provides the work order and purchase order for end-to-end systems integration and project management services. The systems integrator at this stage actively engages as the *Project Manager* and as the end-to-end *Systems Integrator*. Being the Project Manager and Systems Integrator, they overseas development of the various systems integration components undertaken at all major actors interfaces (i.e. content aggregator, device OEMs, network infrastructure operators and SDC) to realize an end-to-end service deployment within the ecosystem. • ***Content Aggregator*** – the network operator with the content aggregator for the content aggregation services. The ingestion process design feeding into the platform (i.e. NSDP) is supervised by the systems integrator. Rigorous content ingestion testing initiatives by the content aggregator is conducted in unison with the systems integrator for the end-to-end service delivery solution prior to the launch of the solution. • ***Device OEMs*** – The network operator provides the *purchase order* for the supply of the specified devices. Accenture supervises the loading of the mobile client and player into devices by various OEMs. These devices are tested for the end-to-end service delivery. • ***Network Operator Infrastructure*** – network operator provides the *purchase order* for the supply of the Mobile TV Platform solution. Delivery, deployment and teting of various components of the Mobile TV Platform. Working with systems integrator to provide the complete SI interfaces with various other incoming and outgoing systems in the ecosystem

INSDF Phases	Actors involved/ Roles Performed
4.0 Solution Implementation	• ***Network Operator*** – internal departments within the network operator (i.e. Content Engineering, Network & Technology, Marketing and Product Management) are involved in the deployment and launch of the service. • ***Systems Integrator*** – The end-to-end deployment of the service in unison with network operator's operations department in particular. Other internal departments within the network operator (e.g. Content Engineering, Network & Technology and Product Management) work with the systems integrator for the deployment of the service. • ***Content Aggregator*** – the content aggregator communicates with the systems integrator and the network operator for deployment of the service and then continues to participate in the life cycle stages of the service. • ***Device OEMs* -** works with the network operator and the systems integrator for deployment of the service • ***Network Operator* -** Works with the systems integrator and the network operator for deployment of the service. • ***Gui Provider*** – collaborate with the network operator for deployment of the service and then continue with participation in the life cycle stages of the service.
5.0 Solution Effectiveness	• ***Network Operator*** – Operation and Maintenance of the Solution (Change management, Problem Management, Configuration Management) • ***System Integrator*** – Minimum involvement. Involved significantly only in product enhancement situations. • ***Content Aggregator*** – Continuous involvement in ingesting content into the network operator's Mobile TV platform. • ***Device OEMs*** – Working with the network operator in understanding usage patterns for future device features development • ***The Platform*** – No further involvement accept in critical systems support situations. • ***GUI Provider*** – Work with the systems integrator and the network operator for deployment of the service and then continue with participation in the life cycle stages of the service.

Appendix 17

Research Instrument – The Research Questionnaire

**Interorganisational New Services Development Capability:
A Case Study into the impact of Next Generation Technology in the Telecommunication sector**

Semi-Structured Interview Protocol

Stephen Singaraju

September, 2007

Researcher's use only:

Interviewee's Name: ________________________

Position in the Firm: ________________________

Interview No.: _____________________________

Organisation: ____________________

Org. Type: Node ☐ Client ☐

Date of Interview: ___/___/07

Time of Interview: _____ am pm

Interview Start time: _______

Interview Finish time: _______

Counter Setting: _______

Preamble to the interview:

- Introduction
- Aim of the project and purpose of the interview
- Approximate time that the interview will take

Phase 1: The Next Generation Communications Industry - The New Landscape

1. In your opinion, what are the **main technological and other changes** that have contributed to the current landscape in the mobile telecommunication industry in the last 5 years?

Field notes:	Prompts:
              Keywords:	• Competitive pressure to keep **ARPU** growing • Move towards and **IP open standards (SOA)** from a **proprietary system (PSTN)** - **Next Generation Network (NGN)** (p. 15, 19) • **Convergence** of IT and Telecommunications world (p. 10,11,12,19) • **Shared infrastructure/ platform** for service delivery (e.g. SDP) (p., 14, 41, 42) • **Partnerships/ Collaboration** is increasingly critical to innovation (p.42, 45, 47) • **Broadband** connectivity is increasingly critical to innovation in services • Changes in the **regulatory** environment supporting growth of

	the industry (p. 13, 27)

2. How have these changes impacted on your organisation and your customers?

Field Notes	Prompts
	• Change in focus where **one service fits all** to a service that is **highly personalized/ customized** • The element of **customer experience** and offer something that customer find **truly simple**. • **End-to-end service delivery** or the management of **end-to-end customer experience** (p.16, 61) • The move towards and **IP open standards** (p.49) from a **proprietary system** – i.e. the migration from PSTN systems to NGNs. • **Partnership/ Collaboration** – The ability for operators to flexibly **take advantage of resources that reside both within and outside the operators organisational**

Keywords:	**<u>boundaries</u>** (p.39) • **<u>Adaptability</u>** of operators to changing regulatory, technology and customer behaviors **Cross ref to Q1**

3.

a. There has been increasing recognition of the potential revolution brought about by **<u>next generation networks (NGNs)</u>**. What are NGNs?

Field Notes	Prompts

Keywords
	• The Move from **<u>Proprietary Networks</u>** (p.14) to **<u>NGNs</u>**
	
	• Difference between **<u>NGNs</u>** and **<u>Proprietary Networks</u>**
	    ○ **<u>Interoperability</u>** between networks
	    ○ **<u>Fiber optic</u>** cable connections
	    ○ **<u>Multiple services</u>** supported by the netowrk
	
	• Engine for Growth/ Platform for Growth/ New Growth Platforms - **<u>Service Delivery Platform (SDP</u>**) (p.14, 18)
	
	• Based on **<u>IP open standards</u>** (p. 15, 19)
	
	Cross ref to Q1

b. In your opinion, what are the **factors** that are particularly instrumental in the formation of NGNs?

<table>
<tr><th>Field Notes</th><th>Prompts</th></tr>
<tr><td></td><td>

Convergence – the various dimensions of convergence (p. 10,11,12,19)

- **Market**
- **Network**
  - Layered architecture with IMS
- **Devices**
  - Seamless WLAN/2G/3G connection
  - Multi access mobile phone with both licensed and unlicensed mobile access
  - Media and PC functionality in mobile devices
- **User Services**
  - Bundling of fixed, mobile and broadband subscriptions
  - Triple play (telephony, internet and IPTV via broadband)
  - Single phone number & mail box
  - Single mailbox

Industry Boundaries – redefinition of traditional industry boundaries (p. 10, 11, 22, 39, 45)

Is a "**network**" emerging? – **Ecosystem?** (p. 12, 32, 45)

What makes up the Ecosystem? –

</td></tr>
</table>

Keywords:	**Actors** (p.11, 12, 20-25, ……) Single Unifying Platform (p.42) or architecture bringing all these actors together on a concerted context to develop and deliver services – **Service Delivery Platform (SDP) & Internet Protocol Multimedia Sub-System (IMS)** (p.18, 19) Is **SDP** becoming the **platform** in provision of NG services? (p.18) **Cross ref to Q1, Q2:**

c. Can you please elaborate as to how technological changes such as NGNs over time have either **hindered or enhanced your organisation's capabilities** in providing services to the customers?

Field Notes	Prompts
	Enhanced: • NGN seen as **NGP – New Growth Platform** (p.18) – particularly for the generation and delivery of **IP based services** • Creating **new families/ rich forms of services** & **entry into new market domains** not traditionally domains identified with the telecommunications industry e.g. Location Based Services, IPTV, Video-on- demand etc) (p.19)

	• Increased ability to **bundle services,** increasing the **flexibility in the service mix**– i.e. Triple play and Quadruple play • **Single Unifying Platform** or **architecture** – enables actors in the ecosystem on a concerted stage to develop and deliver services • The NGN facilitates the **redeployment of capabilities within (internally)** the organisation but also **acquiring capabilities through the organisation's network (externally)** partners/actors
Keywords:	**Cross ref to Q3a, Q1:**

d. Have technological changes such as NGNs lead to **<u>collaboration or alliances</u>** in developing services?

☐ Yes ☐ No

If Yes, could you please elaborate using examples?

Field Notes	**Prompts**
          Keywords:	• **<u>Convergence</u>** – At various levels (p. 10,11,12,19) • Emergence of the **<u>Ecosystem</u>** (p.32, 45) • **<u>SDP</u>** facilitating collaboration? (p. 14) • **<u>IP open standards</u>** – practically anyone with an Internet based content could collaborate with Telcos (p.15, 19. 49) **Cross ref to Q3a & 3b**

4. In recognising the importance of a platform like the SDP within NGNs, as facilitating innovation within the mobile ecosystem, how does the SDP then enable the right portfolio of **capabilities**, **business processes**, **systems** and **assets** to be assembled to deliver services that satisfy market demand?

Field Notes	**Prompts**
Keywords:	**Capabilities** (p. 13, 19, 23, 27, 30, 32, 39, 44, 49) **Business Processes** (p. 13) **Systems (p. 12, 13, 14, 15, 16, 43)** **Assets (p.13, 30, 39, 44, 47)** • Assets that are **complementary** in relation to the ecosystem (p.30, 39) **Cross ref to**

Phase 2: Project Under Observation

5.

a. In your understanding, how would you describe the project selected for the purpose of this research?

<table>
<tr><th>Field Notes</th><th>Prompts</th></tr>
<tr><td>

Keywords:</td><td>

- **Name of project**: ____________________
- **Kind of services produced**: ____________________
- **Target Market (i.e. customers)**: ____________
- **Actors** (p. 11, 12, 20, 22, 23, 26, 29, 30, 31, 32, 33, 34, 35……)
  - **Who are they**?
  - Each actor's **functions** and **roles**?
  - The **position** each actor occupies in the network (i.e. ecosystem)?
  - The **relationship** between each actor? **Ad Hoc/ Permanent**? Bound by **agreement**?
  - **Time** – How long has the ecosystem been in existence? Is it likely to last well into the future? Why it that so?
- Is the **SDP/IMS architecture** used in delivering this service? (p.18, 19)

Time – How long has this service
</td></tr>
</table>

	been in the market? How long did it take from idea generation to launch?

b. How would you describe this project in terms of its **<u>processes</u>** (i.e. both development and delivery), **<u>people</u>** and **<u>assets</u>** involved (both within and external to the organisation)?

<table>
<tr>
<td>

Field Notes

Keywords:

</td>
<td>

Prompts

Processes:

- The **<u>stages of the interorganisational NSD</u>** for this product/service (i.e. the project observed) - obtain a blueprint if possible
- Involvement of **<u>multiple actors</u>** in the ecosystem to complete the various stages of the **<u>interorganisational NSD process</u>**
- **<u>The stages of the delivery Process</u>** for this product/service (i.e. the project observed)

People:

1. Those involved within the **<u>Telco</u>**
2. Those involved from **<u>collaborating organisations</u>**

Assets:

3. Those involved within the **<u>Telco</u>**
4. Those involved from **<u>collaborating organisations</u>**

</td>
</tr>
</table>

Phase 3: Network Interconnectedness

6.

a. Do you see the telecommunication industry exhibiting an increasing degree of **cooperative behaviour** with regards to the development of and provision of NG services?

☐ Yes ☐ No

b. How do you explain this behaviour and what are the reasons you see as compelling in describing this sort of behaviour?

Field Notes	Prompts
Keywords:	• **Reasons** for **Co-operative behaviour** among actors ○ **Interdependence** between the various actors (p.26, 32, 33, 40, 41, 43) ○ **Resources and capabilities procurement** ○ **Pursue resource specialization** ○ **Uncertainty reduction** (e.g. share cost & risks) (p.33) ○ **Developing new markets** (p. 27) ○ **Penetrate new markets** (p. 27) • **Inter-organisational relationship** emerging as a key determinant for Co-operative behaviour • Correlation between **Inter-organisational relationship** and **strategic performance of the ecosystem** **Cross ref to Q#:**

7. What kind of collaboration is the **ecosystem** considered to be?

Field Notes	Prompts
	• Predominantly a **Horizontal Network** (p.19, 26, 40) – different from the **vertical networks** previously characterizing NSD projects • **Horizontal Network Characteristics** • Why has **Horizontal Networks** only come to prominence within the telecommunications industry recently? It is because of the emergence of **SOAs** like the SDP and the IMS? • Each actor uniquely **embedded** within the ecosystem (p.33, 36) • **Functions** & **Roles** of each actor in the Ecosystem – Each actor is unique to the ecosystem according to the expertise and skills set they brings to the ecosystem (p. 23, 62) • Actors with specific set of skills and expertise go on to **develop skills and expertise in other areas (specialization)** – congruent with the argument of **resource specialization** – How does such development **affect their position in the ecosystem**? (p.27) • Is **opportunistic behaviour** among actors in the ecosystem a common occurrence? (p. 31, 41, 45) – Examples • Explain the level of **bilateral commitment** (p.28, 29) among these actors in the ecosystem – Examples

	- Investments in relations specific assets (p.38) - Substantial knowledge exchange (p.38) - Combination of complementary resources/ capabilities (p.38) • The various actors' **frequency of involvement** – **ad hoc** or a **persistent** basis in the ecosystem over time? – **Time horizon** of Involvement of various actors in the ecosystem • **Structured exchange process** in the development and delivery of new services? – Explanation of the **exchange process** – **Formal contracts – Service Level Agreement (SLA)** (p.32.33) • **Semi-autonomous** features of the relationship between the eactors in the ecosystem – each actor are relatively independent from other actors with regards to their organisational objectives while at the same time being economically and/or legally dependent on the rest of the ecosystem? – **Semi-autonomous characteristics**

	• **Sequential or Simultaneous** – Does the transaction activities/ exchanges processes within the ecosystem occur sequentially or simultaneously? - Examples • Need for **mutual adjustments** (p.24) in the ecosystem position among actors - explain the circumstances. • Any signs of **convergence** among actors in the ecosystem (p30, 31): ○ **Attitudinally** (i.e. for communications and negotiations in relationships to be less conflictual)? If yes, Please provide example in support of argument. i) **Familiarity/ mutual forbearance** ○ **Structurally** (i.e. for the reduction of operational frictions)? If yes, Please provide example in support of argument. i) **Processes/routines/ procedures** **Cross ref to Q#:**
Keywords:	

8. In your opinion, with reference to the project under observation, is there a **focal point** in its ecosystem (i.e the centre of the ecosystem)? Where is the **focal point** of the ecosystem centered? Why is it so?

Field Notes	**Prompts**
	• Is it an **Actor /node**? • **Central Point** in the Network – how is it measured? (e.g. **degree centrality** (p.34) – the number of ties a firm has with other actors in the ecosystem) • **Central/ Lead Organisation** within the ecosystem – define a **central/ lead organisation** (e.g. power, access to sources of info/ resources, legal links such as SLAs) • **Importance of the Central Organisation** in the ecosystem - how does it affect "interconnectedness" between the various actors in the ecosystem? • The degree of **visibility** (p.34) and **attractiveness** (p.34) of the **Central/ Lead Organisation** • The **higher degree of centrality** of **the Central Organisation** in the ecosystem , the higher the influence on **network "interconnectedness"**. This allows for **Central Organisations** to be in a **better position** to attain a **"bird eye" view** of **resources and capabilities**

	of other actors in the ecosystem and thus have a positive effect on the **ecosystem's innovation capability** • **Role** and **Functions** of the Central Actor • The element of **Power** and its relation to the Central organisation within the ecosystem – **key driver** underlying exchange relationships between organisations within the ecosystem? How is this so? • **Lead organisations** within the ecosystem acknowledged the significance of the **value co-producing system**? – Measures taken for this? **Cross ref to Q#:**

Keywords:	

9. How do the **structural differences** characterized and contributed by each actor to the ecosystem influence the ecosystem's **new service development capability**?

Field Notes	Prompts

	• How does it influence the **level of interconnectedness** between the various actors that comprise the ecosystem?
	
	• Degree of "**complementarity**" between actors (p. 32, 37, 38)
	
	• **Network adaptation** – modifying the strategy, stance, posture, or resources in order to enhance complementarity with partners.
	
	• Are there clear **niches** within the business ecosystem emerging? Explain these niches further.
	
	• **Network Identity** of actors – the perceived attractiveness of actors within the ecosystem
	    o Anticipated resource transferability
	    o Anticipated activity complementarity
	    o Anticipated actor relationship generalizability
	
	• **Strategic resources** increasingly crossing

Keywords:	formerly distinct organisational and **industry boundaries** to reside in **relationships** between organisations within the ecosystems? How is this significant to the new service development capability of the ecosystem? **Cross ref to Q#:**

10. Do you observe certain actors within the ecosystem having a **conflicting relationship** (i.e. cooperating and competing at the same time)?

Field Notes	Prompts
	• They **cooperate (i.e. cooperation)** (p.30, 31, 38, 39, 40, 42, 44, 45, 46) in some activities and **compete (i.e. competition)** (p.24, 40, 43, 44, 45) on other activities concurrently within the ecosystem? If yes, please explain the circumstances. • Does it comes from the **horizontal structure** (p.19, 26, 40) of the network/ecosystem? • Is there a "**partially convergent interest and goal structure**"(p.41) present in the ecosystem for this **paradoxical relationship to take effect?** Please explain circumstances where this exist. • **Co-opetition** (p.40, 42, 43) as a significant force that in increasingly being associated with the ecosystem?

Keywords:	**Cross ref to Q#:**

Phase 4: Customer Collaboration

11. Who are the customers in the context of the project under observation?

Field Notes	Prompts

Keywords:	- Who are the "**customers**"(p.48)? **A clear definition** of the concept of customer from the perspective of the project being observed for the research.
	- The **end users** – who are they?
	- Does the notion of customer **mean the same to all other actors** of the ecosystem?
	  - How and why is that so?
	- Are all customer of equal importance? Or is there a **distinctive category of customer** who are better positioned to contribute to NSD – i.e. **typical** vs.**lead users**
	  - Who are the **"typical users"?** (p.53)
	  - Who are the **"lead users"?** (p.54,55, 56, 59)
	  - What are their respective **characteristics** (p.55)?
	  - Which category of customers are critical to the NSD project? Why?
	Cross ref to Q#:

12. Do you think these are different categories of customers (e.g. some customers exhibit **typical need and consumption patterns** where else other customer exhibit more **innovative need and consumption patterns** for new services)?

Field Notes	**Prompts**
    Keywords:	• **Market Laggards** • **Lead Users – characteristics** displayed by this group of users – their **contribution to NSD capability of the ecosystem** • **Lead Users** – operating on a **different knowledge platform – knowledge platform related to future mass market needs** (p.50) • **Lead Users** – having the **capability** and **motivation** to innovate • **Lead Users** – their **degree of engagement** in NSD projects – do they play a fundamental role in the NSD process? How? **Cross ref to Q#:**

13. Is (Lead) Customer collaboration important in the NSD activity within the ecosystem? If yes, please explain how and why is (Lead) customer collaboration important.

<table>
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Field Notes

Keywords:

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Prompts

- Ways in which customer collaborate in the NSD activity – **Examples**
- Customer collaboration – the **contribution** it has made to an increase in the rate of success in new services – elaborate
- Instances of **joint development** of any aspect of the service delivery process, infrastructure or system with the customer – elaborate
- Any **policy documents**, etc. available for reference
- Is this **process documented**? Are there documented methods that involved in lead customer collaboration in the NSD activity for this project? If yes, what are they?
  - **Conventional market research** - such as focus groups, conjoint analysis and user questioning been used in customer collaboration initiatives – degree of success
  - **Unconventional market research**

Cross ref to Q#:

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14. Is there a systematic process concerning the: (i) acquisition of customer intelligence, (ii) the dissemination of that intelligence across all functions of the organisation (i.e. marketing, operations, R&D, etc.), (iii) and the transformation of that intelligence into marketable services (responsiveness)?

Field Notes	**Prompts**
	• **Examples** • **Methods** of acquisition, dissemination and the transformation of intelligence into marketable services • **Does it involve every** actor within the ecosystem?
Keywords:	**Cross ref to Q#:**

15. Do you perceive **technology** as playing a critical role in facilitating customer collaboration in NSD projects? If yes, please describe how does technology facilitate customer collaboration in NSD projects?

Field Notes	**Prompts**
	• **Service delivery Platform** – **Horizontal architecture** • The emergence of **forums** between various actors in the ecosystem - Allows for **knowledge transfer** of the customers' **use context** – **Examples**
Keywords:	**Cross ref to Q#**

Phase 5: Concluding Questions

16. Are there any other issues that you think could be applicable for this research? Please explain why?

Field Notes	**Prompts**
     Keywords:	 **Cross ref to Q#:**

Appendix 18

The Data Coding Process

The coding process applied in this thesis is based on the method prescribed by King (1998). The 'template analysis' approach involves coding a large volume of text so that segments about an identified topic (the codes) can be assembled in one place (i.e. a template) to complete the interpretative process.

The complete analysis process of organizing, connecting and corroborating/legitimizing involves the following phases:

- **Phase 1:**
  Creating a code manual/coding scheme

- **Phase 2:**
  Computer coding and sorting the data using *Nvivo 8*

- **Phase 3:**
  Analyzing the coding template and making the connections that are subsequently corroborated and legitimized

Phase 1: Creating a Code Manual/Coding Template

A well accepted argument on the creation of a template is provided by Crabtree and Miller (1999). Crabtree and Miller (1999) argue that:

> "…researchers can develop codes only after some initial exploration of the data has taken place, using an immersion/ crystallization or editing organizing style. A common intermediate approach is when some initial codes are refined and modified during the analysis process" (Miller and Crabtreee, 1999, p. 167).

The creation of a coding template in this thesis is applied according to the suggestion provided by King (2004) and Miles and Huberman (1994). King advocates one of three positions when starting out on the research:

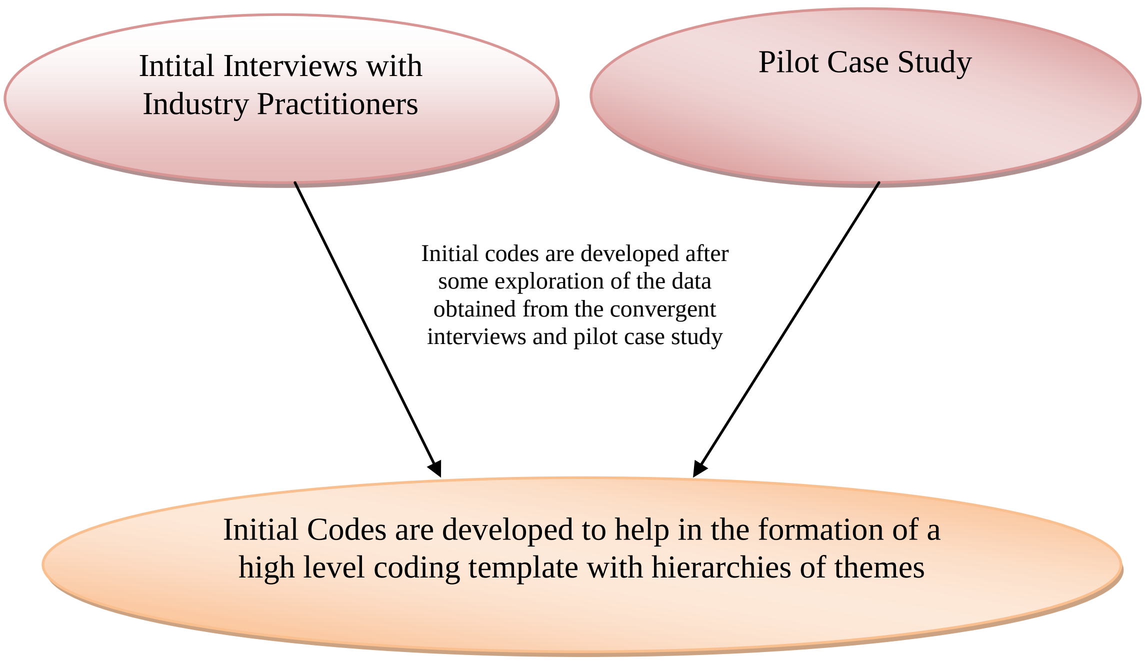
- Develop pre-define codes/ a priori codes based on the theoretical position of the research;

- Develop codes after some initial exploration of the data; or

- Take a half way position – some initial codes (possibly from the interview questions) and refinement after exploration of the data. It may depend on the epistemological position of the research.

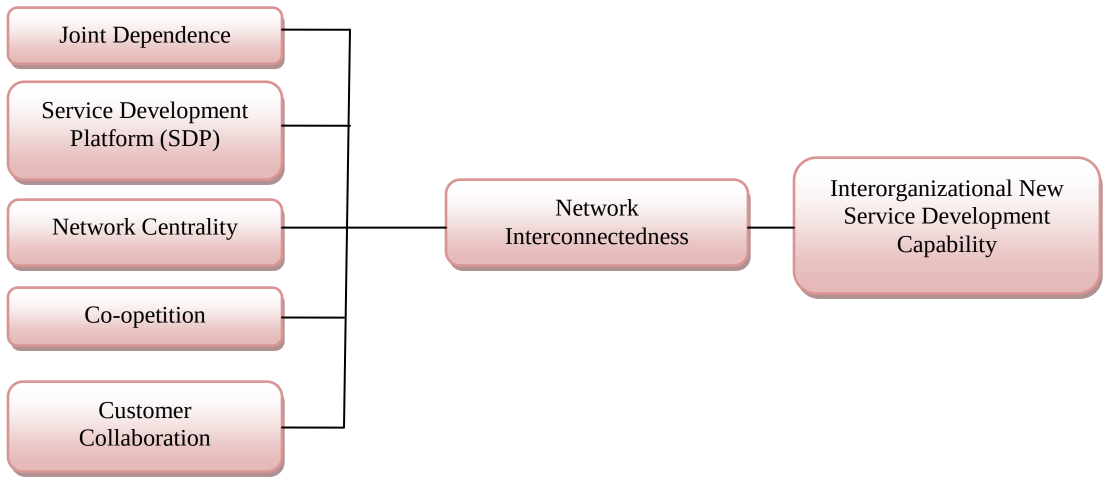
This research adopts the half way position as described by King (2004), where some initial codes are developed from initial interviews with industry practitioners and from the pilot case study conducted prior to the major data collection phase. From these codes, themes (i.e. category of codes) emerge to define the coding template as shown in ***Figure A***:

Figure A



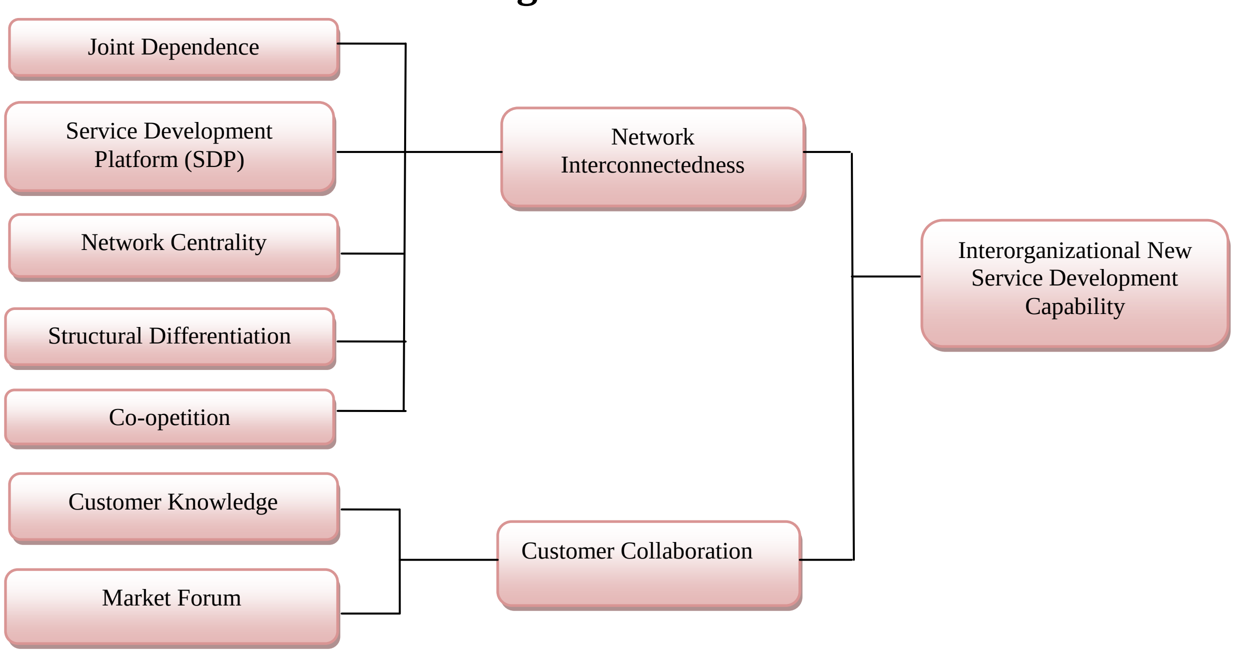
Through the initial interviews with industry practitioners and the pilot case study, a high level coding template with hierarchies of themes, emerged (King, 2004). For example, the following template as represented in *Figure B* emerged from the initial codes derived from the initial interview with industry practitioners and the pilot case study.

Figure B



By the time the initial interviews and the pilot case study were concluded, the initial coding template evolved into a template more reflective of the data obtained. The newly evolved template is represented in *Figure C*:

Figure C



Phase 2: Computer Coding and Sorting the Text using Nvivo 8

Once a coding template was developed, the major data collection phase was then undertaken. The major data collection phase involved the collection of data for both the Mobile TV and the Mobile Music case studies. The computer coding and sorting of text using Nvivo8 involved the following sub-phases:

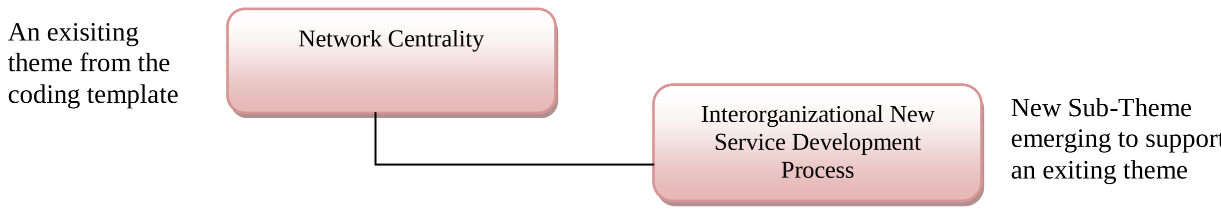
Phase 2a: Creating Projects

This sub-phase involves the creation of new projects. The Mobile TV and Mobile Music case studies were treated as two separate projects. All interviews transcripts associated with these projects were then imported as exisiting doumennts into the databases of the respective projects. Other forms of data such as documents, interview recordings (MP3 files), field notes and additional information from the internet which are relevant to these cases were also imported in their current form into the databases of the respective projects.

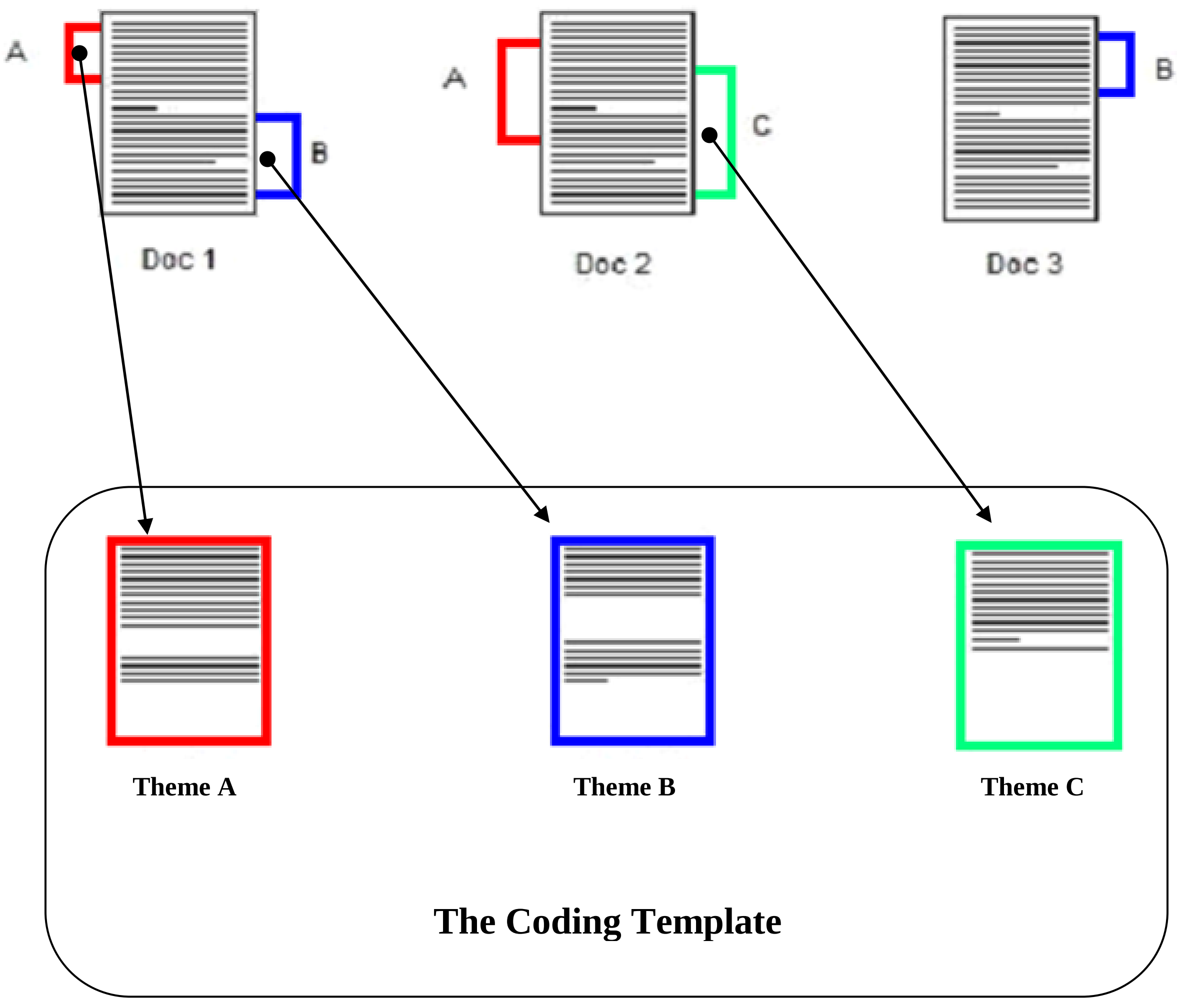
Phase 2b: Creating a Coding Template (i.e.Tree Nodes) for each Project

Phase 2b involved the creation of a coding template made up of nodes (i.e. coding themes). The initial nodes developed in each projects (i.e. Mobile TV and Mobile Music) is defined by ***Figure C***. In Nvivo, however, the coding template evolved with the finding of new themes during the coding process. This required the creation of new nodes or sub-nodes to which the new themes or sub-theme can be attributed. For example, in the 'Service Development Platform' theme was ultimately replaced by 'New Service development Platform' theme to better reflect the data obtained from the interview transcripts, field notes and documents.

In another instance new sub-nodes were created as a result of new sub-themes emerging from the data obtained. For example, in the 'Network Centrality' theme, new sub-themes such as 'Interorganisational New Service Development Processs' was deduced to partly explain the concept of network centrality first inducted from literature review.



Phase 2c: Coding to the Coding Template for each Project

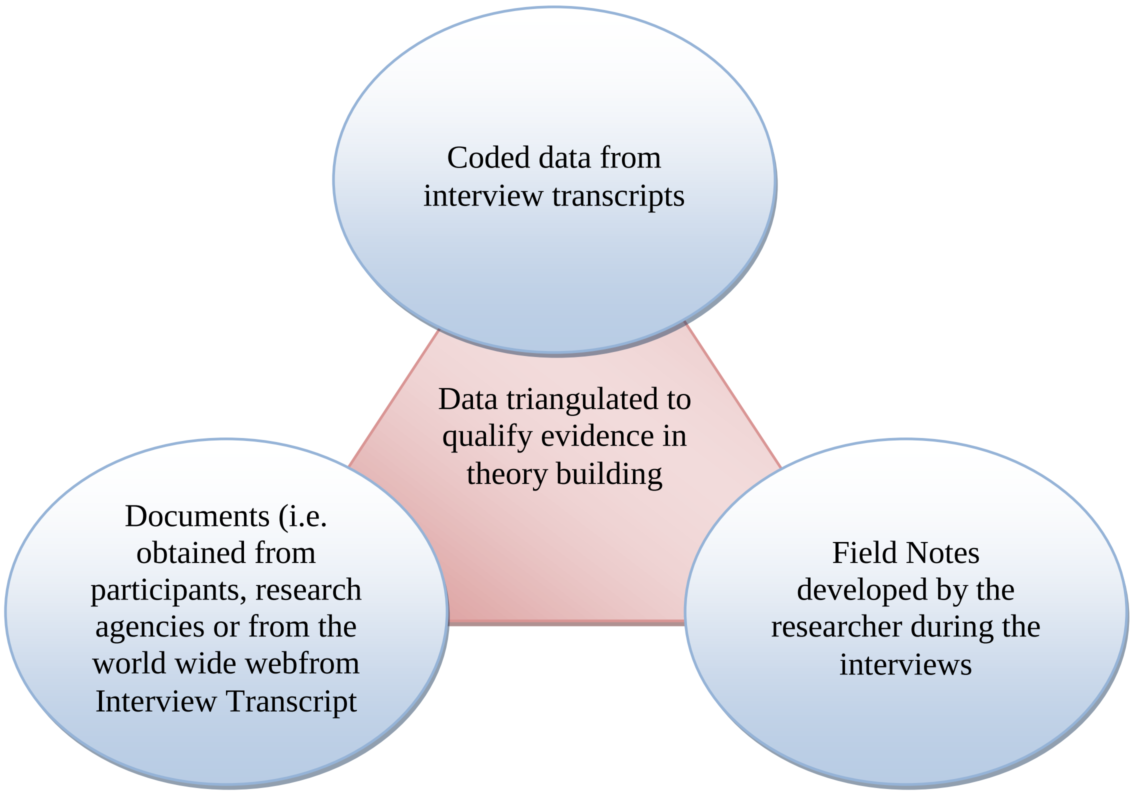


Once imported to the project databases (Mobile TV and Mobile Music databases) the interview transcripts were ready to be coded. In Phase 2c, codes developed from the interview transcripts were then identified to specific themes in the coding template developed in Phase 2b. In certain instances, the researcher indentified the need for ***parallel coding***. In these circumstances a single code was attributed to two or more themes. Phase 2c was repeated for every single interview transcript involving the 21 semi-structured interviews from which the transcripts are derived. Phase 2c continued until all interview transcripts were coded. Upon completing the coding of the transcripts, the data analysis phase (Phase 3) commenced.

Phase 3: Analyzing the Coding Template

At this phase of the coding process, a final coding template populated with codes had emerged. At this stage, all interview transcripts have been coded to the coding template. The template serves as the basis for the development of interpretation and conclusions. The themes developed for this research were not mutually exclusive (Smith and Albaum 2005); therefore, one text extract could be placed in various categories (parallel coding).

In instances where new codes emerge, new codes were added to the template and, towards the end when evidence for a specific theme had not emerged, a few themes (i.e. nodes) were deleted from the coding template. During the coding process, new findings were then linked back to the literature iteratively. Interview data and literature research formed an iterative process. This enabled the researcher to start looking for underlying patterns very early in the data collection process (i.e. during the initial interviews, especially in regard to the interviews with key participants representing the network operator), to define areas that needed further understanding and data collection, to refine the code list during analysis, and to perform the early steps of theory building. The theory building process involved eatablishing evidence from triangulating codes representing themes with documents and filed notes. This is consistent with the argument that a robust fact can be discerned when data from three or more different sources coincides (Yin, 1998). Therefore, in addition to the interview transcripts used in this research, documents, internet resources and other industry events were also used as data sources to corroborate the evidence obtained in the data collection phase.



The process of arriving at the evidence to support the theory was performed through triangulating data already coded (i.e. data from the interview transcripts); data from documents provided by participants during the interviews, documents available externally via independent reports through the worldwide web or research agencies; and, field notes and observations developed during the course of the interviews by the researcher.

For example, Nvivo allows for '***annotations***' to used to aid the reseaher in the coding process. Anotations allows for field notes to be appended to a particular code located in a particular node (i.e. theme). '***Memo***' function in Nvivo was used to capture other forms of data including data sources from the worldwide web and documents from third parties such as research agencies to corroborate the data. A '***see also***' function offered by Nvivo was used to link a particular code with other codes in other projects (i.e. coded data can be linked to the coded data from another participant in another project) to aid the data triangulation process.