Creating and Sustaining Successful Business Ecosystems

Information Systems Science

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“We are bound to history,
Yet every decision is free”

ABSTRACT

In our interconnected business environment, companies rely increasingly on networking in order to achieve market success and sustain performance. The networking involves interaction between members in multiple aspects comprising information and asset exchange with a range of operations and technologies. In order to leverage the competencies within the entire network, the companies need to comprehend the network of business activities and appreciate management of assets, which it doesn't directly own but are critical for its success.

The networked business activities include valuable physical, intellectual and financial assets exemplifying positive feedback in terms of network externalities when connected to and influencing each other. These networked activities create and distribute value among members in the network. Since the business networks traverse industries and encompass widespread activities, interpreting them requires an alternative approach to business network thinking. Business networks as a business ecosystem seems to provide powerful metaphors in understanding the network activities as a whole. It provides insight with analogies to biological ecosystems when appropriate, but extends the theories to business environment when needed.

The thesis contemplates business ecosystem theories in creating and sustaining successful ecosystems. Two alternative approaches are proposed, where an ecosystem is created with and without adaptation to the existing environment. The approaches consist of multiple steps having strategic options to be selected and lead to business ecosystem management. Active management is essential in sustaining the successful business ecosystem evolution and shape the ecosystem in a favourable direction. In the active management, the thesis uses business ecosystem, network externalities and innovation diffusion theories. Additionally, the thesis constructs a competitive intelligence analysis framework and extends 'openness versus closed' choices to support ecosystem active management. Furthermore, the thesis presents a case study of developer driven mobile software business ecosystem to reflect and concretise the discussed theories.

The two alternative approaches and the case study indicate that in order to create and successfully sustain a healthy ecosystem, the additional proposed parameters with the constructed framework are needed. Similarly, the extension of 'openness versus closed' choices are in line with the latest findings. Moreover, the presented case and proposed strategic steps seem to delineate faced options in an ecosystem evolvement and analytically support related activities in business environment analyses in a big Finnish company.

KEY WORDS: business ecosystem, innovation diffusion, innovation management, network externalities, competitive intelligence, strategy, openness, software

TIIVISTELMÄ

Verkottuneessa liiketoimintaympäristössä yritykset ovat yhä enemmän yhteydessä toisiinsa. Ne ovat riippuvaisia verkoista onnistuakseen ja päästäkseen tavoitteisiinsa. Verkottuminen käsittää monipuolista jäsenten vuorovaikutusta, joka sisältää erityyppisiin toimintoihin ja teknologioihin liittyvää informaation, varojen ja kilpailuvalttien vaihtoa. Jotta yritykset voisivat käyttää koko verkoston kykyjä voimavaranaan, niiden täytyy ensiksi ymmärtää verkottuneita liiketoiminta-aktiiviteetteja sekä toiseksi hoitaa varaintoja, jotka eivät ole heidän omistuksessaan, mutta ovat kuitenkin kriittisiä menestyksen kannalta.

Liiketoiminta-aktiiviteetit käsittävät arvokkaita fyysisiä, intellektuaalisia ja rahallisia varoja, jotka linkittyneinä myötävaikuttavat ja vahvistavat verkkovaikutusefektiä. Nämä aktiiviteetit synnyttävät ja välittävät arvonlisää verkottuneille toimijoille. Liiketoimintaverkot ulottuvat myös muille toimialoille ja kattavat laajamittaisia toimintoja. Näin ollen niiden havaitsemiseksi tarvitaan toisentyyppistä lähestymistä verkkoajattelun sijaan. Toimintaverkkojen tarkastelu liiketoimintaekosysteemeinä tarjoaa vahvan vertailukohteen verkkotoimintojen havainnoimiseksi kokonaisuutena. Tarkasteluissa voidaan tarvittaessa käyttää liiketoimintaympäristön käsittelyn lisäksi analogioita biologisiin ekosysteemeihin.

Tutkielmassa pureudutaan liiketoimintaekosysteemiteorioihin, jotka käsittelevät liiketoimintaekosysteemien menestyksekästä luomista ja ylläpitämistä. Kaksi lähestymistapaa esitetään liiketoimintaekosysteemin luomiseksi: 1) ilman sopeuttamista, 2) ja sopeuttaen olemassaolevaan ympäristöön. Vaiheittaisissa luomiseen keskittyvissä lähestymistavoissa on strategisia vaihtoehtoja, jotka päätyvät ekosysteemin johtamiseen. Liiketoimintaekosysteemin evoluutio edellyttää aktiivista johtamista ollakseen onnistunutta ja muokatakseen ekosysteemiä myönteiseen suuntaan. Aktiivista johtamista käsitellään tutkielmassa innovaatiodiffuusio-, verkkovaikutus- ja liiketoimintaekosysteemiteorioiden näkökulmista.

Lisäksi tutkielmassa rakennetaan kilpailija-analyysikehys ja ulotetaan “avoimia ja suljettuja” vaihtoehtoja aktiivisen johtamisen tueksi. Niin ikään tutkielmassa esitetään tapaustutkimus, jossa verrataan ja käsitellään konkreettisemmin pohdittuja teorioita.

Tutkitut kaksi vaihtoehtoista lähestymistapaa sekä tapaustutkimus osoittavat että liiketoimintaekosysteemin menestyksekkäässä luomisessa ja sen elinkelpoisuuden säilyttävässä hallinnassa tarvitaan tutkielmassa ehdotettua analyysikehystä ja lisäparametreja. Vastaavasti ”avoimien ja suljettujen” vaihtoehtojen käsittely on linjassa viimeisimpien tutkimusten kanssa. Tapaustutkimus ja strategiset lähestymistavat kuvaavat kohdattavia vaihtoehtoja ekosysteemin evoluutiossa ja tukevat analyyttisesti liiketoiminta-analyysejä eräässä isossa Suomalaisessa yrityksessä.

AVAINSANAT: liiketoimintaekosysteemi, innovaatiodiffuusio, innovaatiojohtaminen, verkkovaikutus, kilpailija-analyysi, strategia, avoimuus, ohjelmistot

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1 Introduction

In the modern world, the opportunities to create business value have been increasing for decades[1], and the business activity itself can be executed and value can be realised in various ways. Business activity, – the activity of providing goods and services; – involves financial, commercial, and industrial aspects[2], and commonly, the business activity includes interaction between external parties, since only a few companies take the whole responsibility for providing goods or services. In order to practise successful business in an ever-developing world, it is necessary to interact with many parties in increasing numbers. On one hand this is due to an increasing complexity of the goods and services requiring expertise and causing narrower specialisation for companies. On the other hand, the broad range of information and expertise can be tough to manage, thus leading to a tighter focus on the core competence. The amount of parties and stakeholders is increasing with the addressable market size as well; – more interacting individuals and organisations are connected, networked and they depend on the integrated efforts. These complex interdependencies among firms can be analyzed with networking theories. Furthermore, the business network as a business ecosystem seems to provide a powerful metaphor for understanding a business network.

In order to practise flourishing business activity in the business ecosystem, it becomes more and more essential for companies to understand the ecosystem in which they are operating as well as momentous to understand the characteristics that successfully affect the creation and management of the ecosystem. There is continuous activity in building up businesses and consortiums are growing towards a larger viable ecosystem. The viability and growth leads to a healthy, successful business and increasingly minimises rent-seeking costs between the members as well. Similarly to the constant business lifecycle activity, it is well known that the current business industry is fast-moving and dynamic. This is even more visible in the internet age, where more businesses are tested and started in an alpha

[1] World GDP Growth, WTO international trade statistics 2007, Table A1
http://www.wto.org/english/res_e/statis_e/its2007_e/its2007_e.pdf

[2] Business Activity, The Free Dictionary, http://www.thefreedictionary.com/business+activity

level, for example, by third parties, developers or co-opetitors[3]. An additional visibility related to the business lifecycle activity is seen in mobile devices and digital convergence where devices, media, and applications are evolving towards similarity, interacting with each other creating synergies; substituting and complementing in tasks and technologies. Consequently, the convergence reflects on operating systems, their characteristics and their development as well.

Topical examples of the convergence are the existing mobile OS (operating system) ecosystems and their initiatives, where multiple different ecosystems are built and supported by the members. It is not uncommon that an operator needs to support tens of different OS platforms; Vodafone has more than 30 platforms in their portfolio according to Yankee Group (2008) as an example. The initiatives and consortiums of the new ecosystems are established because of contradicting needs and requirements for the existing ecosystems.

The needs and requirements change over time leading to a business ecosystem evolution. This evolution, its dynamics and the business ecosystems as loose networks, have been addressed by previous research. Additionally, its key actors, as describing roles of companies, have been studied earlier to represent and compare ecosystems and their economic environment. However, in order to understand more deeply the key items and decisions that favourably affect the business ecosystem creation and management, it is necessary to study the creation and management of completely new and existing business ecosystems.

This thesis studies the business ecosystem development and its successful evolvement by approaching the creation and management from two starting points: creating an ecosystem without an adaptation to the existing environment, and with an adaptation to the environment. The creation consists of multiple steps in value creation, structure establishment, value sharing, and management. Favourable strategic selections during the steps reflect on a healthy and growing ecosystem which is further actively managed in

[3] Co-operative competitors

order to sustain its successful evolvement. Additionally, the thesis proposes measurement parameters for analysis and management, which are identified by a competitive intelligence process. In order to concretise the highlighted theories and suggested methods, an example case is presented and elaborated upon.

The thesis is divided into six chapters. Firstly, this introductory chapter describes the viewpoint and motivation, research questions and methods, as well as definitions. The second chapter acknowledges innovations in networked information economy and its descriptive characteristics. The third chapter elaborates upon business ecosystem theories. The fourth chapter summarizes all the discussed theories, which are further contemplated in the fifth chapter by way of the case study. Finally, chapter six proclaims the main findings, notes the limitations on the study and suggests further research studies in the field.

1.1 Motivation

Research in a number of industries has documented wide variation between competition in critical dimensions such as productivity, quality, time to market, customer satisfaction, and profitability according to Iansiti and Levien (2004a). There is a lot of evidence that companies excelling in these dimensions can create and sustain a significant competitive advantage. Moreover, this connection between capability and competition has been an important theme in a business strategy, for instance, in terms of “distinctive competence”. A more recent work in this area has emphasized a resource-based view of a firm by noting the core competences, a learning organization and a dynamic nature of the capabilities as Iansiti and Levien (2004a) highlight. However, they continue that most of the performed work has focused on the internal nature of these operational and innovation capabilities between companies by emphasizing, for instance, tighter co-operation for enhanced performance. When the network of business partners grows, the firm with its value network is commonly seen as a source of inertia, not as a dynamic factor that can enhance productivity and innovation.

The business networks have been studied to create network externalities. Shapiro (1999) point out: “There is a central difference between the old and new economies: the old industrial economy was driven by economies of scale; the new information economy is driven by the economics of networks." However, Iansiti and Levien (2004a) and Moore (1996) argue that the use of ecological metaphors is effective in explaining the lack of boundaries in the complex networks traversing industries and the need for a systematic vision of the business. Furthermore, Iansiti and Levien (2004a) believe that a particularly powerful way to conceptualize business networks, is to compare them to biological ecosystems. Like biological ecosystems, business ecosystems are large loosely connected networks of entities interacting each other in complex ways. Thus, the firms are simultaneously influenced by their internal capabilities and by their complex interactions with the ecosystem. Iansiti and Levien (2004a) extend the biological metaphors by stating that there are critical ways in which the business ecosystems differ from the biological counterparts: in innovation, in attracting customers and partners, and in intelligent actors involving forethought planning.

The recent research in business ecosystems include for instance a multi-year initiation by EU Commission at the end of 2002 to build a favourable environment for economic growth and social cohesion, as well as to support the adoption of Information and Commmunication Technologies (ICTs). Corallo et al. (2007) have studied extensively digital business ecosystems in the European environment. Additionally, in Finland TEKES is investing 100M€ in business ecosystems to support the Finnish SMEs' international capabilities.

Since the business ecosystem theories provide a powerful tool in understanding the dynamics of complex business networks and take the external environment into account, the thesis elaborates the creation and sustaining of successful business ecosystems in the following chapters. Finally, the findings are reflected in the case study.

1.2 Research Questions and Methods

This subchapter describes the research questions and used methods. The research questions addressed in the thesis are:

1. **How to successfully create and sustain a business ecosystem?**
2. **Case: how to reflect the proposed theories of creation and sustenance to the case study of developer-driven software platform business ecosystem?**

The research questions are addressed with a design science paradigm. Hevner et al. (2004) consider design science inherently a problem solving paradigm which creates innovative purposeful artifacts for a specified problem domain and effectively evaluates them. The artifacts are rigorously defined and consistent in order to allow the problem representation and construction of solving mechanisms for the problem domain.

In the thesis, the problem of creating and sustaining of a successful business ecosystem is approached from two starting points: creating an ecosystem without an adaptation to the existing environment, and with an adaptation to the environment. The creation consists of multiple steps with strategic selections in value creation, structure establishment, value sharing, and management. Favourable strategic selections during the steps reflect on a healthy and growing ecosystem which is further actively managed in order to sustain its successful evolvement. The ecosystems' healthiness, development and enablers are analysed profoundly with the parameters and methods introduced by Iansiti and Levien (2004a; 2004b; 2005) and Moore (1996). These are further promoted with the innovation diffusion theory by Rogers (2003), network externalities theory by Milgrom and Roberts (1992), and information economy theories by Shapiro and Varian (1999).

Additionally, the thesis constructs a competitive intelligence framework for analysis and management with descriptive ecosystem parameters. In order to concretise the highlighted theories and suggested methods, an example case, developer-driven mobile software platform, is presented and elaborated upon.

1.3 Key Definitions

This subchapter defines key terms used in the thesis. The key terms are: 1) business ecosystem and 2) success in creating and sustaining business ecosystem. Other key definitions and concepts discussed in the thesis are described in the next subchapter.

1.3.1 Business Ecosystem

Business networking has existed for hundreds of years. It started as a loosely connected network of many organisations, many as small as one person. In the second half of the 20th century, business challenges, as well as business network pervasiveness, have evolved due to the development of social, economic, political, and technological systems, according to Iansiti and Levien (2004a). The concept of the business ecosystem was introduced by James F. Moore in 1993 with the description: *"An economic community supported by a foundation of interacting organizations and individuals--the organisms of the business world. This economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The member organizations also include suppliers, lead producers, competitors, and other stakeholders. Over time, they co-evolve their capabilities and roles, and tend to align themselves with the directions set by one or more central companies. Those companies holding leadership roles may change over time, but the function of ecosystem leader is valued by the community because it enables members to move toward shared visions to align their investments and to find mutually supportive roles."* Business ecosystems are analogous with biological ecosystems. Moore (1996) uses biological metaphors and divides the business ecosystem into four stages for analysis and management, which are discussed further in subchapter 3.3.5.2 Stages of Business Ecosystem.

Similarly, Iansiti and Levien (2004a) use congruencies between biological and business ecosystems, but emphasise that analogies between these ecosystems can be dangerous and one should be careful when using them. In fact, they point out critical differences between the ecosystems, for example, innovation, competition for members and intelligent actors (e.g. planning, forethought), to differ from its descendant biological ancestor. However, despite of the susceptibility to risk in the term "business ecosystem" it fits well in the scope of this thesis and accentuates the varieties and possibilities of different interactions of business activities. In addition, the ecosystem analogy borrows viewpoints for understanding the challenges and opportunities in business ecosystems and inspires the seeking of them. Thus, this thesis uses Iansiti and Levien's (2004b) definition of business ecosystem. They define business ecosystems through interconnected business networks:

> "*these loose networks—of suppliers, distributors, outsourcing firms, makers of related products or services, technology providers, and a host of other organizations—affect, and are affected by, the creation and delivery of a company's own offerings*",

where a business ecosystem is described as

> "*like an individual species in a biological ecosystem, each member of a business ecosystem ultimately shares the fate of the network as a whole, regardless of that member's apparent strength."*

An interesting perspective on the evolution of the ecosystems is co-evolution; where ecosystem member organisations or parts of the ecosystem evolve in alignment. An example of co-evolution is a *Digital Ecosystem* and a Business Ecosystem evolution, which Moore (2003) introduces as the *Digital Business Ecosystem (DBE)*. An illustration of the DBE is drawn in Figure 8, and is briefly touched upon in definitions 1.3.1. There has been research in this area by the Information Society and Media of European Commission.[4]

[4] Innovation Ecosystems Initiative, http://www.digital-ecosystems.org

1.3.2 Success in Creating and Sustaining Business Ecosystems

Success in creating and sustaining business ecosystems is reflecting a viable, growing and healthy business ecosystem. In the creation phase, favourable selections in value proposal, in core strategic decisions, and in ecosystem promise are chosen. As for sustaining the business ecosystem, it essentially embodies an active business ecosystem management where the business ecosystem is continuously monitored as well as its healthiness is actively improved. Furthermore, the ecosystem is shaped towards promising insights with strategies and related decisions. The ecosystem healthiness is measured with productivity, robustness and niche creation introduced by Iansiti and Levien (2004a). In addition to this, the thesis proposes further metrics and influencing factors for continuous active shaping and management.

1.4 Other Definitions

The key definitions used in the thesis were described in the previous subchapter. This subchapter discusses additional definitions and concepts used in the thesis. These are: network externalities, innovation, innovation as a concept, sustaining innovation and disruptive innovation, innovation diffusion, operating leverage and competitive intelligence.

1.4.1 Network Externalities

In a networked economy, the use of a product usually has an effect to another user's product value. The effects can be positive or negative and depending on their characteristics the network effects can be classified to: direct, indirect, two (and multi-sided) network effects, and local network effects. A closer look at the network externalities is taken in subchapter 2.2. In this thesis, the following network externalities definition by Milgrom and Roberts (1992) is used:

> *"Externalities* are *positive or negative effects that one economic agent's actions have on another's welfare that are not regulated by the system of prices"*

1.4.2 Innovation

The term "*innovation*" is used widely in the literature and has ambiguous meanings. It was first introduced by Shumpeter (1927) with "*changes of the combinations of the factors of production as cannot be effected by infinitesimal steps of variations at the margin*" and additionally Schumpeter (1928) defined innovation as a new commodity to the public or producing it at a lower cost. In a technological change process, innovation is often referred to with the Schumpeterian trilogy of invention: invention (generation of new ideas), innovation (*encompassing the development of new ideas into marketable products or processes*) and diffusion (new products and technology spreads across the potential market). This is also used by Stoneman (1995) in his book about innovation and technological change.

With similarities to Schumpeterian trilogy, Christensen et al. (2004) use core theories of innovation to untangle the process of innovation: the disruptive innovation theory; resources, processes and values theory (RPV), and the value chain evolution theory (VCE). Here, the disruptive innovation is an innovation concept based on a new value proposal (discussed in 1.4.4 and 3.3.1.1), RVP includes all the things, assets, processes and prioritisation criteria in product development. Finally, VCE consist of producing the product, integrating and controlling the delivery towards consumers.

In comparison, Schilling (2008) uses *innovation as a process in an innovation funnel, where raw ideas are refined as well as selected towards successful new products through small projects and major development programs*. An innovation itself is described in concrete terms in the innovation funnel as "*the practical implementation of an idea into a new device or process*". Innovation has been researched from different perspectives, for instance Luecke and Katz (2003) defines innovation from an organisation perspective as:

”*Innovation . . . is generally understood as the successful introduction of a new thing or method . . . Innovation is the embodiment, combination, or synthesis of knowledge in original, relevant, valued new products, processes, or services*”.

This thesis uses the diffusion of innovations -theory (see 2.3 Diffusion of Innovations) where the innovation according to Rogers (2003), is defined as “*{an innovation is} an idea, practice, or object that is perceived as new by an individual or other unit of adoption.*”. The thesis uses innovation in a broad context as the business ecosystems entail many perspectives and opportunities for utilising and implementing innovation. However, a practical definition is still needed to facilitate the discussion. Thus, the innovation definition used by Tushman and Anderson (2004) is well suited for the purposes of the thesis: “*An innovation is more than an invention. It advances a novel idea to the next level, reducing it to practice in a way that creates economic value for some group of customers. An innovation may lower the cost of producing what a company already produces, enhance the value of the company’s output, or allow the company to reach new customers”*.

The business ecosystems are discussed in the thesis as relatively healthy and innovation is in a significant role in sustaining the healthiness (value creation, innovation diffusion). However, in business ecosystem context ideas do not need to be novel, a reimplementation or an adaptation to a different environment can be most essential; -innovation is defined in the context of this thesis with a minor adaptation to Tushman’s and Anderson’s definition as:

> “*An innovation is more than an invention. It advances an idea to the next level, reducing it to practise in a way that is an attempt to create economic value for member(s) in the ecosystem or some group of customers. An innovation may lower the cost of producing what member(s) already produce, enhance the value of the member(s)’ output or allow the member(s) to reach new customers*”

1.4.3 Innovation as a Concept

As far as innovation and innovation studies are concerned, it is suggested that innovations can be se separated analytically and conceptualised at different levels for analysis. These include, for instance, components, technologies, processes, products, systems, companies, industries, and nations. Hence, many terms for categorisation and separation exist. Without going deep into the different categorisations, let us describe the commonly used terms: incremental, sustaining, radical, and disruptive innovation. As a concept; innovation is relative, context dependent, and considered to challenge or cause divergence for the current state-of-the-art business in question. The innovation is considered to be more radical when applied to an industry level than, for example, studied at a functional level at the department as Laaksonen (2007) points out. Further to incremental innovation, Tushman and Smith (2004) describe it as "*innovations that push the existing technological trajectory for existing subsystem and linking mechanisms.*" Accordingly, radical innovations tend to create breaks to system boundaries or are discontinuous in nature.

Similarly, Christensen (2003) discusses sustaining technologies, which can be radical or incremental in nature, but have a common component if they improve product performance. Thus, the sustaining technologies improve the performance of established products incrementally or radically within expectations and valuations of mainstream customers in major markets. A disruptive innovation concept is defined by Christensen (2003) as an innovation, which brings a very different value proposition to a market, and likely has a rather modest product performance (at least in the near term). Products based on disruptive technologies are typically cheaper, simpler, smaller, and more convenient to use.

1.4.4 Sustaining Innovation and Disruptive Innovation

In the business ecosystem context of this thesis; incremental, radical, sustaining, disruptive innovations are defined from the business ecosystem point of view and the definitions are relative concepts rather than exact hard-written statements, and need to be considered from the health and vitality perspective of the ecosystem:

> *The sustainable innovations are essentially traditional, predictable, and incremental in character as discussed in 1.4.3 to retain and attract members to a business ecosystem as well as driving its growth.*

Furthermore, we shall define disruptive innovations from a business ecosystem perspective as:

> *Disruptive innovations are different value propositions or radical performance propositions or (technology) discontinuations, which can make a new business ecosystem flourish or request the surrounding business environment to adapt to change in a fundamental way, for instance, significantly change the business model.*

1.4.5 Innovation Diffusion

Innovation diffusion has been researched according to nine major traditions since the 40s (rural sociology, marketing and management, communications, public health and medical sociology, general sociology, education, geography, anthropology, other traditions) in their respective order. Everett M. Rogers (2003) defines innovation diffusion by:

> *"Diffusion is a process by which an innovation is communicated through certain channels over time among the members of a social system."* (Rogers 2003)

1.4.6 Operating Leverage

Iansiti and Levien (2004a) introduce a concept of *operating leverage* in a business ecosystem, which systematises value creation with a series of assets to be easily shared across the business network (operating leverage sharing). Operating leverage consists of:

- High-value, sharable assets (e.g. process tools, libraries)
- Leveraging direct customer connection (e.g. effectiveness in value chain)
- Creating and managing physical and information hubs (e.g. shareable resources)
- Supporting uniform information standards, for instance, APIs (Application Programming Interfaces), and purchase histories
- Creating, packaging and sharing state-of-the-art tools for innovation building blocks (e.g. optimised design tools)
- Establishing and maintaining performance standards (e.g. monitoring performance within the ecosystem)
- Building or acquiring financial assets for operating leverage (e.g. injecting venture capital money)
- Reducing uncertainty by centralising and coordinating communication (e.g. simplifying communication),
- Reducing complexity by providing powerful platforms (e.g. software platform).

As far as innovation is concerned (see 1.4.2), it is possible to note that many of the operating leverage assets are actually broadly defined innovations at different levels; where operating leverage is a super-ordinate term, for example; innovation frameworks, innovation platforms, and supply chain innovations. In addition, it includes assets for value creation, which can hardly ever be considered innovations, for instance, maintaining standards and building financial assets.

1.4.7 Competitive Intelligence

The thesis constructs an analysis framework based on CI (competitive intelligence) theories to collect, filter, and analyse information in order to support strategies and decision making in the ecosystem evolvement. The monitoring and analyses are related to ecosystems, operating environment, and smaller groups and assets within the ecosystem.

The SCIP (Society of Competitive Intelligence Professionals) define the CI as: "*Competitive intelligence is the legal and ethical collection and analysis of information regarding the capabilities, vulnerabilities, and intentions of business competitors*". Kahaner (1996) uses the concept of CI as: "*Intelligence is information that has been filtered, distilled and analyzed. Competitive intelligence requires knowing precisely the differences between information and intelligenc*e".

Commonly, the competitive intelligence is used as a synonym for *competitor intelligence*, which according to Deschamps and Ranganath (1995) *"is needed to evaluate the evolution of competitive strategy over time through changes in competitors' structure, new product substitutes and new industry entrants."*

The CI discussion is continued in subchapter 2.4, where the CI theories are elaborated upon. In subchapter 3.3.2, the CI analysis framework is presented.

2 Innovation in Networked Information Economy

This chapter discusses innovations in a networked information economy to give an overview of the context the business ecosystems are operating in. Firstly, networked information economy is discussed. Secondly, network externalities and its types are reviewed. Thirdly, diffusion of innovations theory is reviewed with the main elements in the diffusion process. And finally, competitive intelligence theory is gone deeply into.

2.1 Introduction and Networked Information Economy

There are remarkable differences in the old industrial economy compared to the 21st century information economy. In the information economy, there is increased emphasis on information activities and the characteristic of such an industry is that it is information intensive. Information is produced, sold, and disseminated as a good or service in such forms as media, information processing, communications, and software. In the industrial economy, only a small number of large firms producing smokestack-industry-related utilities dominated the markets and the economy was driven by economies of scale. The new information economy is driven by the economics of networks, where positive feedback and network effects are even more significant. This is to say that, the fundamental value proposition is different; the value of connecting to a network (whether real or virtual) depends more and more on the number of other people already connected to it according to Shapiro and Varian (1999).

Positive feedback makes the strong grow stronger and weak grow weaker. In such a market where the positive feedback is strong, it is inevitable that only a few emerge as winners. The negative feedback in its negative virtuous cycle makes it harder to survive in the markets, and in its most extreme form this feedback can lead to a winner-takes-all market (see Figure 1).

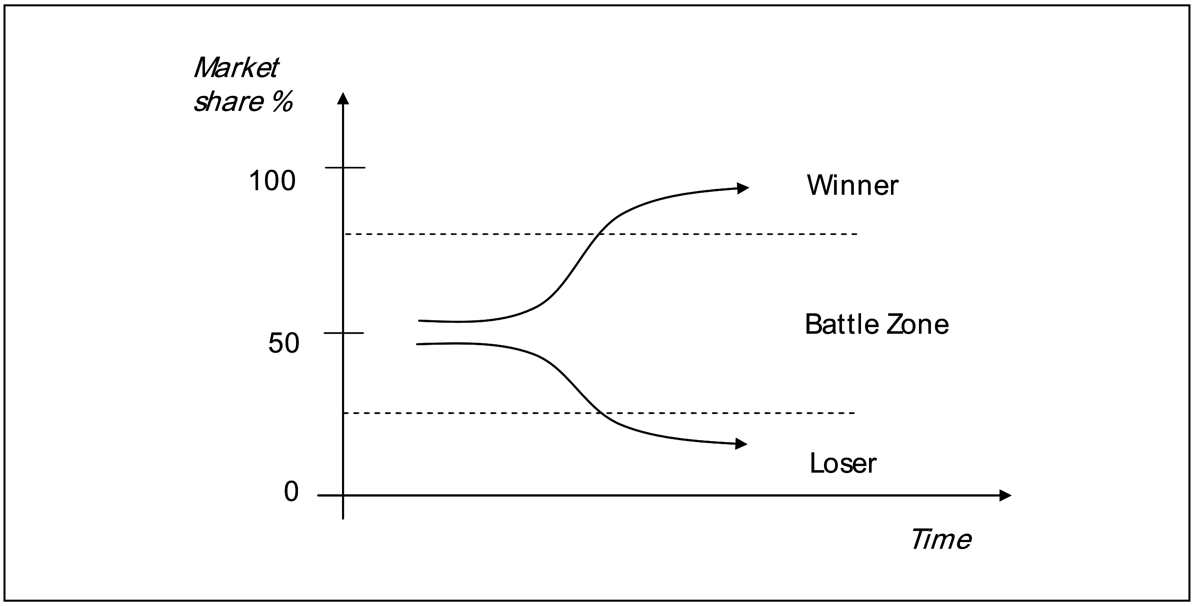

Figure 1: Positive feedback by Shapiro and Varian (1999)

In the old economy, positive feedback existed primarily on the supply side of economies of scale where it was exhibited in the form of lowered manufacturing costs mainly by large companies. In the information economy, both demand and supply sides have economies of scale and especially the demand side is virulently effective. A characteristic industry for this is the software industry where the value to users grows rapidly as the number of users increase. Lotus 1-2-3 leveraged the advantage of demand scale economies during the 1980s and enjoyed the largest installed base of users of spreadsheet programs. Because the performance of the spreadsheets was superior and personal computers become faster, Lotus 1-2-3 was preferred by skilled users, who developed sophisticated macros with it. The spreadsheet market grew rapidly and attracted new users who were required to have compatible software. At the same time, VisiCalc was not able to introduce a competitive product fast enough, experienced negative feedback and quickly succumbed. Similarly, Microsoft has been successful in gaining positive feedback on the demand side by dominating market share in different Windows and Office software program families in the 90s and 00s. In such a dominating position, the supply side exhibit additional economies of scale, as Shapiro and Varian (1999) highlight.

Although the information industry has demand side information economies of scale as the norm, this does not necessarily mean that positive feedback occurs very quickly or predictably. The alternative solutions can co-exist in balance for years and the loser(s) might exist in the market with a smaller market share. Nevertheless, nowadays the demand side of economics is in a stronger role than before due to the strong networking and ecosystem dependency. In some businesses, it might be possible to leverage both demand and supply side economies of scale to make the positive feedback in the network economy especially strong. Thus, the growth on the demand reduces the cost of the supply side and at the same time makes the product offering more attractive to the users. As a result, this kind of business is exhibiting greater dynamics and is faster paced, the business, even an entire industry, is under stronger forces and is created or destroyed more rapidly than before.

2.2 Network Externalities

Usually, the use of a product has an effect on other user's value of the product in the economy. A classic example of this is a telephone network where an increasing number of users increase each user's product value due to a broader reach of the telephones in the network. The primary research on this topic was made by Bell laboratories in the 70s, where subscribers' utility in a communications service was analysed. (Rohlfs, 1974)

The network effects can be negative as well. A commonly used example of a negative effect is pollution, the waste or emissions decrease the other users' value or use of a product. Negative network effects have not been studied widely in information products, however, Asvanund et al. (2004) extend the understanding of network effects by measuring both the positive and negative externalities and their variability as a function of network size in the context of peer-to-peer information networks. Interestingly, they find that the marginal benefit than additional user poses to the network decreases with the network size and at the same time, the marginal cost they impose on the network in the terms of used resources and congestion increases as the network size grows. Thus, they propose that the optimal size of a network is bounded while network designers retain a variety of options to improve network scalability and performance with architectural decisions and network properties. The network scalability could have interesting implications to preferred business ecosystem architecture.

While the previous real-network examples are simplifications to crystallise the network externalities phenomena, it is a necessity to realise that the network effects are most commonly related to logical (or virtual) networks in the information economy. These networks consist, for instance, users who use the same product or service and are part of the network, where the manufacturer (or service provider) is the sponsor and crafts the network. The sponsor designs the strategy and interfaces of the network, finds partners, builds alliances, makes improvements, and knows how to get the network into operation.

2.2.1 Types of Network Effects

The terms network effects and network externalities are often used interchangeably in the literature. Milgrom and Roberts (1992) define network externalities with: *"Network externalities are positive or negative effects that one economic agent's actions have on another's welfare that are not regulated by the system of prices"*

A closer look at the network effect research brings out many types of network effects and can be outlined by the most common characteristics.

Direct network effects are the simplest and most traditional form of network effects. An increase in the number of products (usage) leads to value gain as Farrell and Saloner (1985) highlight. This can be calculated with Metcalfe's law: "The value of a network goes up as the square of the number of users". Thus, the total value of the network according to the law is proportional to $n \times (n-1) = n^2-n$. (Shapiro and Varian, 1999)

Indirect network effects are referred to, when the increase in the number of products or usage of the product, for instance, create more production of complementary goods and thus, increase the value of the original product. For example, the availability of complementary applications or products may be important with respect to the original value of the product. (Katz and Shapiro, 1985)

Two-sided (and multi-sided) network effects are a generalisation of the indirect network effects. Now, the increase in the number of products or usage of the product increases not only the number of complementary products but the value of another set of users as well. Similarly, complementary products and another set of users' usage create additional value for original products and a set of users. Examples of two-sided network effects are hardware/software platforms, marketplaces, and product ecosystems. (Rochet and Tirole, 2001)

Local network effects are studied in the latest network effect research papers. Rather than valuing the size of a network (and an increase in the size), the microstructure of the network connections matters for the users. The microstructure consists of a small subset of other consumers' selections, preferences, and incomplete information which is used as a basis for valuation and decision criteria. A great example according to Sundarajan (2007) is a specific social or business network, which is selected if "he" or "she" is connected to it rather than by the extent of the network. Another example is preferred interaction patterns (e.g. packaging of data, compatibility in methods) of close collaborators, which create the most utility for a user rather than the total number of users using the pattern. (Banerji et al., 2005)

2.2.2 Network Externalities and Switching Costs

Switching costs are about the stickiness or cost in making alternative choices for the future. The previous selections in history, whether they are technology, methods or brands bound us and systems to the existing assets. Switching costs are ubiquitously present in the information economy, although the forms can vary much. It can be an investment to another system replacing the previous system, time and cost used to make the systems working and compatible, learning a new system, overcoming mindset and behavior of the previous working paradigms, contractual commitments, partnership loyalties and specialisation and getting the performance and quality to a comparable level.

Usually, switching costs are undervalued; the direct investments, estimated working time etc. are calculated, but the indirect multiplicative effects as well as psychological, emotional, and social costs are trivialised (Gourville, 2003). When network externalities exist, collective switching costs apply, thus the combined switching costs of all members. According to Shapiro and Varian (1999), there exists better alternatives to the currently used QWERTY keyboards, but the switching costs in changing to an alternative Dvorak keyboard layout are simply too high to make the transition worthwhile. Not only would the technology change and have its costs and the human component in learning a new layout take time, but actually no-one is willing to lead the new adoption; new typists learn QWERTY because of the compatibility, and old layouts are used because of the availability of skilled persons who use it. It is rather straightforward to extrapolate that in the cases where network externalities are strong and businesses highly networked, in business ecosystems, the indirect and collective switching costs are remarkably present.

When the switching costs are substantial, users and companies face lock-in; they are tied to a certain product or a system. This can be a source of enormous problems and headaches, or substantial profits depending on the management of switching costs. In order to win the markets with switching costs, the need to be strategically managed, neither to be avoided nor (over) embraced. Additionally, it is necessary to consider the full life-cycle of a lock-in to understand and predict actions of ecosystem members in each cycle phase. Thus, the barriers, strategies, selections, and areas to be emphasised vary remarkably depending on the cycle phase. Actually, it is a basic principle to anticipate the entire cycle from the beginning and even go beyond one cycle trip in order to anticipate multiple cycles in the future to form a strategy and contemplate the value of switching costs. These are discussed in the next subchapter 2.2.3 Switching Costs and Lock-in.

2.2.3 Switching Costs and Lock-in

Lock-in is a concept where switching costs vary at different points of time. Investments, realised needs, lock-in cycle phases, as well as other lock-in cycles affect the level of switching costs. Let’s first consider the life-cycle of a lock-in illustrated in Figure 2 from a customer (buyer) perspective to open up this dynamic concept. With respect to business ecosystems the lock-in is discussed in subchapter 3.3.5 Managing Business Ecosystem.

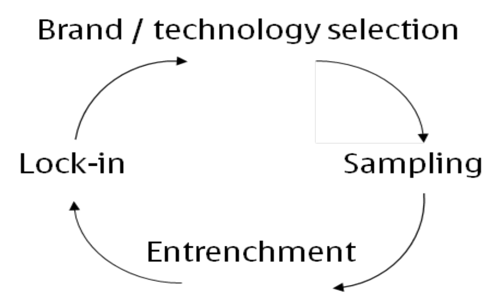

Figure 2: Lock-in life-cycle, adapted from Shapiro and Varian (1999)

At the brand/technology selection point, the customer chooses a new brand. Inherently, the customer does not have a preference nor is locked-in to any brand, the lock-in takes place through the virtue of choices made for the future, where the options are limited due these previous selections. User preferences in choosing a technology and brand have been studied and modeled throughout the literature. According to Rogers (2003), innovation diffusion is a five-step process (see 2.3 Diffusion of Innovations) in which prior conditions, knowledge, and persuasion precede the decision process. Davis (1989) has developed a Technology Acceptance Model (TAM) where influencing factors of user acceptance and use of technology are delineated. The technology acceptance model has later been developed further by Venkatesh and Davis (2000) and Venkatesh et al. (2003).

In the next phase, the sampling phase, the customer actively uses the new brand and is given inducements like free samples, sweeteners, and lower offers to turn the new customers to revenue-paying customers. Moreover, this is a phase where the customer tries the samples, for instance, to find out compatibility issues, performance, and other correspondence in offers and requirements.

The customers who do more than try samples, continue to the entrenchment phase. In this phase, the selection is fully leveraged. The own value, product, is built on top of the selection, preference over a competing brand is developed, and the features are fully utilised by a company or by the end users. Consequently, the switching costs are growing unless actively managed and this phase culminates in the lock-in (phase) in which the switching costs become substantially more expensive. Furthermore, the suppliers are dragging out the entrenchment phase to boost the switching costs by enabling complementary investments and dependencies for the selection. Active consideration of other selections and multiple lock-in cycles are balancing the switching costs in addition to paying attention to changes in circumstances.

The active management of switching costs can be very tricky for buyers, sellers, stakeholders in the business ecosystem and between competing ecosystems. This will be discussed further in 3.3.5 Managing Business Ecosystem.

2.3 Diffusion of Innovations

Innovation diffusion is a process in which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, where the perceived new ideas spread via messages by the members. The main elements in the diffusion of innovations are: 1) the *innovation*, 2) *communication channels*, 3) *time* and 4) *social system*. (Rogers, 2003)

2.3.1 Innovation in Diffusion Theory

Rogers (2003) defines an *innovation* as an idea, practice or object that is perceived as new by the individuals. All innovations are not equivalent in analysis and characteristics of innovations help to explain their different rates of adoption. Perceived attributes of innovations are *relative advantage, compatibility, complexity, trialability* and *observability*. Innovations that are perceived as having greater relative advantage, compatibility, trialability, observability and less complexity are adopted more rapidly than other innovations. According to Rogers (2003), the previous research indicate that these five attributes are the most important characteristics of innovations in explaining the rate of adoption.

On the basis of the innovation diffusion theory by Rogers (2003), the *Relative advantage* is the degree to which an innovation is perceived as better than the idea it supersedes and can be measured in economic terms. However, social factors, convenience and satisfaction are important determinants as well. The relative advantage of perception is subjective, thus the greater it is, the faster the adoption rate will be in spite of a real "objective advantage" of an innovation. *Compatibility* is the degree an innovation is perceived as being consistent with the existing values, past experiences and needs of the potential adopters. An incompatible idea with the existing values and norms of a social system will not be adopted as rapidly as a compatible one because incompatible adoption often requires the prior adoption of a new value system, which is a slow process. *Complexity* refers to the degree an innovation is perceived as difficult to understand and use. Some innovations are easier to understand by the individuals and thus are easier and faster to adopt, while the ideas that require new skills and understanding are slower to adopt, such as the Dvorak keyboard substitute to QWERTY (see 2.2.2). *Trialability* is the degree to which an innovation can be experimented with on a limited basis. The ideas that can be tried on an existing installment are generally adopted faster due to learning by doing, easier division, and lowering uncertainty towards the idea. *Observability* is the degree the results of an innovation are visible to others. The higher the degree is, the more likely and easily innovations are adopted because visibility stimulates peer discussion and innovation evaluation.

2.3.2 Communication in Diffusion Theory

Communication is a process, in which the members create and share information to reach a mutual understanding, thus approaching convergence (or divergence) in their meanings as individuals exchange information. The communication is a two-way process instead of one-way, and information is exchanged through a communication channel. A communication channel is the means by which messages spread from individuals to others and the nature of the information exchange relationship determines the conditions in which individuals transmit and receive information. There is a variety of possible communication channels. Mass media channels are usually efficient in informing an audience of potential adopters about the existence of an innovation, whereas interpersonal channels are efficient in persuading and influencing attitudes. As a result, most people tend to depend on subjective evaluation based on the suggestions of the previously adopted near peers rather than scientific studies of innovation consequences. (Rogers, 2003)

In free-choice communication, which usually involves face-to-face exchange between near peers, individuals tend to interact more with the ones that have similar characteristics. Rogers (2003) assumes this is because the communication tends to be more effective and have rewards in communication. Thus, if the characteristics such as beliefs, education, and socioeconomic status have similarities, the communication of new ideas is likely to have greater effects in knowledge gain, attitude formation and change which lead to faster innovation diffusion. One of the most distinctive problems of a slow diffusion of innovations is the high level of asymmetry in characteristics, which has the effect of long convergence times in reaching a mutual understanding.

2.3.3 Time Dimension in Diffusion Theory

According to Rogers (2003), *time* is involved in the diffusion process in three dimensions: the *innovation decision process*, the *innovativeness of an individual* and the *rate of adoption* associated to an innovation in a system. Firstly, the innovation decision process is the mental process where an individual seeks information from various sources in order to reduce uncertainty towards innovation and its consequences. The innovation-decision process starts with knowledge of an innovation and can be conceptualised in five steps: 1) *knowledge*, 2) *persuasion*, 3) *decision*, 4) *implementation*, and 5) *conformation*. In the knowledge step an individual learns of the innovation's existence and gains some idea how it functions. Persuasion takes place when an individual forms a favourable or unfavourable attitude towards the innovation. In the decision step an individual engages in activities leading to choices about rejecting or accepting the innovation in concern. Furthermore, implementation occurs when an individual concretises the innovation and puts it into use. Finally, in the confirmation step an individual evaluates the results of a previous innovation decision and possibly can reverse the decision if there are conflicting messages about the innovation.

Secondly, *time* is involved in the diffusion process as a relative degree of *innovativeness of an individual* compared to other members in the social system. It describes whether an individual is a relatively earlier or later adopter of an innovation in comparison to other individuals. The individuals as adopters can be classified into five categories: innovators (venturesome-active information seekers), early adopters (respect), early majority (deliberate), late majority (skeptical) and laggards (traditional). Adopter categories are depicted in Figure 3. (Rogers, 2003)

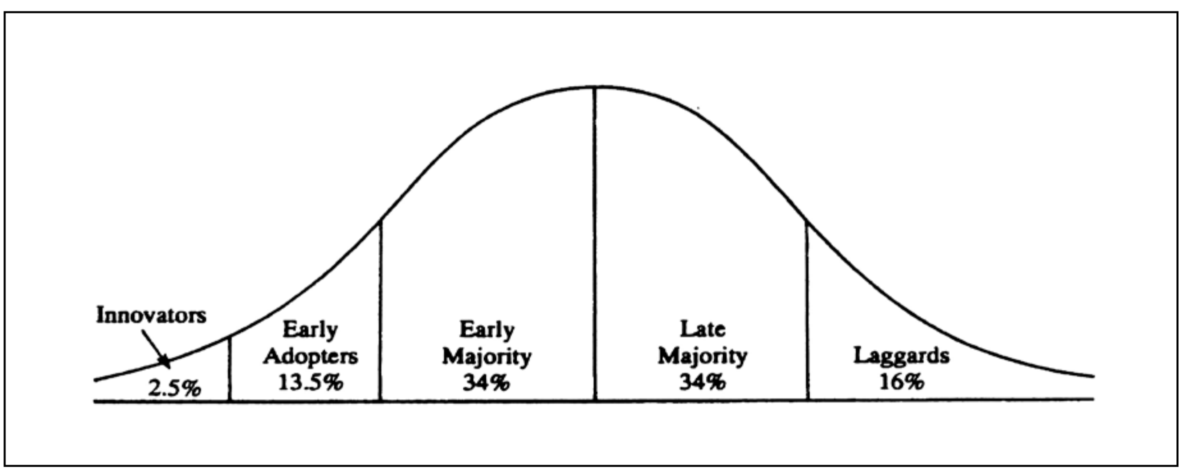

Figure 3: Adopter Categories (Degree of Innovativeness) by Rogers (2003)

Thirdly, Rogers (2003) highlight that *time* is associated to the *rate of innovation adoption* in the system. This is a relative speed with which an innovation is adopted by the members in the social system, which is measured by the number of users adopting the innovation in a certain time interval. Most innovations have an S-shaped rate of adoption, but the adoption curve varies depending on the innovation. Some innovations diffuse relative rapidly and the diffusion S-curve is relatively steep. However, other innovations have a slower rate of adoption meaning that the S-curve is more gradual, the slope is gentle in shape. Different adoption rates measured in the percentage of adopted members as a function of time are shown in Figure 4. As discussed earlier, innovations that are perceived by individuals as having greater relative advantage, compatibility, triallability, observability, and lower complexity are diffused faster, for instance, Innovation I in the illustration.

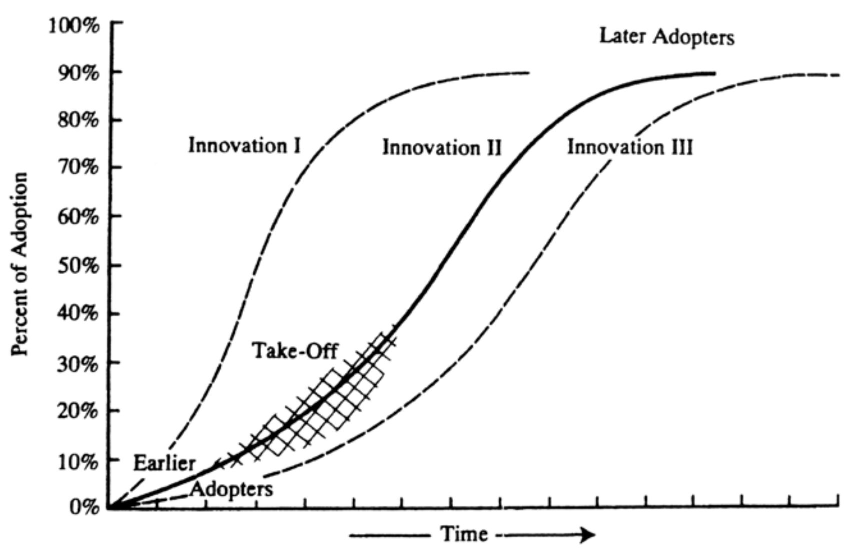

Figure 4: Rate of Adoption in Innovation Diffusion (Rogers, 2003)

2.3.4 Social System in Diffusion Theory

The fourth main element in the process of innovation diffusion by Rogers (2003) is the social system. Members in the social system are interrelated units that engage in joint problem solving to accomplish a common goal. The members may be individual, informal groups, organisations, or subsystems co-operating at least to the extent of seeking a solution to the common problem. A common objective to reach a mutual goal binds together the social system in which the diffusion occurs. The social system consists of a boundary, *structure*, certain *norms*, *roles*, *types of innovation-decisions*, *change agents*, and *consequences of innovations* affecting the diffusion.

To the extent that units in the social system are different in their behavior, there exists a structure in the system as a form of patterned arrangements of the units. The structure gives stability and behavior predictability to some degree, thus decreasing the uncertainty towards the innovation. Well developed social structures in such a system consist of hierarchical positions where orders are expected to be carried out constituting one type of a formal structure. In addition to this formal structure, an informal structure also exists in the system; an interpersonal network linking system members together under certain circumstances. There are other behavior related patterns for the members in a system. *Norms* are established behavior patterns that define a range of tolerable behavior and serve as a guide or standard for the expected behavior. The norms can be a barrier to change or decelerate it, depending on at what level the deviant norms are faced, at the level of a nation, religious community, organisation, local system, etc. (Rogers, 2003)

Other constitutive elements affecting the diffusion in the social system are *change agents* and opinion leaders, as Rogers (2003) acknowledges. The most innovative members of a system are very often perceived as deviant from the social system and are accorded a status of low credibility by the average members, and thus these individuals' role in diffusion (persuasion) is limited. Certain other members in the system function as opinion leaders and are able to influence other individual's attitudes or overt behavior informally in other ways via informal leadership. Opinion leadership is earned and maintained by individual's technical competence, social accessibility, and conformity to the system's norm serving as a model for the innovation behavior of their followers. Thus, opinion leaders exemplify and express the system's structure and usually the system has both innovative opinion leaders and leaders who oppose change. As a communication network consists of interconnected individuals linked by both formal structure and interpersonal networks, the most striking characteristic of opinion leaders is their unique and influential position to be at the centre of interpersonal communication networks. This position allows the opinion leader to serve as a social model whose innovative behavior is imitated by many other members in the system. Nevertheless, opinion leaders can be "worn out" by change agents who might overuse them in diffusion activities because change agents often use opinion leaders as their lieutenants in diffusion activities. A change agent is an individual who influences innovation-decisions in a desirable direction by obtaining the adoption of new ideas, but may attempt to slow down diffusion to prevent the adoption of undesirable innovations.

Innovation-decisions have yet another important influence on the diffusion of new ideas as innovations can be both adopted or rejected by individual members in the system or by the entire system. There are three types of possible innovation-decisions: optional innovation-decisions (independent adoption/rejection choices from other members of the system), collective innovation-decisions (adoption/rejection made by consensus of members) and authority innovation-decisions (adoption/rejection order made by authorities where individual members have little or no decision power). Innovations have *consequences*, this is to say, changes that occur to individuals or the social system as a result of the adoption or rejection. The consequences can firstly be desirable or undesirable, secondly, direct versus indirect (depending on whether the changes have immediate or second order response), and anticipated or unanticipated (depending on whether the changes are recognisable and intentional) in the social system in concern. (Rogers, 2003)

2.4 Competitive Intelligence

"You can see a lot by watching"
-Yogi Berra

An information overload is commonly experienced in the hectic pace of our daily business. Actually, it can be even worse to have too much information than too little information. On the one hand, it is believed that information per se is power, but on the other hand we complain about how much we needed to know in order to conduct business. Competitive intelligence is a process to relieve this issue in that a major part is about collecting information. However, it is not just about collecting information, it is about analysing information, filtering it, learning about its usefulness, and most of all using it.

The competitive intelligence (CI) is a process that *"is a collection of information pieces that have been filtered, distilled and analyzed ... and turned into something that can be acted upon. Intelligence, not information is what managers need to make decisions. Another term for intelligence is knowledge"* (Kahaner, 1996). Additionally, according to SCIP (2007) competitive intelligence is a legal and ethical collection of information related to intentions of business competitors.

Competitive intelligence as a process: 1) anticipates changes in the marketplace, 2) anticipates actions of competitors, 3) discovers new or potential competitors, 4) learns from the successes and failures of others, 5) increases the range and quality of acquisition targets, 6) learns about new technologies, products, and processes that affect business, 7) learns about political, legislative or regulatory changes affecting business, 8) enters new business areas, 9) looks at own business practices with an open mind, 10) facilitates in implementing the latest management tools (Kahaner, 1996).

Rouach and Santi (2001) define competitive intelligence as a concept, which is summarised in Figure 5. According to them, competitive intelligence is the art of collecting, processing and storing information to be made available to people at all levels of the firm to shape the future and protect against competitive threat. CI has the following aspects:

technological intelligence, commercial and marketing intelligence and strategic & social intelligence.

The *strategic and social intelligence* includes regulation, financial and tax, economic and political issues, as well as social and human resource matters. Accordingly, *technological intelligence* "*is needed to assess the cost/benefit of current and new technologies and to forecast future technological discontinuities*" and *commercial and marketing intelligence "is needed to provide a road map of current and future trends in customers' needs and preferences, new markets and creative segmentation opportunities, and major shifts in marketing and distribution."* (Deschamps and Ranganath, 1995 in Rouach and Santi, 2001).

Figure 5: Competitive Intelligence Aspects (Rouach and Santi, 2001)

Based on the CI aspects in the CI process, Rouach and Santi (2001) discuss different possible intelligence attitudes. They present and compare competitive intelligence characteristics practiced by the majority of leading companies and summarise five intelligence attitudes, which are categorised on the basis of companies' approaches to CI.

The categorisation of attitudes have two dimensions: the level of expertise of CI (methods, personnel), and the level of pro-activity (from offensive to inactive), and are measured on the basis of the company's pro-activity in a certain market and desired investment level in tools and methods in the CI process.

In order to add appropriate value for the company, for the ecosystem, and especially to know the state of an ecosystem in concern, the thesis proposes that attitudes (including CI processes) are used and adjusted according to the stages of a business ecosystem. In the recreation phase of a business ecosystem, which is discussed in subchapter 3.3.4 Recreating Existing Business Ecosystems the CI processes should be as pro-active and high level in expertise as possible. In the management of an ecosystem, elaborated in 3.3.5 Managing Business Ecosystem the pro-activity level should be high as well; however, most focus should be on stable processes, monitoring the changes (metrics) in the business ecosystem (see 3.3.3 Ecosystem Parameters). In contrast, when a totally new business ecosystem is created (a new industry or market) as contemplated in 3.3.1 Creating New Business Ecosystems, there is actually not much CI analysis before the business ecosystem is established and viable. Thus, the stage of the business ecosystem as well as the CI attitude together define "the purpose of CI" in order to provide services for decision making and strategy. CI services can be, for instance, in the form of executed analyses, knowledge management and the like.

The analyses are the most common outcome for the CI process. According to Kahaner (1996), the successful analyses should include 1) must be responsive to management's needs, 2) must be focused (not too general), 3) must be timely, 4) have high trust level, 5) and must be in the best form. A conduction of CI analysis include specific question set-up, methods for collection and analysis. According to Myburgh (2004) more than 100 different analytical techniques to analyse information exist. Some of them are included in appendix 7.1 CI Analysis Methods. Very commonly used methods are SWOT, benchmarking, and scenario analyses.

The CI analysis theory with respect to business ecosystems is continued in 3.3.2 Analysing Ecosystems, where a CI process framework is presented. The framework is used in action and elaborated upon further in subchapters 3.3.1 Creating New Business Ecosystems and 3.3.5 Managing Business Ecosystem. Then, the framework is used in action in the case study in chapter 5 Case: Developer - Driven Mobile Software Platform Ecosystem. In the next chapter, the business ecosystems, their creation and management are introduced in detail.

"Knowledge is the true organ of sight, not the eyes."

-Panchatantra

3 Business Ecosystems

This chapter goes deeply into business ecosystem theories. Mainly, the theories proposed by Iansiti and Levien (2004a) and Moore (1996) are followed. The chapter is organized into three subchapters. The first introductory subchapter gives an overview to business ecosystems. The second subchapter exemplifies business ecosystem structures, which are further explored in the third chapter with five subchapters. These subchapters contemplate the creation of business ecosystems, analyzing them with descriptive parameters, as well as managing them. The next chapter 4 summarises the discussed business ecosystem theories and other theories reviewed in the previous chapter.

3.1 Introduction

A good way to make business is to look at the markets, competition, make a resounding product or service positioning, as well as offering to compete for the market share. Except that in many cases, (at least in small scale business activities where this can lead to successful outcomes, it is likely the business context), the business environment is essentially ignored and causes withering in business activities. However, in our increasingly interconnected world companies need to leverage the competencies of an entire business network in order to achieve competitive advantage. This is to say, the business ecosystems have become an established way of making business and the executives need to find new approaches to manage assets the business does not actually own, but are critical to its success by adjusting strategies, processes, and tools to fit the new way of making business (Iansiti, 2005). These include, for example, analyzing the ecosystem, determining critical species and their roles, building it, managing it, co-evolving and co-operating with the members.

As a concept, the business ecosystem is broad and can be analysed, constructed, and elaborated in various ways. The analogies to biological ecosystems give useful insights for observation, but they have limits, as was discussed in the subchapter 1.3.1 where the term business ecosystem was defined. Additionally, the business ecosystems themserves are one way of describing the operating environment and information context companies and consortiums are actively involved in. In some cases, a more useful way of formalising the ecosystem is to separate the ecosystem into appropriate layers, for instance, network infrastructure, digital ecosystem, components and applications ecosystem and business ecosystem. In this dynamic layered structure, depending on the case, the layers can have co-evolving, evolutionary, self-organising or adapting elements.

An example of complex ecosystem research is an initiation by the EU Commission at the end of 2002. The Digital Business Ecosystems Research aims "*to build a favourable environment for economic growth and social cohesion, support for the adoption of Information and Communication Technologies (ICTs) {which} was identified as playing a key role in driving the transformation of the European economy.*" The initiative engages a community composed of computer scientists, social scientists, linguists, epistemologists, economists, political scientists, system theorists, cognitive scientists, biologists, physicists, and mathematicians in a joint enterprise finalised to collectively define technologies, practices, paradigms, and policies that can produce tangible results as the basis for a gradual deployment of a network of digital ecosystems to drive the transformation of the European economy (see Figure 18 in the Appendix 7.2) (DBE Book, 2007).

Nevertheless, as companies are fundamentally business focused it is appropriate and more straightforward to build business ecosystems and strategies from the business perspective (e.g. the ecosystem from a knowledge society perspective discussed in previous paragraph is inherently complex). Yet, the applicable business cases can request different characteristics from the ecosystem structure and emphasise different elements. In this subchapter of the thesis, business ecosystems are elaborated in detail. Particularly, theories presented by Moore and Iansiti are followed. (Moore, 1996; 2003; 2006) (Iansiti and Levien, 2004a; 2004b; 2005)

3.2 Business Ecosystem Structure

As discussed in the previous subchapter, the (business) ecosystems can be delineated in various ways and it is necessary to find structures that appropriately represent the activities, species, networking, and the shared vision.

If a business ecosystem already exists, firstly its operation should be understood to delineate a business ecosystem structure: shared fates, members' strategies, roles, opportunity environment, and interconnectedness. In addition to that, the health of the current business ecosystem should be analysed with three effective measures: robustness, productivity, and niche creation. Shared fates mean that the whole business ecosystem succeed, if the fate of the ecosystem succeed and the fates' of individual companies succeed. Practically, those are patterns of actions in interconnectedness (inputs and outputs from the business ecosystem according to vision and strategy), which are leveraged by companies for its own and the ecosystem's health.

Firstly, business ecosystem members' strategies and roles can be determined from the series of actions in their operation in the business ecosystem. Secondly, the opportunity environment is referring to the industry area, market size, market state (e.g. dynamics, age), and thirdly, interconnectedness can be seen from the type of interaction in business activities: are the ecosystem activities connected through certain platform, information node, connectivity technology or shared media? More detailed business ecosystem analysis in subchapter 3.3.2.

If there is no existing business ecosystem and the company determines to craft an ecosystem, a vision, a strategic intent (where the company wants to be, it's role in the ecosystem), mission and strategy (a series of actions supporting the strategic intent) are to be build around the vision and an opportunity. The creation of a business ecosystem is elaborated in the next subchapter 3.3.

Whether the ecosystem exists or is to be crafted the structure needs to be formulated. That is to say, to describe the most conspicuous elements "species" in the business ecosystem. Iansiti and Levien (2004a; 2004b; 2005) formulate the ecosystem structure as a business ecosystem with the following species: keystones, dominators, hub landlords, and niche players. An illustration of the idealised business ecosystem with these species is seen in Figure 6 where thick lines and large nodes represent keystones occupying only a small portion of the total nodes in the network; remaining nodes with thin lines and small circles are available for other species' occupation.

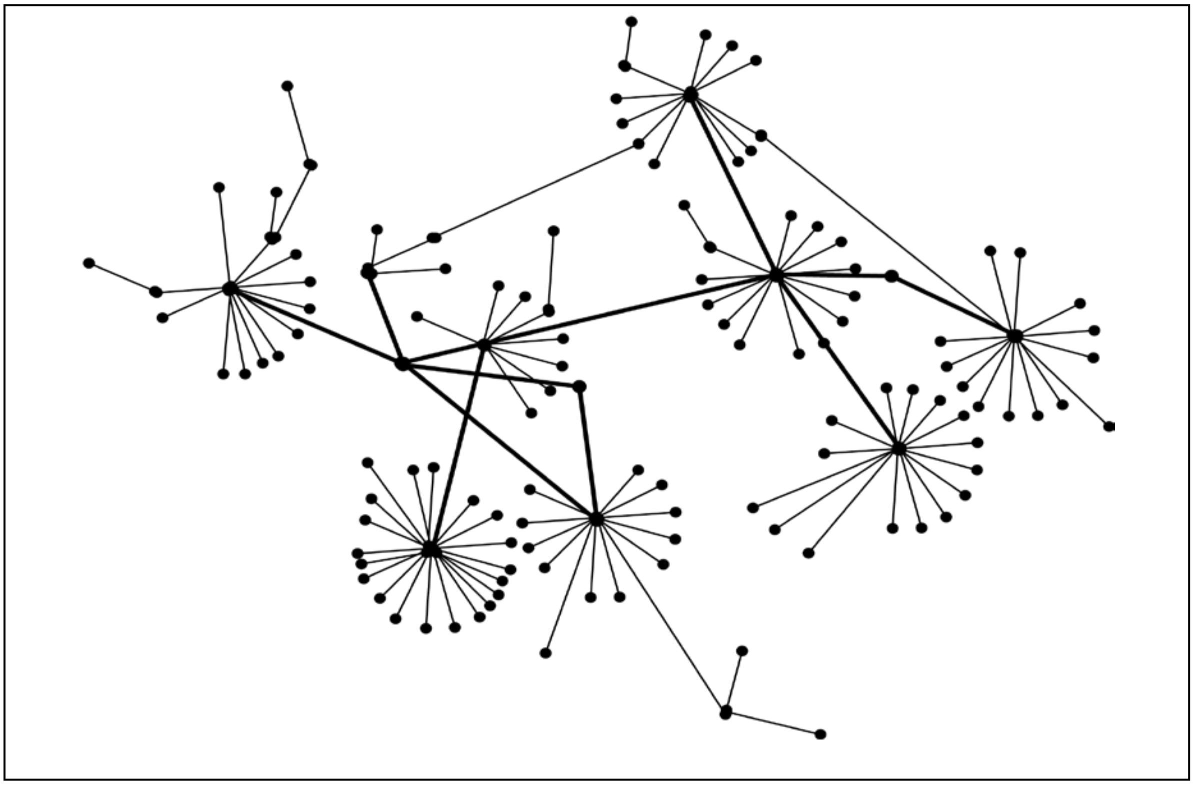

Figure 6: An illustration of the Business Ecosystem (Iansiti and Levien, 2004a)

Keystones actively improve and foster the overall health of the business ecosystem, their own survival and benefits depend on the sustained performance of the firms in the complex network. These species are critical for the survival of the whole ecosystem and their loss can have dramatic cascading effects (even indirect) through the entire ecosystem. Keystones can enhance the health of the ecosystem in various by, for instance, limiting, removing species that would reduce productivity, providing foundations on which other species rely, maintaining stability of the ecosystem and creating diversity for the ecosystem. Additionally, keystones create and share value with their network by leveraging their central hub position in the network.

Dominators integrate vertically or horizontally and manage as well as control a large part of the network. They are easily recognized and distinguished from the keystones by two characteristics, they are actually bigger in size than keystones and they discourage diversity by taking over the functions of the species. The dominators eliminate species and are responsible for the majority of both value capture and value creation for themselves, thus leaving little opportunity for the emergence of a versatile ecosystem.

Hub landlords create little if any value for the ecosystem and have low physical presence occupying only few network nodes. Instead, they extract as much value as possible from the network without directly controlling it, leaving a starved and unstable ecosystem around it.

Niche players individually do not have broad-reaching impacts on other species in the ecosystem, but constitute the bulk of the ecosystem both in mass and variety. Thus, they are critical in shaping what the ecosystem is. While keystones shape, *what* an ecosystem does, niche species *are* what it does. They are such critical species that firms must follow the strategies of niche species. Niche species develop specialised capabilities that differentiate them from other firms in the network, while occupying only a narrow part of the network itself. Actually, the niche players' effective network leverage as well as pursuance of effective keystone strategies enhances, and is critical, for the health of the entire ecosystem.

The ecosystem evolution is a dynamic process and for this reason the roles are by no means stable. Species can take roles, eliminate non-keystone species or a member can execute a strategic shift towards another role. In this type of ecosystem, which relies to keystone like behavior, the members and roles of the ecosystem may change, but the system as a whole, along with its keystones, persists. If the business area the ecosystem is operating is characterised by frequent and significant external disruptions, the ecosystem may become vulnerable. In such an environment, the keystone-like behavior to create diversity act as a buffer in preserving the overall structure, productivity, and diversity of the system as non-key species are being eliminated. (Iansiti and Levien, 2004a)

According to Moore (1996) the business ecosystem is made up of customers, market intermediaries, companies selling complementary products, suppliers, and the company itself, which can be thought as the primary species of the ecosystem. A more or less typical business ecosystem is depicted in Figure 7. As far as ecosystem structure, roles and networking are concerned, Moore (1996) does not elaborate on them in detail. According to him, the business ecosystems can be considered as small business initiatives or vast collections of enterprises, where the boundaries can be fuzzy. Moreover, Moore (1996) emphasises the evolutionary stages of the ecosystem, its evolvement and describes the challenges in each stage.

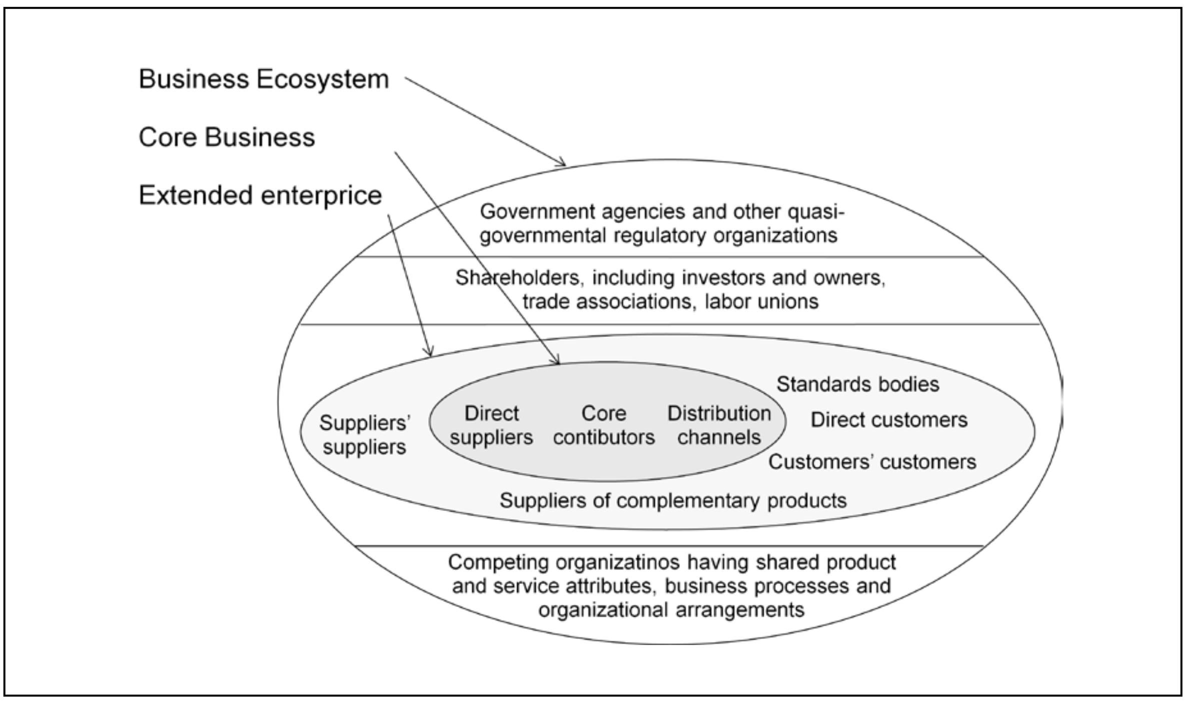

Figure 7: Business Ecosystem (Moore, 1996)

Co-evolution has been studied in literature from different perspectives and Peltoniemi (2005) composes various sources in her research paper. An adaptive evolutionary process "*co-evolution*" is presented by Bateson in his book *Mind and Share* according to Moore (1993), "*in which interdependent species evolve in an endless reciprocal cycle - in which* *changes in species A set the stage for the natural selection of changes in species B – and vice versa*". Similarly, Moore (1993) states the co-evolution in the business ecosystem context as "*the complex interplay between competitive and cooperative business strategies*" and separate four distinct stages in the evolution: birth, expansion, leadership and self-renewal. These are discussed in more detail in subchapter 3.3.5.2.

Ecosystems can co-evolve in a structural level in addition to species, roles and functions. Figure 8 illustrates a Digital Business Ecosystem structure where the business ecosystem and digital ecosystem are coupled to form a viable dynamic innovation ecosystem. The digital ecosystem influences enterprises, their social and business networks, and the business ecosystem affects the organisms of the digital ecosystem. (DBE Book, 2007)

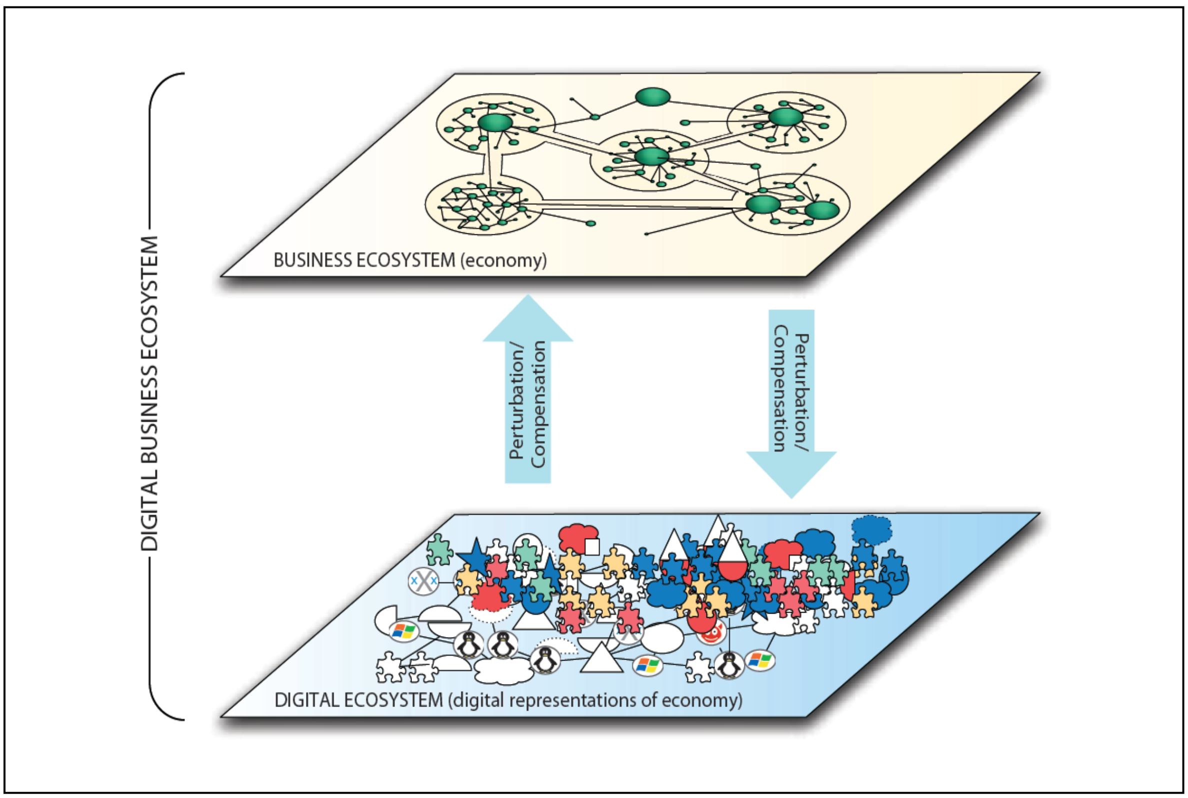

Figure 8: Digital Business Ecosystem (DBE Book, 2007)

In this subchapter, theoretical ecosystem structures essential in the context of this thesis were presented. More structures and an evolutionary environment example are included in appendix 7.3. In the next subchapter, the ecosystem creation and sustenance are elaborated.

3.3 Business Ecosystem Creation and Sustenance

This subchapter presents two alternative approaches to the business ecosystem creation and discusses its sustenance. Firstly, the next subchapter 3.3.1 explores a business ecosystem creation without adaptation to the environment. Secondly, subchapter 3.3.4 highlights a business ecosystem recreation with adaptation to the environment. Then, sustaining the business ecosystem is depicted. This is addressed in subchapters 3.3.5 Managing Business Ecosystem, and 3.3.2 Analysing Ecosystems.

Generally speaking, there are two foundational components in a business ecosystem creation. Firstly, it is a necessity to create value within the ecosystem in order to attract and retain members in addition to providing growth potential for the ecosystem. If these foundational criteria are not met, the ecosystem will wither. Secondly, there needs to be a way to share the value within the ecosystem. (Iansiti and Levien, 2004a, p.91)

Value creation for the ecosystem is essentially innovation within the ecosystem and customers outside the ecosystem; see 1.4.2 Innovation and 1.4.3 Innovation as a Concept. In order to have such a big value proposal that it is possible to create a new business ecosystem, the innovation needs to be disruptive or radical innovation as discussed in 1.4.4. Additionally, as Iansiti and Levien (2004a) point out, there needs to be a way to share the value as well. Thus to understand the value sharing, an appropriate ecosystem structure needs to be crafted according to the discussion in 3.2. Furthermore, in order to distribute value in the ecosystem, it is a requirement to understand how the innovation is diffused and how network externalities are present, see 1.4.5 and 1.4.1 respectively.

3.3.1 Creating New Business Ecosystems

In the increasingly interconnected business networks, a new business ecosystem can fundamentally be created two ways. In the first case, a strong asset or vision already exists (or is researched), which is leveraged by proposing a value creation and value sharing methods for the ecosystem. Once vision and opportunity have been identified, the business ecosystem structure and strategy can be made, which requires an understanding of the possible species and roles. Then, the plans are applied to a totally new market or industry to get the ecosystem into operation.

The second way is through analysing the existing business ecosystem, where a new business ecosystem, member interaction, and networking are to be created. Consequently, the existing ecosystem is analysed, ecosystem evolution and opportunity are elaborated. A vision, that is to say, a prediction about the future from the perspective of an ecosystem is determined. The vision needs to ensure growth opportunities and give ground on healthy operations for the business ecosystem as a whole. On the basis of the vision, a strategic intent, that is, where the business ecosystem and company wants to be in the future, as well as mission and strategy, are to be built.

To sum up, the first case creates a totally new operating leverage proposal (likely to a new industry or market as well), creating new value for the business ecosystem, attracting new members and drawing existing members from other ecosystems. This is discussed in the next subchapters 3.3.1.1 Value Creation and 3.3.1.2 Establishing Ecosystems. In the second case, the business ecosystem process is based on a new or recreated operating leverage proposal that is going to be adapted to an existing business environment where the value is both created as well as drawn from the activities. This is discussed in subchapter 3.3.4 Recreating Existing Business Ecosystems.

3.3.1.1 Value Creation

There are various ways to create economic value, which can be shared within the business ecosystem, customers and other members. These value creation proposals in this subchapter are not meant to be a comprehensive list, but rather to give understanding on the various opportunities to create value with and within the business ecosystem. Moreover, the highlighted opportunities are assumed to give an insight to the business activity context the business ecosystems are operating in.

The economic value is created through innovation. Iansiti and Levien (2004a) state the value creation as “operating leverage” in ecosystems, which are a series of assets that can be scaled and shared by a broad network of business partners. Operating leverage, essentially broadly defined as innovation, can be obtained by the development of physical, intellectual, and financial assets. See 1.4.6 for further operating leverage clarification.

Christensen et al. (2004) introduce a disruptive innovation theory whose principle is depicted in Figure 9. The solid lines illustrate company improvement trajectories in products and services that are the expected incremental innovations implemented to products. Furthermore, the dashed lines (customer demand trajectories) illustrate how customer demand and needs are increasing over time, measured in performance and feature requirements. Disruptive innovations occur in two ways and are shown as a low-end disruption and a new market disruption in the figure. They introduce a new value proposal which is actually below the market expectation in performance. The first disruption opportunity, the low-end disruption, opens when the existing products in the market are “too-good”, thus the market products tend to be overpriced relative to the value the consumers use. Now, the opportunity is in reshaping the market by introducing a relative straightforward product. The second disruption opportunity signals in the market are when the consumers tend to be inconvenient in using the product because of centralised settings, deep expertise or great wealth. The new disruptive products tend to compete against non-consumption and are essentially based on a new value proposal to create a new market. Thus, the new value proposal is usually based on ease of use and having the main value proposal in other characteristics than in the dominant market products. (Christensen et al., 2004)

As far as disruptive innovations are concerned, it is possible to anticipate that these are excellent proposals to craft a new business ecosystem. Firstly, there is high impact to the market, which itself creates a big opportunity. Secondly, low-end disruptive innovations reshape the market, which allows the forming of new species and roles. Thirdly, new market disruptions create vast amount of possibilities for new business ecosystems. In addition to attracting new members and members from other ecosystems, the ecosystem per se can be assembled to a large extent (structure, species, roles, interaction).

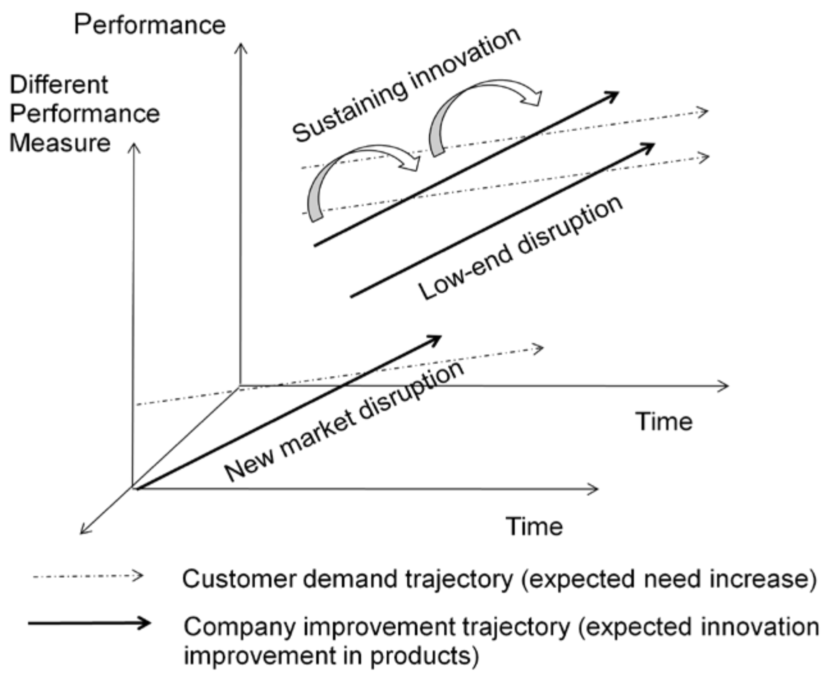

Figure 9: Disruptive Innovation Theory by Christensen et al. (2004)

Another opportunity to create value is to build on a performance leap. This value proposal is highlighted by Shapiro and Varian (1999) as a brute force strategy in attracting customers: A product, which is so much better than what people are using will bear the pain of switching to it. However, how much does the performance leap need to be in order to attract customers and gain significant competitive advantage against competitors? According to Grove (2003) and Lucier et al. (1997) the performance improvement needs to be at the level of a 10-fold increase in order to force the players and business models to adapt to the change.

Let's next consider the business ecosystem value creation by extrapolating backwards from successful strategies, since they may have congruencies to successful value creation for new business ecosystems. Parnell (2003) discusses critical challenges in strategy making and notes the generally quoted Chinese warrior Sun Tzu's strategy: All war is based on deception and the best strategies are one's competitors do not understand. However, since the business ecosystem is based on collaboration between multiple parties, it's unlikely that hidden and secrecy in business ecosystem activities would not be seen by competing ecosystems and thus would fly far. On the contrary, if the business ecosystem is crafted in reverse order, that is to say, the main assets are being kept secret while the opportunity area and frameworks are built for the ecosystem it might succeed with high risks.

Unlikely occasions are acknowledged in its extreme in the theory referred to *Black Swan theory* too. In short, the theory proclaims that since the world is far more complex than we think, we systematically ignore occasions, build and predict according to widely held assumptions and beliefs. Hence, in some point there can be a high impact occasion "which simply is not possible" thousands of observations of white swans did not point to its possibility of existence. A high impact "black swan" could be a prominent point of creating a new business ecosystem because of the possibilities to change the impact on value creation for an ecosystem and to attract members from other ecosystems. For instance, this could be applied to widely held assumptions like Moore's law in doubling the capacity. Since the Moore's law is expected by multiple parties, investments can be intentionally made to have and reach this goal. What is changing the area further is the green and sustaining economics that are increasingly confronting new value proposals that did not exist when resources were supposed to be unlimited and the environment non-contaminated. The notification of new values and co-living of environment and economics could anticipate new economic principles as argued by Bayon (2008). Thus, the statements like *"Technology Changes. Economic Laws do not"* (Shapiro and Varian, 1999 ch.1), might not be valid anymore and derived assumptions from changing economic principles could lead to new business ecosystems.

3.3.1.2 Establishing Ecosystems

Moore (1996) approaches the creation of an ecosystem from the analogy of humans pioneering a new land. Possibly, the terrain itself has to be fitted to the needs and carefully examined from afar before moves are made. In a surprising many cases, the unpredictable creativity of individual customers in a new ecosystem can play a profound role and should be experimented with. The developers of business ecosystems are in significant role, they do not want to depend on the change alone, but give economic experimentation as much help as possible. Thus, from these viewpoints the aim for business ecosystem strategists is to manipulate predictably the assembly rules of ecosystems.

Moore (1996) proposes a directed learning cycle to anticipate what is involved and transpire in an emerging new business ecosystem. The directed learning cycle is an accelerated way to experiment with the creation of economic value consisting of: new ideas, action and experimentation, realising value for customers and investors, and finally, reflecting what has been created. Thus, it is an accelerated way to understand possibilities in creating value within the ecosystem through mutual, self-reinforcing sets of relationships in order to realise possible assembly rules of the ecosystem. Business relationships are emphasised by Vuori (2005) as well. She concludes in her research paper about intellectual assets in business ecosystems that a key to sustaining a business ecosystem is to invest significantly in business relationships. This supports Moore's (1996) proposal of experimenting with the self-reinforcing sets of relationships in the business ecosystem establishment phase.

According to Iansiti and Levien (2004a) and their proposed business ecosystem structure (see Figure 6), a keystone can create a new business ecosystem, for instance, by virtue of powerful platforms, processes and assets shared within the ecosystem. The keystone systemises value creation in a large network by creating "*operating leverage*", which are a series of assets that can be scaled and shared by a broad network of business partners. Efficient operating leverage creation enables a keystone to generate enough value to be shared within the ecosystem in order to maintain healthiness of the ecosystem as a whole.

A very concrete way of establishing a new business ecosystem is to start with a set of strategic options. A research paper by Gawer and Cusumano (2008) suggests a set of strategic options from a business and technology perspective to succeed in becoming a new platform leader. The business actions to be considered are: an essential problem for many industry players, creating and preserving complementors' incentives to contribute and innovate, protecting main sources of revenue and profit and maintaining high switching costs to competing platforms. Accordingly, the technology actions to be considered are: solving an essential "system" problem, facilitating external companies' provision of add-ons, keeping intellectual property closed on the innards of your technology, maintaining strong interdependencies between platform and complements.

Establishing a business ecosystem is indeed specifying strategic options and putting those into action. Moreover, the strategy implementation and especially refinement continues for the whole lifespan of the business ecosystem. It is possible to divide the strategic options to a set of core strategic options, strategic options for the promise of the ecosystem (see 3.3.1.3), and strategic options for the management of the ecosystem throughout the lifespan discussed in subchapter 3.3.5. The core strategic options should be chosen in the establishment phase, the next set (promise) of strategic options should be chosen to share value in the ecosystem, and finally a set of strategic options is used to manage the ecosystem.

The set of core strategic options are defined on the basis of the ecosystem vision and core value creation leverage (see 3.3.1.1 for value creation). According to Iansiti and Levien (2004a), the strategy, hinges on understanding the foundation of an architecture (how boundaries are drawn between technologies, products, and organisations), integration (how organisations collaborate across these boundaries) and market management (how organisations complete transactions across boundaries in the complex market dynamics).

Iansiti and Levien state these three areas can be used despite the role a company is executing in the ecosystem.

It is possible to contemplate the core strategic options further, and especially the strategic choices are not black and white, thus it is proposed to elaborate the choices as a set of selections and dependencies where appropriate levels are chosen. The set of selections and dependencies vary on the basis of the defined vision and intent of the ecosystem. A set of strategic options can be for instance: number of preferred species and specifying their roles, co-evolution of other ecosystems (digital ecosystem, service ecosystem, see 7.3), a level of allowed member diversity, a level of opportunity exploration versus leveraging clear assets, a level of preferred ecosystem growth rate and openness versus closed in the ecosystem and towards other ecosystems. Additional options can be a level of tight co-operation between members, other governance structures, a level of sharing value versus capturing value for members in the ecosystem, and level of basing the operating leverage to own assets or external asset.

3.3.1.3 Value Sharing

Ecosystem health will suffer, unless some of the created value is shared in the ecosystem. The keystones usually couple value creation with value sharing, but value sharing is not simply a matter of deciding whether to share value or not, or how much value should be shared, it is a significant operating challenge. It is a question of sharing value through a massive network of business partners and the cost of sharing value with each individual business partner must be very low and preferably decrease with the size of the network. In order to enable value sharing in the ecosystem there must be ways to share problems throughout the network, sustain value creation and balance value creation and sharing. The value sharing ways and methods vary depending on the ecosystem, however, as keystones focus on improving the overall health of the ecosystem (performance, robustness, niche creation), the efficient value sharing ways generally consist of robust platforms, easy-to-use APIs, intellectual property licensing, shared operations, enabling software tools, and the like. (Iansiti and Levien, 2004a)

In the previous subchapter, business ecosystem strategy was divided to three sets: core strategic choices, strategic choices implicating the promise of the ecosystem, and strategic choices in management of the ecosystem. The value sharing in an ecosystem is fundamentally a promise of the ecosystem for the members of the ecosystem and customers. The promise of the ecosystem is built on the following theories: openness versus closed by Shapiro and Varian (1999), network externalities (see 2.2), and innovation diffusion (see 1.4.5).

The first theory, openness versus closed, is fundamental in networked markets in the information economy. In this trade-off choice, the "open" approach offers higher compatibility over multiple products, faster take-off of the product (easier to take use by multiple members), lighter lock-in, availability of specifications, open APIs and the like. In contrast, closed choices offer compatibility within the same product family, are based on proprietary interfaces and standards, can be hard to take-off (requires market power, investments, tipping towards other solutions and high value proposal over other solutions). Nevertheless, closed-based solutions are easily managed due to more centralised governance and can provide fast-time-to-market solutions. The selections between openness and closed share value between industry and a company where the openness emphasises total value added to the industry, and closed emphasise total value added to the industry, as shown in Figure 10. However, totally proprietary solutions tend to be used by fewer parties and totally open solutions minimise the value for a company. Thus, intermediate approaches are frequently used. (Shapiro and Varian, 1999)

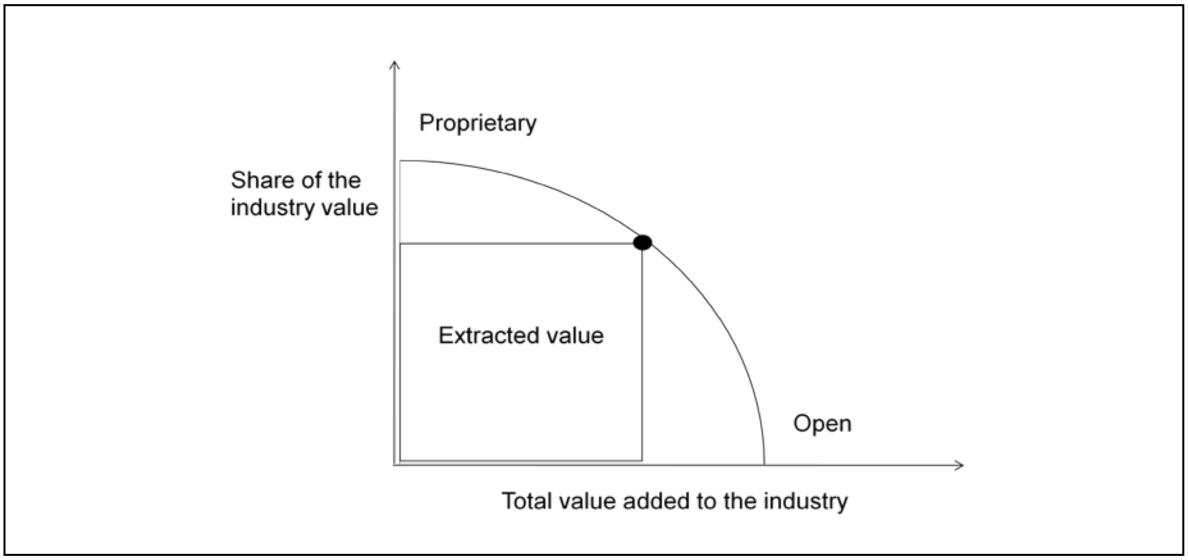

Figure 10: Openness versus Closed Adopted from Shapiro and Varian (1999)

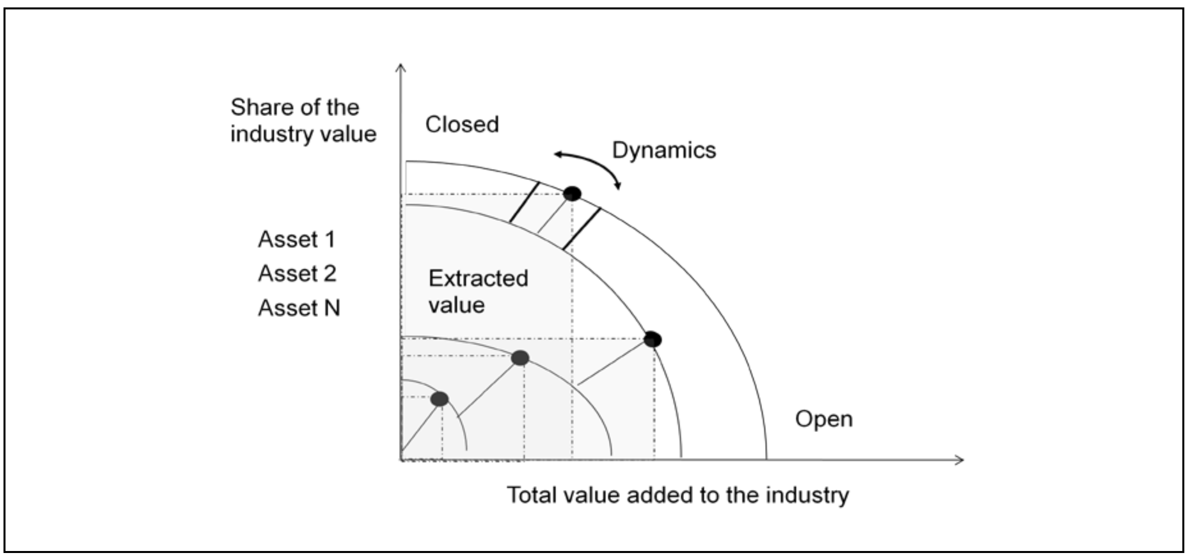

Figure 11: Openness versus Closed, Assets and Dynamics

In Figure 11, the value compound of total value, extracted value and industry value is opened up with separate assets. For each of the assets, an appropriate openness versus closed strategy is chosen according to the desired lock-in, industry collaboration, compatibility between other systems, depending on the intention of the asset. Most commonly, the asset is related to a technology specification, API, development tool, and interfaces in hardware or software. However, if the asset is considered as any asset creating value to the ecosystem (see: operating leverage 1.4.6, innovation 1.4.2 and value creation in ecosystem 3.3.1.1), it is actually possible to contemplate the strategic choices of openness versus closed in many perspectives. Additionally, the thesis proposes dynamics for openness versus closed, thus there is a certain operating flexibility for member(s) in the ecosystem to operate and create differentiation with the asset through the open or closed interface in question. These interfaces can be categorised into three divisions: member type interfaces, technical interfaces, and interfaces in a business case level. In this value sharing definition phase, a set of strategic options for the promise of the ecosystem is chosen. This means formulating a strategy framework with the three divisions and providing operating dynamics for the ecosystem, which can be later used in managing the ecosystem.

The member type division openness is discussed by Eisenmann et al. (2008) in a research paper about platform openness. According to them, a platform is open when no restrictions are placed on participation of its development, commercialisation or use. Or alternatively, any requirements to conform to technical standards or paying licensing fees are applied uniformly to all potential platform users non-discriminatory and reasonably. The paper highlights openness at multiple levels depending whether participation is restricted at the demand side user, supply side user, platform provider or at a platform sponsor level (see Table 1). It is emphasised that decisions to open or close platforms are crucial and entail tradeoffs between adoption and appropriability (ability to capture profits generated by an innovation (Teece, 1986)). Opening can spur adoption by harnessing network effects, reducing concerns about lock-in and stimulating production of differentiated goods meeting the needs of users in different user segments. On the other hand, the reduced lock-in also lowers switching costs, thus increasing competition among platform providers. These distinctions give multiple opportunities in managing the platform and thus ecosystem with horizontal and vertical strategies, which are discussed more in subchapter 3.3.5 Managing Business Ecosystem. (Eisenmann et al, 2008)

	Linux	Windows	Macintosh	iPhone
Demand-Side User (End User)	Open	Open	Open	Open
Supply-Side User (Application Developer)	Open	Open	Open	**Closed**
Platform Provider (Hardware/OS Bundle)	Open	Open	**Closed**	**Closed**
Platform Sponsor (Design & IP Rights Owner)	Open	**Closed**	**Closed**	**Closed**

Table 1: Openness in Platforms at Member Type Level (Eisenmann et al. 2008)

In addition to contemplating openness strategic options at a different member type level, separate assets and openness implications on different members should be reviewed. This is to say, dissecting assets and the impact on technical division and business case division. In the technical division, it is defined whether certain core technologies, methods or intellectual property should be kept proprietary, secret, open and available in the platform promise. Similarly, in the business case dimension it is defined whether certain member(s) are in the scope of common ways of sharing information, subject to exclusivity, co-operating in research, joint-venture, whether certain general guidelines, suggestions, practices or values are to be pursued. These separate assets and management are discussed further in 3.3.5 Managing Business Ecosystem.

The second theory, network externalities theory, is much dependent upon openness versus closed strategic choices. As Shapiro and Varian (1999) and Iansiti and Levien (2004a) point out, network externalities are fundamentally present in business networks and their importance was discussed in subchapter 2.2 Network Externalities. Furthermore, the significance of network externalities lever effect was discussed in 2.1 and was emphasised that especially in the information economy, both demand and supply sides exhibit network externalities making business dynamics virile. In this ecosystem promise phase, the most significant areas of creating network externalities lever should be outlined. For instance, the network externalities lever can be in an area of: a) end-users, who create content shareable across network, b) developers who provide leading innovation to parties, c) innovative supply chain/distribution mechanism providing superior economics of scale or d) premium platform offering versatile ways to combine and connect assets for further leveraging (local network effects). Thus, once the lever areas are found, they should be embraced and invested in according to future insights. In other words, if a potential area is discerned it can be devoted to lead the cutting edge solution with strategic investments for instance by investing in tools, partnering, information sharing etc. These strategic investments should be both made to boost the network externalities lever area as well as facilitate the innovation diffusion in concern.

The third theory, innovation diffusion, was elaborated upon in subchapter 2.3, where its main elements and factors influencing diffusion were discussed. First of all, innovation diffusion is affected by the first two theories: openness versus closed, and network externalities and vice versa. However, it might be the most straightforward to proceed in this order rather than have all the choices open and iterate between the choices. Thus, once the network externalities lever areas have been identified, the innovation diffusion can be facilitated in various ways in an ecosystem. Moreover, it is possible to make strategic decisions in the innovation diffusion area. Firstly, a strategic decision whether there is a certain adopter group in the selected network lever area (e.g. innovators, early adopters, opinion leaders, change agents, certain stakeholders or members in the ecosystem) to be targeted with the innovation and its diffusion facilitation. Secondly, what communication channels should be used in the diffusion? Thirdly, what is an appropriate level of investment in facilitating the diffusion, and fourthly, whether there is a certain time target in the diffusion?

The diffusion facilitation focuses on innovation promotion in the innovation-decision process. Thus, the five steps, 1) *knowledge*, 2) *persuasion*, 3) *decision*, 4) *implementation*, and 5) *conformation* are facilitated in their respective order through selected communication channels. With this in mind, the efficient value sharing ways proposed by Iansiti and Levien (2004a) were robust platforms, easy-to-use APIs intellectual property licensing, shared operations, enabling software tools, and the like. By summing up the innovation-decision process promotion and efficient value sharing ways the thesis proposes that in this ecosystem formation phase, the value should be shared by funneling and convoying information to the relevant stakeholders and members fast. This is to say, the diffusion is facilitated according to the desired directions in the business ecosystem structure (e.g. hubs in a structure Figure 6), and can be slowed down in unwanted areas if necessary.

In more concrete terms, the value can be package with tools, licensing and APIs to be shared and used by members in another part of the ecosystem. In addition, when the information reaches certain parts of the ecosystem faster, it itself facilitates the diffusion by reducing uncertainty towards innovation. The persuasion step in the innovation-decision process play an important role in diffusion facilitation as well. Its adoption attributes (relative advantage, compatibility, complexity, triallability, observability) should be embraced with effort. This facilitation requires deeper analysis of the innovation and its suitability to members' intentions and plans. The member lock-in cycle and switching costs should be enquired into, which was discussed in 2.2.3. Some of the adoption attributes can't be facilitated much anymore, because the previous choices, for instance, openness versus closed - exclude some options for relative advantage, compatibility, and complexity.

However, much can be done to facilitate diffusion related to adoption attributes including: awareness, how-to, principles of the innovation, attitude towards innovation, information asymmetries, culture where the innovation is to be diffused, formal and informal networking, individual dissonance (conflicting messages after decision), discontinuance (promote current innovation if new innovations in the same area are emerging), and using appropriate communication channels in order to target mass audience, certain groups or individuals.

It is possible to "package" potential value to be shared in the ecosystem. The case study part of the thesis in chapter 5, represents a user experience (UX) domain value proposal which can shared for members' differentiation and utilization. The value sharing should be managed over time, which requires continuous analysing and shaping. In the next subchapter ecosystem analysis is discussed. The business ecosystem management is elaborated upon subchapter 3.3.5.

3.3.2 Analysing Ecosystems

The ecosystem analysis is done with competitive intelligence (CI) theories, which were presented in subchapter 2.4. This subchapter constructs a CI framework which can be used in continuous monitoring and shaping of the ecosystem. In the continuous monitoring and shaping, descriptive parameters are needed to reflect the ecosystem state and healthiness. The parameters are depicted in subchapter 3.3.3.

Myburgh (2004) proposes in her paper a framework for CI process consisting of the steps: asking questions, looking at the companies and industry and competitors, identifying sources, defining techniques for information gathering, evaluating and synthesizing and analyzing the information, dissemination and communication of the information and outcomes for decision making. Furthermore, it is proposed that different analytical methods are categorised on basis of Craig Fleischer's and Babette Bensoussan's FAROUT criteria, which means that the models are separated on the basis of: Future orientation, Accuracy, Resource efficiency, Objectivity, Usefulness and Timeliness. Applying this formula enables the selection of the appropriate analytical technique for the problem that must be solved and information collected. With this categorization, it is possible to conduct an analysis framework to solve questions and provide valuable information.

With respect to business ecosystems, the competitive intelligence methods describe the state of the ecosystem, compare with other ecosystems, show progress, highlight problems, successes, opportunities, competitive advantage, provide data for monitoring the ecosystem health factors, juxtapose alternatives, reduce uncertainties by showing facts, help to avoid blind spots, introduce alternative scenarios for the future in choices and the like. All in all, the CI methods and analyses provide various decision, strategy and insight support with over 100 existing analytical tools. However, what is important is to specify accurately: what are the questions to be solved, metrics to be measured and what the preferred outcome elements from the used methods are.

In this thesis, the following framework for ecosystem analysis shown in Figure 12 is proposed. Firstly, the analysis target focus is selected, which specifies the question and purpose of the analysis, what is analysed and why? This also gives indications of how the analysis itself should be made in order to select appropriate tools, methods, expertise for the analysis. Secondly, after the question and purpose have been defined, it is possible to gather the required information from external and internal data for the selected methods, tools and expertise. The analyses provide filtered and processed information reflecting the question and purpose of the analysis. In the best case it provides (future) implications too, thus beyond the original question as these might not have not been possible to know and ask in the question phase. Thirdly, the analysis should present information in an appropriate format for further use whether it is intended to be stored in an information database (e.g. knowledge management) or to be presented for the decision makers needing the information.

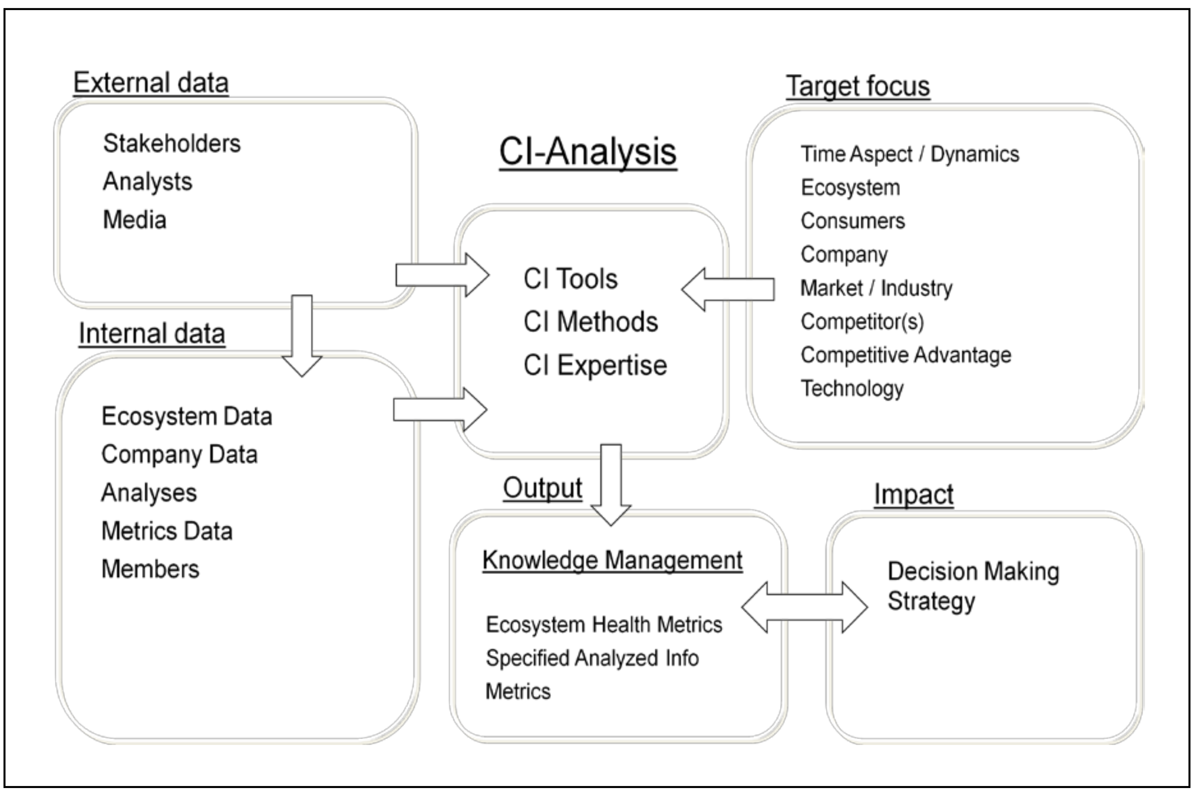

Figure 12: CI Prosess Framework for Analyses

In order to use the described framework for ecosystem analysis, the following items are proposed to be analysed:

1. Analyze the landscape the ecosystem is operating in (political, social, economic and technological environment)
2. Analyze how the business ecosystem is working (business networking, practices, health of the ecosystem, define critical parameters)
3. Analyze the roles of existing primary players in the ecosystem (and own role). The roles were described in 3.2.
4. Analyze how the ecosystem is changing (technologies, roles, strategies, business modes, dynamics)
5. Other specific questions in concern (e.g. competitive benchmark, scenarios)

Outcome elements:

1. Key ecosystem quantifiable parameters (measures, metrics, influencing factors)
2. Key competitive assets (technologies, methods, operating models)
3. Current roles and strategies and their meaningfulness with respect to strategic intent (gaps, possibilities to change)
4. Future insight and trends (major changes in the landscape, assets, possibilities to have an impact, business opportunities)
5. Tools and methods to be used systematically in the ecosystem management with the selected parameters and information sources

3.3.3 Ecosystem Parameters

In order to understand how the ecosystem is working and to follow its evolution, a set of indicative quantifiable parameters are required. In this thesis, the three sets of parameters are defined: measures, metrics, and influencing factors (equivalent to the first outcome element in subchapter 3.3.2). The measures are based on Iansiti and Levien (2004a) effective health aspects of the ecosystem: robustness, productivity, and niche creation. The metrics are defined according to the results of the ecosystem analysis framework, which was discussed in subchapter 3.3.2. This is to say, the critical data outcome is changed to measurable units. Furthermore, influencing factors are essential areas that have a major impact on the specific ecosystem operation, such as the political situation and regulation, which can be used, for instance, in risk analyses with certain probabilities.

Measures of the ecosystem parameters are:

- *Productivity* describes how innovations and raw materials are converted into products, lowered costs and functions. Also, describes where investments are most efficiently used. There are three productivity-related units of measurements: *factor productivity* (commonly ROIC = returns on invested capital), *change in productivity* over time (ROIC changes as a function of time) and *delivery of innovations* (e.g. time between the appearance of a technology and its distribution)
- *Robustness* is the ability to survive disruptions and unforeseen changes. A robust ecosystem provides its members a buffer against external shocks and provides some degree of predictability. Used units of measures are: *survival rates* (survival against recession, number of start-ups going out of business), *persistence of ecosystem* structure (contained; gradual changes in structure), *predictability* (core of the ecosystem stays unaffected after experienced shocks), *limited obsolescence* (e.g. capacity and installed base in use after experienced shocks) and *continuity of use experience and use cases* (gradual evolvement of consumer experience and their use cases, stable APIs etc.)
- *Niche creation* is the ecosystem's ability to create new, valuable functions and foster diversity that creates value. Units of measurements are *growth in firm variety* (the number of new firms created within the ecosystem community in a certain period of time), and *growth in product and technical variety* (for instance, the number of new product options, technological building blocks, products, businesses being created within a certain time period)

Metrics of the ecosystem parameters are varying on the basis of an ecosystem and are defined according to the outcome of the ecosystem analysis framework. However, appropriate metrics are guided to be chosen from the following categories and units of measures:

- *Member related* in terms of financials (dept, access to capital, cost structures), roles (changes in operations, behavior patterns), business models (disruptive business logics, pricing), organisation (balanced scorecard, personnel changes, types of organisation, sizes), satisfaction (ecosystem evolvement, opportunities), input and output of products and services (utilisation rates, value creation), history (past successes and failures in decisions and actions)
- *Structure related* in terms of species (number, changes), in channels (specific communications, operations in the value chain), platforms (APIs, tools, compatibility, standards, training, ways of use), business relations (methods, ways to operate, ways to share, common practices)
- *Competitiveness* versus other ecosystems in products or services (performance, quality, market shares, satisfaction, returns, scalability), in innovations (number of lift-up products and new products), in technology (number of critical assets, intellectual property), in personnel (expertise, availability), in manufacturing (capacity, processes, machinery, quality), in brands (key members' brand value)
- *Activity* in terms of interaction (transactions, business networking, contacts, different activity participation), turnover of members (joining/leaving members, customer number)
- *Insight* in terms of opportunities (areas of shaping, opportunities, operating leverage creation, predictability) and risks (changes in the operating environment, level of competition, competitive disruptions and value proposals) evolution (state of the ecosystem, members' switching costs, maturity of technologies and markets)

In addition, the thesis proposes *influencing factors* as measurable parameters for the ecosystem analysis. These followed factors are the following, however, suggested to be selected according to their applicability for the ecosystem in concern.

Influencing factors for the ecosystem are:

- *Political* (political stability, acute crises, monetary policy, fiscal policy, economic situation)
- *Regional* (availability of material and labour, physical distances, ideologies, norms and values)
- *Regulative environment* (changes in legislation posing opportunities or threats)
- *Domains* – the ecosystem can be separated to different domains, which Iansiti and Levien (2004a) describe as groups of organisations engaged in similar activities. Thus, domains can refer to any specified separable area, whether this is related to technology, members, and methods or the like. Here, a specific domain as an influencing factor can be selected for its additional importance to the ecosystem per se. This can be, for instance, a part of the ecosystem horizontal or vertical integration in a value distribution. Later, in the case study part of the thesis, user experience domains are used, which are predefined end user value bundles as roughly expressed
- *Transforming areas* – certain companies, industries, part of the ecosystems can be in a middle of transformation, which should be carefully monitored and measured differently in comparison to the rest of the ecosystem

The above parameters concretise the most valuable and acute information associated with a viable ecosystem. When carefully chosen, the parameters not only support decision making and strategy, but can be used as a dashboard in business ecosystem management. Building an ecosystem dashboard is proposed by Iansiti (2005) as well. To sum up, it is recommended that an ecosystem dashboard that has the different level of parameterised information is built from the initial analyses and updated during the ecosystem evolution.

3.3.4 Recreating Existing Business Ecosystems

It was discussed in subchapter 3.3.1 Creating New Business Ecosystems, that business ecosystems can be fundamentally created two ways, by creating a totally new business ecosystem (likely applied to a new industry or market too) and recreating the existing business ecosystem, which is to be applied to an existing business ecosystem environment. This subchapter addresses new business opportunities by recreating the existing business ecosystem.

Firstly, let's take one step backwards to understand why the ecosystem is in this situation that it either anticipates recreation or encourages a new value proposal for the recreation. A very likely case is that the ecosystem promise, its leveraged value creation proposal, has reached a mature state, thus the growth is slowing down and naturally needs to be invested in and renewed. In short, accumulated S-curves for products in the market the ecosystem is operating in are reaching a mature state. Other reasons can be changes in the economic environment / regulatory or customer preferences (consumption behavior), which necessitate a renewal. Although these might not be the only reasons, there can be disruptions inside or outside the ecosystem forcing adaption and renewal, such as strong value proposals (technology, experience, and other assets), ecosystem instability (due to external or internal disruptions), wild species or the like. Additionally, the ecosystem can become far too inflexible (e.g. too many members or customers in a last phase of switching lock-in cycle see 2.2.3). Furthermore, the ecosystem can be too differentiated (aka fragmented), thus slowing down new niche creation or too unified, which according to Iansiti and Levien (2004a) poses risks for disruptions. All in all, there can be various reasons why the business ecosystem is to be recreated or why there exists opportunities for new business activities.

In the recreation, the existing business ecosystem is analysed and the value for the ecosystem is both created and drawn from the existing activities. Members are attracted from other ecosystems, new species are born, some species vanish and roles change. Even the business ecosystem structure can alter notably, however, the whole ecosystem as such does not perish but can, however, wither substantially.

The business ecosystem recreation starts with analyses of the existing ecosystem and the operating environment. At the heart of the analysis is competitive intelligence elaborated in the theory part of the thesis in subchapter 2.4. In short, competitive intelligence methods delineate the environment, competitive landscape, reflect the landscape to the ecosystem's current state, and provide alternative scenarios for changes and future. The competitive intelligence is used as a continuous CI process in the ecosystem evolvement as presented in subchapter 3.3.2. The process output has information, which was classified in five categories: key ecosystem parameters, key competitive assets, current roles and strategies, future insight, and tools and methods. In this early phase of the ecosystem recreation, this information is used in five phases to: 1) *find a new value proposal*, 2) *adapt to the environment*, 3) *adapt to the existing ecosystem* 4) *adapt towards competing ecosystems* and 5) *adapt to future insight*. The first phase correspond value creation in comparison to phases in Creating New Business Ecosystems in subchapter 3.3.1. Whereas second phases belong to establishing ecosystems (core strategic options) and moreover third, fourth and fifth phases are comparable to value sharing (ecosystem promise).

3.3.4.1 Finding a New Value Proposal

With respect to the first phase of ecosystem recreation, *finding a new value proposal*, there is not a single right way to realise a new value proposal. This was the case in the creation of a completely new business ecosystem as well (presented in subchapter 3.3.1.1 Value Creation). However, the thesis proposes that in order to recreate a business ecosystem and adapt it to the existing market, there needs to be significant amount of similarities to the existing ecosystem's value proposal. If the value proposal is totally different the ecosystem formation can follow the ecosystem creation methods presented in 3.3.1 Creating New Business Ecosystems.

Figure 13, adopted from Christensen et al. (2004) and Kim et al. (2005), points out exemplary value factors in an ecosystem value proposal. Both ecosystem value factors (E1, E2, En) and end-user targeted value factors (C1, C2, Cn) are shown in the figure. VP1 represents an old value proposal and VP2 a new value proposal. The old value proposal is found out with the CI analysis methods, what are sold as the most important factors to consumers and what are the most important factors to a number of ecosystem members.

The new value proposal's factors, as shown in the figure, are more end-user experience targeted, have a higher price, and are lacking in the ecosystem's proposal. This is not necessarily a defective proposal for the ecosystem, since the new consumer-experience-centric proposal can create a consumer pull, which leads to a development of higher ecosystem value factors over time. Similarly, a higher value proposal for the ecosystem probably creates more innovation as well as efficiency, which lead to higher value proposal for the end-users over time as well.

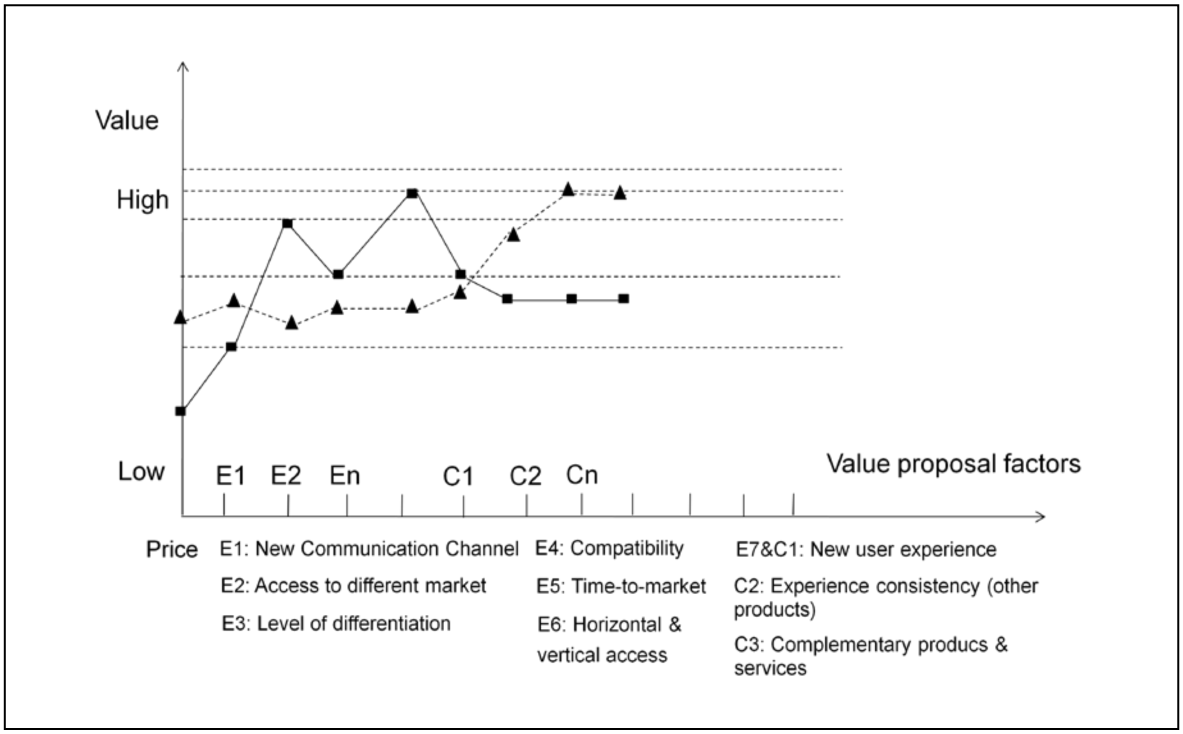

Figure 13: Value proposal

In the best case, the new value proposal combines both old value factors by improving them and creates new value factors. With this way it is possible to reach as many of the existing end-users and new end-users as reasonable. The old value factors are likely the most valuable existing assets in the ecosystem subjected to an active competition and development. These solutions have been used for a long time and new competitive assets have been built on top of them. Moreover, as the assets are exhibiting fierce competition, the solutions and markets start to become mature and growth and profits are decreasing. Because of the maturity, many members in the current and competitive ecosystems are more open to alternative solutions and thus, new value factors.

The new value factors can be based on available solutions, emerging technologies or other innovations to be pursued. However, these can be totally new factors, which create an uncontested market called Blue Ocean, as Kim et al. (2005) state it. The totally new factors make it possible to enter to an unconventional market area, which is untainted by competition. The competition is irrelevant, because the "rules of the game" are waiting to be set and value is increasingly created rather than fought over. Primarily, the new value factors are sought to explore new market space for products, but this thesis proposes similar process for seeking new value proposals for the ecosystem. Now, the value factors include both new product related value factors, but value factors for the ecosystem as was illustrated in the Figure 13.

According to Kim et al. (2005), new value factors can be found from six different fields: across alternative industries (not only direct substitutes, but alternative solutions to problems), across strategic groups (strategies of groups outside competitive groups within own industry), across chain of buyers (gain new insight from previously overlooked buyers), across complementary products and offerings (unleash complementary products' and services' value), in functional and emotional appeal to buyers (markets tend to saturate with either one, challengers often find a new space), and across time perspective (find insight in trends observable today).

3.3.4.2 Adaptation to the Environment

The second phase, *adaptation to the environment*, deals with the core strategic options in the business ecosystem recreation. At this phase, core strategic options are formulated, evaluated and selected. Information from the CI analyses (especially *influencing factors*) is of great help, though some information is commonly available. The core strategic options describe how the decisions between options affect future growth and ecosystems' living opportunities. These options are made in regional, regulative, political, ecosystems' governance model perspective. Additionally, options are contemplated with respect to dynamics, possible co-evolution between other ecosystems, whether ecosystem should pursue species variety, emphasise certain domain or build/tear down boundaries between technologies.

3.3.4.3 Ecosystem Promise Adaptation

The previous two phases constitute the value proposal and core strategic options for ecosystem establishment that are used as an input to the next three phases: *adaptation to the existing ecosystem, adaptation towards competing ecosystem and adaptation to the future insights.* These three phases are the promise of the ecosystem. In order to create a new ecosystem promise and adapt it, the existing promise should be known and analysed. The CI analyses are essential in this process - the CI process methods reverse engineer patterns of actions by filtering and selecting information to describe strategies, operations and routines.

In subchapter 3.3.2 Analysing Ecosystems, the analysis outcome elements were discussed. Now, the analysed elements of key ecosystem parameters, key competitive assets, current roles and strategies, and future insight are reflected on the new value proposal and core selections. The first outcome element key ecosystem parameters is primarily used in the ecosystem management and has valuable information here as well. But the fifth outcome element is not taken into account here (tools and methods not applicable). However, in reflection and comparison, questions such as the following are posed: which of the key competitive assets can be used in the new value proposal, which are to be changed, substituted or totally removed? Are the species, roles and structures appropriate for the new value proposal? What can the parameters expose from existing ecosystems strengths and weaknesses? How should the current communication channels, operations and methods be adapted to address the new value proposal? How open should the ecosystem be towards different members? What kind of products, services, platforms, and innovation is embraced? How to ensure great customer access for ecosystem members? How best to leverage network effects in the ecosystem? How the value sharing is currently arranged and how it should be changed? Value sharing was discussed in subchapter 3.3.1.3.

Competitive ecosystem adaptation is approached with question elaboration too: how does the previous value proposal and expected new value proposal compare to competitive ecosystems? What extent is appropriate for co-operation? What assets and elements are to be kept proprietary or open?

3.3.4.4 Adaptation to the Future Insights

Future insights adaptation contemplates linkages between existing, new and possible future promise. In order to attract more members to the ecosystem, there can be linkages and hooks to the previous ecosystems in addition to an attractive new value proposal. There are for instance, compatibilities between the ecosystem's products, platforms, and services. Furthermore, there can be linkages in a business-case level, for example, with contracts, methods, common tools, and the like. The future insights adaptation elaborates on the current states of the ecosystem regarding switching costs and evolution. High and low switching costs affect dynamics and adoption, thus in some places those are preferred and some places not. The switching costs are evolving in respect to the evolution of the ecosystem as well when new products, innovation, and other member activity is experienced. This can open up new market spaces and opportunities for the future if taken into consideration early enough, the ecosystem value promise can approach a new big opportunity market step by step because in the first value promise it is not yet possible. The ecosystem evolution has many other implications within the ecosystem; however, these are dealt with further in subchapter 3.3.5 Managing Business Ecosystem.

This subchapter presented a business ecosystem recreation. It was the alternative of new ecosystem creations, which adapts to the existing business ecosystems and environment. The recreation used CI analysis information as an input for the creation of a new value proposal and formulation of strategic options. This CI analysed information as well as the new information based on the strategic options (which have now been selected) is further summarised to a dashboard. The dashboard concretises the most valuable and acute information associated to a viable ecosystem as stated in 3.3.3 Ecosystem Parameters. These parameters have the most impact to the existing ecosystem, environment and competitive landscape, and are used in ecosystem management. The ecosystem management is elaborated in subchapter 3.3.5 Managing Business Ecosystem.

3.3.5 Managing Business Ecosystem

> *"Forget, Borrow, and Learn are indeed the three central implementation challenges for leaders of disruptive innovations."*
> —Clayton M. Christensen, Professor of Business Admin., Harvard Business School

This subchapter elaborates upon ecosystem management. In order to have the ecosystem evolving and growing in a direction that is favorable to its members, it needs to be actively managed. Firstly, the ecosystem management principles are discussed at a general level. Secondly, the ecosystem evolution stages are described, which affects the management. Thirdly, the ecosystem descriptive data is discussed giving insight on the active management decisions. Fourthly, the ecosystem management is discussed at a more practical level and concrete examples on how to manage the ecosystem are given.

3.3.5.1 Business Ecosystem Management Principles

It is essential to understand that ecosystem management emphasizes more an external nature of operational and innovative capabilities instead of an internal nature. Iansiti and Levien (2004a) highlight this with a notation that the ecosystem strategic management is increasingly becoming an art of managing assets keystones do not own. However, they add that keystones pursue development of own capabilities, enhance competitiveness and defend against external threats with the management as well. A key assumption according to Iansiti and Levien (2004a) is that the keystones do not pursue strategies for altruistic reasons neither taking an advantage of them. The primary aim for a keystone is to engage in continuous improvement of the health of an ecosystem. This is a necessity for its own effectiveness and sustainable performance as well.

The health of an ecosystem and its related measures (productivity, robustness and niche creation) were discussed in subchapter 3.3.3. These three measures introduced by Iansiti and Levien (2004a), assess the health and dynamics of a business ecosystem and provide convenience for describing the ecosystem health in a general level. In addition, the measures can be extended to a domain level, thus assessing the health of a certain group in an ecosystem.

Ecosystem's health is promoted by increasing ecosystem's productivity, robustness, and niche creation capabilities. Productivity is enhanced by removing species, limiting the number of species (reducing disproportion), simplifying the complex task of connecting network participants to each other (information hubs, foundations, standards), and improving the product creation of third parties in many ways (e.g. asset sharing, tools). Robustness is strengthened by investing in and integrating new innovations, and providing reliable reference points as well as interfaces for the members in the ecosystem. Additionally, robustness is made better by increasing diversity, adaptability, and predictability, which are a remedy against shocks and disruptions. As for niche creation, it is encouraged to invest in infrastructure and offer new innovative technologies to third-party organizations to pursue the growth in a variety of products, firms, and technology. It is important to note that diversity per se does not map directly to a positive health measure, but the capability to increase meaningful diversity through the creation of new valuable functions for niche players. The valuable functions can be appearing in a form of new products, new APIs for developers and new businesses exposing new technology, which productize and deliver the new innovations.

This subchapter discussed general principles in the business ecosystem management. An aspect to the management is the stage (maturity) of the ecosystem, or its sub parts, for instance domains, activity points, and technologies. Depending on the evolution stage, the active ecosystem management faces different challenges, which is discussed in the next subchapter.

3.3.5.2 Stages of Business Ecosystem

Moore (1996) separate business ecosystem development into four stages: pioneering, expansion, authority and renewal (or death). With respect to the stages, different ecosystem leadership, co-operative and competitive challenges are encountered.

Moore (1996) point out that in the pioneering stage, the greatest leadership challenge is to create new working value chains with partners based on efficiency, new opportunities, and new paradigms. This means being better than others at defining and implementing an offering others will desire. Moreover, the leaders must be protective of their own ideas and learn everything that is possible from others. With similarities, this thesis discussed value creation broadly in subchapter 3.3.4 Recreating Existing Business Ecosystems by following and adapting a value promise proposed by Christensen et al. (2004) and Kim et al. (2005) to an ecosystem level. Additionally, possibilities to create value were contemplated in 3.3.1.1 Value Creation.

The expansion stage is about achieving market coverage while also blocking alternative ecosystems. During this stage, the new offer is brought to a large market with supplier and partner co-operation. This is to increase supply and to achieve maximum market coverage and critical mass. The possible alternative implementations of similar ideas are defeated by the domination of the key market segments and by working with the key suppliers and important channels as Moore (1996) suggests. In this type of challenges, the innovation diffusion and openness versus closed theories are prominent. These will be acknowledged in following subchapter 3.3.5.4 Practical Ecosystem Management.

A central challenge in the third stage according to Moore (1996), is to maintain authority and uniqueness in the maturing ecosystem. In this authority stage, it is important to maintain co-operation, contribution and encourage communitywide innovation and co-evolution when alternative ecosystems are created and ecosystem faces internal pressures. The new alternative ecosystems likely have similarities and new well defined paradigms and technologies. Barriers to entry with a competitive ecosystem become barriers to retaliation. For instance, the massive investments, proliferation of operation processes and developed expertise may create significant challenges in shaping when they become obsolescent. The internal pressures may come in a form of fighting over the direction of the ecosystem by members and partners as well as tussling over the portions and profits among members. Moore (1996) suggests that these challenges can be addressed by providing a compelling vision for the future, which encourages supplies and customers continuously improve the ecosystem. Additionally, the maintenance of a strong bargaining power including key customers and suppliers, is among the suggested solutions in this third stage as well.

Finally, in the renewal stage, the overall challenge is to win the struggle against obsolescence, which already showed indications in the previous stage. All the business ecosystems depend on a certain range of conditions in their environment and on their superior ability to exploit those conditions in comparison to other ecosystems. Even the sturdiest and most dominant ecosystems will eventually be attacked and perhaps replaced by a new ecosystem. It is important to notice though that the existing business ecosystem can contain billions of dollars of assets, serves millions of customers and employs hundreds of thousands of people. It is thus, an ultimate challenge to leverage these assets, work with the innovators to bring new ideas to the existing ecosystem. Simultaneously, high switching costs (see 2.2.3 Switching Costs and Lock-in) should be maintained for the customers, and similarly, high barriers to entry, to prevent innovators from building alternative ecosystems. It is worth to evaluate an investment in a new and alternative ecosystem – the same money and creativity might be better invested that way in comparison to reformation, if the ecosystems are based on dramatically different approaches.

In order to shape the evolution of the ecosystem, the different phases of require continuous monitoring and analysis. The information gathered from the analysis and understanding the status of the ecosystem facilitate in managing the ecosystem. This continuous shaping is discussed in the next two subchapters.

3.3.5.3 Continuous Business Ecosystem Monitoring

As for continuous business ecosystem shaping is concerned, it requires understanding of the current ecosystem and comparison to the competing ecosystems. This comprehension is gained through analyses and gives insight for the possible future opportunities and forthcoming threats. The analysis of business ecosystems was discussed in subchapter 3.3.2 and its related parameters were proposed in subchapter 3.3.3. Further, is has been previously discussed, that the valuable information from the analyses are used in different phases of the ecosystem. With respect to business ecosystem continuous monitoring the dashboard is in a central role.

The dashboard summarizes the valuable information related to the current ecosystem as well as competing ecosystems. It consists of quantifiable parameters proposed in subchapter 3.3.3 Ecosystem Parameters. There will be a debate, what is an appropriate level of detail in the continuous monitoring of the ecosystem, which on the one hand includes enough descriptive information with respect to the ecosystem and on the other hand is not offering too much information that the key data is highlighted enough. Probably, it is appropriate to constantly monitor the measures (productivity, robustness and niche creation) regarding all the competing ecosystems to get knowledge of the general dynamics in comparison between the ecosystems. Anyhow, other descriptive data is needed to comprehend the underlying issues especially for the ecosystem to be shaped and managed. This descriptive data is compounded of other parameters.

This other descriptive data consists of selected information associated to key members, primary customers, market changes, product and service offerings, processes, structures and activity points. The data should highlight the locations of improvement and deterioration. Additionally, it would be important to monitor the status of the most valuable assets and productized innovations in respect of their maturity. This gives indications about the life-cycles of different assets, and thus, offers more predictability to the overall maturity of the ecosystem. The monitoring of activities and their changes give indications of the appropriateness of solutions and point out changes, for instance, in attitudes, strategies and obsolescence. Thus, this descriptive data gives a significant support for decision making to shape the ecosystem evolution. It is essential to constantly seek for locations of opportunities and problems to further improve the health of the ecosystem. The shaping of the ecosystem is discussed in the next subchapter 3.3.5.4 Practical Ecosystem Management.

3.3.5.4 Practical Ecosystem Management

In short, the practical ecosystem management consists of addressing the points of improvement, and deterioration, and sustained improvement with relation to the health of the ecosystem. The practical management is executed and implemented with the help of continuous monitoring as described in the previous subchapter.

First of all, the intention is not to comprehensively consider all the possible ways to execute practical management associated to business ecosystems. Instead, the thesis first gives an overview of the ecosystem management, and then gives examples of the practical ecosystem management counting on diffusion of innovations, openness versus closed and network externalities theories. These theories are used in contemplating the information included in the dashboard, as suggested in the previous subchapters.

The parameters of the dashboard give indications of the dynamics and changes of the ecosystem in comparison to other ecosystems. If the overall health of the ecosystem is declining as a relatively long timeframe, additional investments or establishment of a new ecosystem are to be considered. However, most likely there are certain highlighted domains, items or groups of activity points, showing improvement, deterioration or transformation. The highlighted areas are reflected on the overall value promise, and vision of the ecosystem to determine further actions.

According to Iansiti and Levien (2004a) the management hinges on understanding the three foundations in a networked setting. These are 1) foundation of architecture (boundaries between technologies products and organizations within the ecosystem), 2) foundation of integrations (collaboration across the boundaries and sharing capabilities), and 3) foundation of markets.

The foundation of architecture goes well beyond technology sector. Fundamentally, it serves as the connection fabric for an ecosystem with standards, platforms (product, service and operational), and frameworks by offering general solutions to common problems and opportunities. The integration provides an access to enormous amount of intellectual and physical assets within the ecosystem to be leveraged and further developed by the members. The market foundation assesses design, operations and management of markets. Market design essentials culminate to pricing mechanisms. In many cases, the value and opportunity costs of assets are known to determine pricing strategies. The cost curve needs to be designed so that losses generated before the market reaches a point of critical mass are manageable. Successful market operations should define clear, scalable frameworks for core operations, integration, and coordination. Additionally, those should leverage the operational capabilities with relation to the participants in the ecosystem, for instance, by minimizing internal efforts in transactions.

The above paragraphs gave an overview to the ecosystem management. Let's take a few more concrete examples with respect to management in practice. Firstly, the dashboard indicates an area of deterioration or transformation. These areas are probably at the end of their lifecycle and should be ramped down. However, these can indicate an opportunity as well, if there is a certain common problem which can be addressed or implemented differently to solve e.g. obsolescence. Secondly, the dashboard indicates an area of improvement. This highlighted area is compared to the value promise, vision, and it decided whether it is a practise or an asset, which is likely to further develop value for the ecosystem, improve its competitiveness, and shape the evolution to a decided direction. If so, it is important to diffuse it for the members in the ecosystem. Additionally, connection points can be created, in order to unleash N-sided networks effects around the new assets. This means creating network effects between multiple groups and customers, not only between the asset and the network using it (see two- and multi-sided network effects in subchapter 2.2.1).

The diffusion can be improved by facilitating the elements in the diffusion process. These elements were discussed in subchapter 2.3 Diffusion of Innovations. Furthermore, in practice, there tends to become barriers and facilitators to the diffusion process within an organization, such as a business ecosystem essentially is, as well. According to Simard and Rice (2001), the barriers and facilitators related to diffusion of best practices include the diffusion process itself, but additionally organizational context (institutional and organizational environment, absorptive capacity, competency traps, identity, culture and size), and management-related (managerial commitment, appropriateness of training and reward systems). The best practices are defined as practices, which have been shown to produce superior results, selected by a systematic process, judged as exemplary, good, or successfully demonstrated otherwise. Thus, to facilitate the diffusion, the enablers should be embraced and barriers removed to the direction it is appropriate for the ecosystem to evolve.

Another concrete way to have an impact in respect to a highlighted area in the dashboard, and thus shape the ecosystem, is to select a new level of openness. The openness versus closed theory was elaborated in subchapter 3.3.1.3. The new level of selection has can have many effects. Generally opening e.g. a platform according to Eisenmann et al. (2008) can spur adoption by harnessing network effects, reducing users' concerns about lock-in, stimulating production of differentiated goods, reduces switching costs and increases competition by making it more difficult to appropriate rents from the platform. An example considering the dashboard indication of deterioration, could be to select a more open level in order to enable new innovation associated to the deteriorated area. It is worth the note that in general, the openness levels tend to become more open, otherwise the backward compatibility is likely reduced as Eisenmann et al. (2008) presume.

4 Summary of Successful Business Ecosystems

The previous chapters discussed business ecosystems, business ecosystem creation, management as well as business ecosystem related theories. In chapter 2, the business ecosystem environment in terms of information economy and business networking was described. Additionally, the chapter elaborated diffusion of innovations and competitive intelligence, which are apparent in a business ecosystem evolvement. Chapter 3 went deeper into ecosystem theories representing business ecosystem structures and constructed an ecosystem analysis process with measurable parameters, which can be used in ecosystem creation as well as continuous management in shaping the ecosystem. With all the presented theories, the thesis contemplated business ecosystem creation and its sustainable evolvement from two perspectives. These were creation of a new business ecosystem without adaptation to an existing environment, and an existing business ecosystem recreation with adaptation to the existing environment.

It is important to understand the differences between the two approaches. In other words, the two approaches present opposite approaches in business ecosystem creation, but are not necessarily exclusionary. In some cases, a mediocre adaptation to the environment is applicable, thus, some phases or areas (e.g. assets, domains) of the adaptation can be omitted.

Figure 14 illustrates the two alternative approaches in business ecosystem creation, which starts with an investment evaluation. The investment evaluation contemplates whether it is better to recreate and adapt the existing business ecosystem or create a new without adaptation. Once, there is enough insight in this respect, the ecosystem creation can proceed with the drawn steps. The business ecosystem recreation without adaptation follows: value creation, ecosystem establishment, value sharing, value promise and continuous management in order to sustain the ecosystem evolvement. Alike, the business ecosystem recreation without adaptation follows the steps of: finding a value proposal, adaptation to the environment, adaptation to the existing ecosystem, adaptation to the competing ecosystems, adaptation towards future insight, and finally continuous ecosystem management. The steps are further categorised as: value proposal, core strategic selections, ecosystem promise, and ecosystem management according to required strategic selections and actions in different phases of the ecosystem creation.

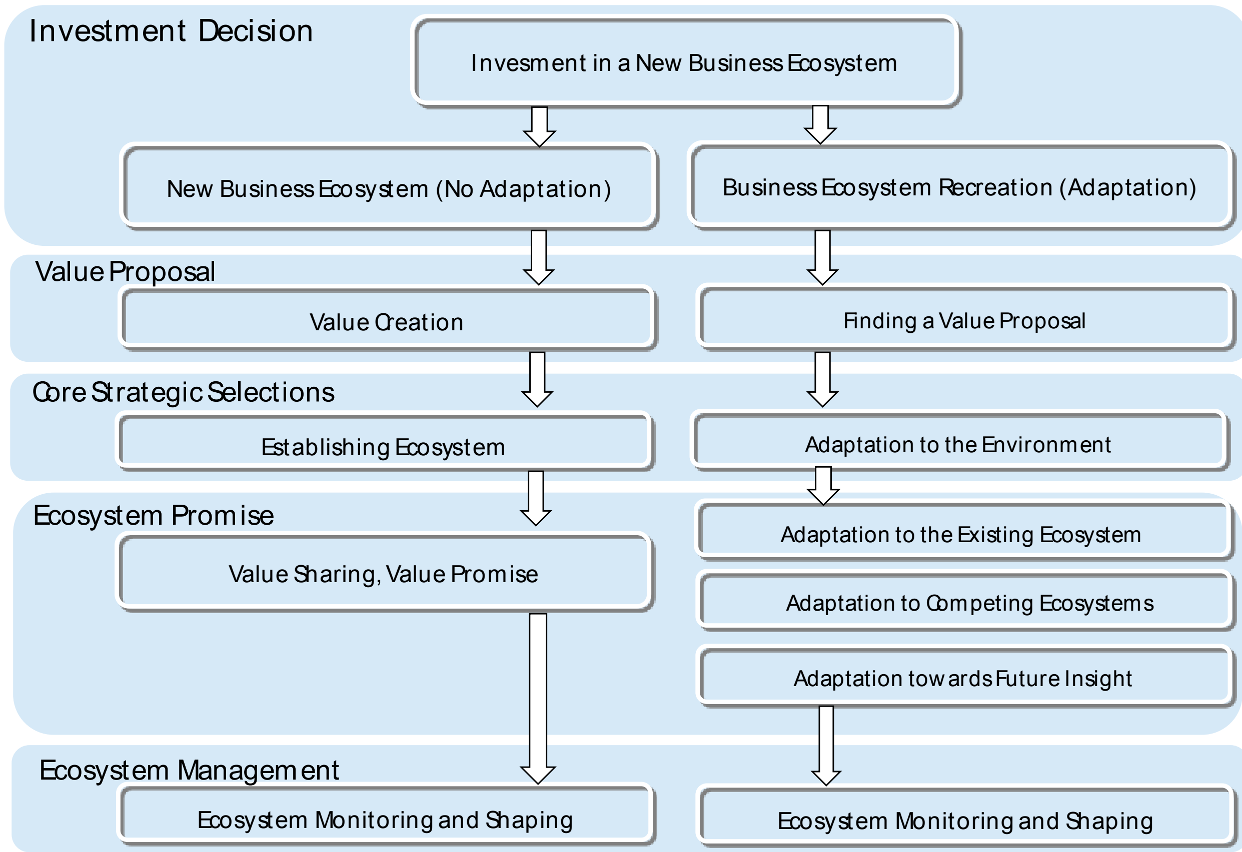

Figure 14: Business Ecosystem Creation Alternative Approaches

As for ecosystem strategic selections and actions, both approaches include options to be decided and executed during creation. The strategic options and actions associated with both ecosystem approaches are collected in Table 2.

The first ecosystem creation approach (without adaptation) starts with value creation, where a totally unique *value proposal* is envisioned or researched during the ecosystem initial stage. This was discussed in subchapter 3.3.1.1. On basis of the high value proposal, *core strategic selections* are made, which support best the high value assets (see 3.3.1.2 Establishing Ecosystems). During this phase, the analyses are started to collect the information associated with ecosystem evolvement and support decision making in a later phase. Once the core strategic decisions are made or there is an insight of the best selections, it is possible to elaborate *ecosystem promise* and its strategic options. In business ecosystem creation without adaptation, this is essentially value sharing (operating leverage, assets etc.) though the ecosystem structure to its members and activity points. There needs to be ways to share value, share differentiation and problems though the ecosystem in order to enable niche creation and new innovation in the ecosystem. Value sharing was described in subchapter 3.3.1.3 with three theories: openness versus closed, network externalities and innovation diffusion. Additionally, in this ecosystem promise phase, further ecosystem analyses are made and descriptive parameters are collected on a dashboard, which is used in the next phase, ecosystem management.

The *ecosystem management* consists of continuous monitoring and shaping and was introduced in subchapter 3.3.5 Managing Business Ecosystem. Monitoring is done with continuous CI analysis process (see 2.4), which updates information on a dashboard and solves other questions in concern. The analysed information and indications are reflected to the ecosystem vision, favourable ecosystem evolvement direction and used in strategies and decision making. On the basis of the decision and strategies further actions are taken and executed, for instance, with different levels of openness and innovation diffusion facilitation.

Strategic Action	Options			
Investment Decision	Evaluation of alternative investment Level of difference in approach in respect to alternative investments			
	New business ecosystem (no adaptation)		Business ecosystem recreation (adaptation)	
Value proposal	•Unique, high value assets, high difference value, perfomance leaps •Clear, common vision •Research asset opportunity	ANALYSES •N/A	•Finding value proposal -Value factors for customers and ecosystem groups	ANALYSES •Existing value proposals and factors •Constructing a dashboard
Core Strategic Selections	•Ecosystem establishment -Learning cycle -Core strategic options (species, roles, coevolution, structure, domains)	ANALYSES •Leaning cycle info	•Adaptation to environment -Regional, regulative, political, coevolution, species, domains -Dynamics	ANALYSES •Dashboard influencing factors
Ecosystem Promise	•Value sharing and promise -Openness levels and assets -Network externalities levers -Innovation diffusion facilitation	ANALYSES •Constructing a dashboard reflecting selections and promise	•Adaptation to existing ecosystem -Assets for competitive promise -Roles, structure, channels, operations -Openness, network externalities, innovation diffusion •Adaptation to competing ecosystems -Co-operation, openness, standards •Adaptation to future insights -Evolution to favourable direction -Addressing further market opportunities	ANALYSES •Dashboard parameters •Reverse-engineered strategies, operations and routines
Ecosystem Management	•Continuous ecosystem monitoring and shaping -Actions in respect to ecosystem stage -Actions to shape with openness levels & network effects -Diffusion facilitation with enablers and blockers		ANALYSES •Continuous dashboard update •Dashboard indications of deterioration, improvement, transformation	

Table 2: Strategic Actions in Business Ecosystem Creation

The second ecosystem creation approach (with adaptation) starts with value proposal as well. However, now the existing value proposals and factors in the alternative ecosystems are analysed and the value proposal is based on the possible combinations of new and existing value factors. These were elaborated in subchapter 3.3.4.1. This new value proposal is first adapted to the environment to see whether the new value proposal is viable overall. For instance, it consists of comprehending regulative, regional, political and co-evolving issues and was discussed in subchapter 3.3.4.2. Next, in the ecosystem promise adaptation, (see 3.3.4.3) the value proposal is adapted to the existing and competing ecosystems. This phase incorporates multiple assets, interfaces, operations to be contemplated, and whether those should be kept, renewed or removed.

In the ecosystem adaptation approach, the continuous monitoring and management is in a more crucial role than in the first approach. Now, the analyses are used to support strategies and decision making in all of the phases: in analysing the value proposal, in updating the dashboard constantly, and in managing the ecosystem.

This chapter summarised the discussed business ecosystem creation, management and business ecosystem related theories in Figure 14 and Table 2. The next chapter presents a case study regarding the discussed theories and strategies in order to concretise them further. A mobile software platform ecosystem is created, and is driven by software developers after the creation.

5 Case: Developer - Driven Mobile Software Platform Ecosystem

In the previous chapter 3, business ecosystems, their formation and management were elaborated in detail. Theories, with respect to business ecosystems and information economy were discussed in chapter 2. Nevertheless, as the business ecosystems are extensive, include broad concepts, and have rather an abstract theory, it is worth the attention to discuss the business ecosystems with a case study. With the case study represented in this chapter, the introduced concepts and theories become more concretised and many of the previously made suggestions and examples are given increasing clarity. Furthermore, this case study is selected, because it supports related activities in business landscape analysis in a big Finnish company the author is working in.

As the previously discussed theories are general, those could be applied to many cases regardless of the industry. However, the thesis has been discussing the business ecosystems in the context of information economy and highly networked business networking, where innovation and its diffusion are emphasised. Additionally, the thesis has been grounding on the CI framework in understanding and managing the business ecosystem with descriptive parameters. In order to demonstrate the discussed concepts in action with a suitable and topical case study, the thesis constructs a business ecosystem in the software industry. More specifically, business ecosystem is constructed around a mobile software platform, which is used by multiple members and stakeholders.

The case study is arranged in the following way. Firstly, mobile operating systems and software platforms are briefly introduced in respect to business ecosystems. Secondly, an example business ecosystem is constructed around a mobile software platform. Thirdly, the case study software platform is driven by developers, who are actively given proposals by the business ecosystem keystone company to shape and lead the ecosystem. And finally, fifthly, the case is summarised with discussion.

5.1 Mobile Software Platforms as Business Ecosystems

There exist multiple major mobile OSs (operating systems) on the market. At the end of 2008, major OS market shares were: Symbian OS (46.6%), iPhone OS (17.3%), RIM Blackberry OS (15.2%), Windows Mobile (13.6%) and Linux (5.1%)[5]. Even more different software platforms releases exist, which are commonly based on the major operating systems, including more or less proprietary elements and varied components. According to Yankee Group (2008), only Vodafone has more than 30 platforms to support in their portfolio as an example. The multiple different software platforms are initiated and implemented because of contradicting members' needs related to the existing software platforms.

These contradicting needs arise because the members have different requirements and inputs to the active consortium around a software platform. A *platform*, according to Eisenmann et al. (2008), encompasses a common set of *components* and *rules* used in interactions. The components include hardware, software, and service modules with a specified architecture fitting the components together. Rules are formed in order to coordinate network participants' activities including standards, protocols, policies and contracts that specify responsibilities and rights.

It is rather straightforward to extrapolate that a software platform including distinct type of participants, components and rules is a very suitable for business ecosystem creation because of the common activity aggregation components and rules. The software platforms are commonly referred to in business ecosystem studies, for instance, by Iansiti and Levien (2004a), Iansiti and Levien (2004b), and Iansiti and Richards (2006) as well. Tools and building blocks in platforms provide ecosystem members with opportunities to create powerful applications that turn into end users' benefit, and platform providers can act as "keystones" in the ecosystem. The platform providers effectively connect many application providers to each other and define critical common interfaces as Iansiti and Richards (2006) suggest.

[5] Wikipedia: Smartphone, http://en.wikipedia.org/wiki/Smartphone, accessed Feb'09

The use of a software platform as a common base of business ecosystem opens-up multiple ways to foster the growth of business opportunities for its members, and improves the benefits it delivers to its customers. Depending on the software platform, the members and member types can vary. Eisenmann et al. (2008) discuss software platforms having four types of members: demand-side platform users aka end-users, supply-side platform users, platform providers, and platform sponsors.

As far as software platform member roles are concerned, Eisenmann et al. (2008) recognise different levels of openness in the platforms, which have multiple implications to platforms' characteristics, network effects, and its participation. An illustration of the different levels of openness according to Eisenmann et al. (2008) was shown in Table 1.

However, the thesis proposed broader use for openness in terms of strategic options, value sharing, and management as reviewed in 3.3.1.3 with openness versus closed theory. The openness versus closed choices were separated into three divisions: member type interfaces, technical interfaces, and interfaces in a business case level.

A broader use of openness is in line with McQueen et al. (2008) description about mobile operating system openness (openness at the API level, openness at the UI level, openness at the stack level). Thus, it is possible to decide appropriate openness in these different member interfaces, in technical interfaces in respect to software architecture in mobile operating system or software platform, and in a business case level. Openness choices related to the case study are elaborated in the next subchapter 5.2.

5.2 Proposal for Developer - Driven Mobile Software Platform Ecosystem

The software industry is an active industry with multiple major existing operating systems and software platforms discussed in 5.1. Since there exist different operating systems and platforms in the industry, most of the active participants are members at least in one of the software ecosystems. This indicates that it is more appropriate to recreate an existing business ecosystem than to craft a completely new one. The primary difference in these approaches was, how well the new business ecosystem should be adapted to existing one. Thus, in this recreation the new business ecosystem should be well adapted to the existing business environment, which needs to be firstly analysed in order to understand its operation and characteristics. The business ecosystem analysis and recreation were discussed in 3.3.2 and 3.3.4 respectively.

Consequently, after the existing business ecosystem (and competing ecosystems) are analysed with the CI process framework, the valuable output information in parameters (measures, metrics, influencing factors) (see. 3.3.3 Ecosystem Parameters) can be used to envision exciting new value proposals for the business ecosystem. Moreover, a descriptive map of the existing environment and alternative choice paths should be delineated in order to formulate the future insight. The compelling new value proposals can be based on multitude combinations of technology, business and networking related enablers, problems and use cases. However, what has been drawing increasing attention is the invention of new user experiences (UX) as value proposals. This is recognised by Moore (2006) as well. Owing to this, the case study value creation and sharing is based on a user experience proposal.

5.2.1 Value Proposal

This subchapter presents a user experience based value proposal for the case business ecosystem. Firstly, the user experience is defined and then the value proposal is discussed. See 3.3.4.1 for previous discussion about finding a value proposal in business ecosystem recreation.

User experience is a broadly studied area having a multitude of definitions and approaches. Hassenzahl et al. (2007; 2006) describe user experience in human mobile interaction with a suitable and straightforward way for the case study. They divide the user experience to 1) to-do part, and 2) to be part. The “to-do” part includes usability, usefulness, and task oriented factors, and the “to-be” part includes all the psychological needs and feels associated with the device, situation, and context. The studies emphasise that contextual factors can bias the to-be part towards the to-do part, (e.g. emotions, social situations, time, and money pressure).

The user experience in “to-be” and “to-do” is present in all the technologies, devices and services that have a certain total personal user experience. This personal UX is both designed in the product, applications and services creation and affected by personal previous experiences, beliefs and context. Since the UX can be designed in the product creation phase, it is possible to examine the preferred user experiences and thus designed appropriately for a certain user group. Moreover, in a case of a platform the user experience forms a user experience domain, which is an aggregation of the user experiences intended to be implemented with the platform. Furthermore, it is possible to decide appropriate openness for different parts of the platform (member interfaces, technical interfaces, business cases) in order to *craft a user experience domain for the members of the ecosystem*. This is a critical part of the developer driven mobile software platform proposal and requires more clarification.

The Figure 15 shows example “to-bes” and “to-dos” associated with the user experience. For instance, ways to express, consume, and create are to-dos and feeling better, presence, and engagement are to-bes. These to-bes and to-dos are combined according to user-oriented needs for products and services. This forms a user experience domain, which can include some dynamics as well. This is to say, the user experience is predefined to vary with a certain extent in order to have differentiation for products and services. In respect to a software platform, it is possible to link and combine the user experience domains for further total user experience in final products, applications and services for the end user delight. This is illustrated in Figure 16.

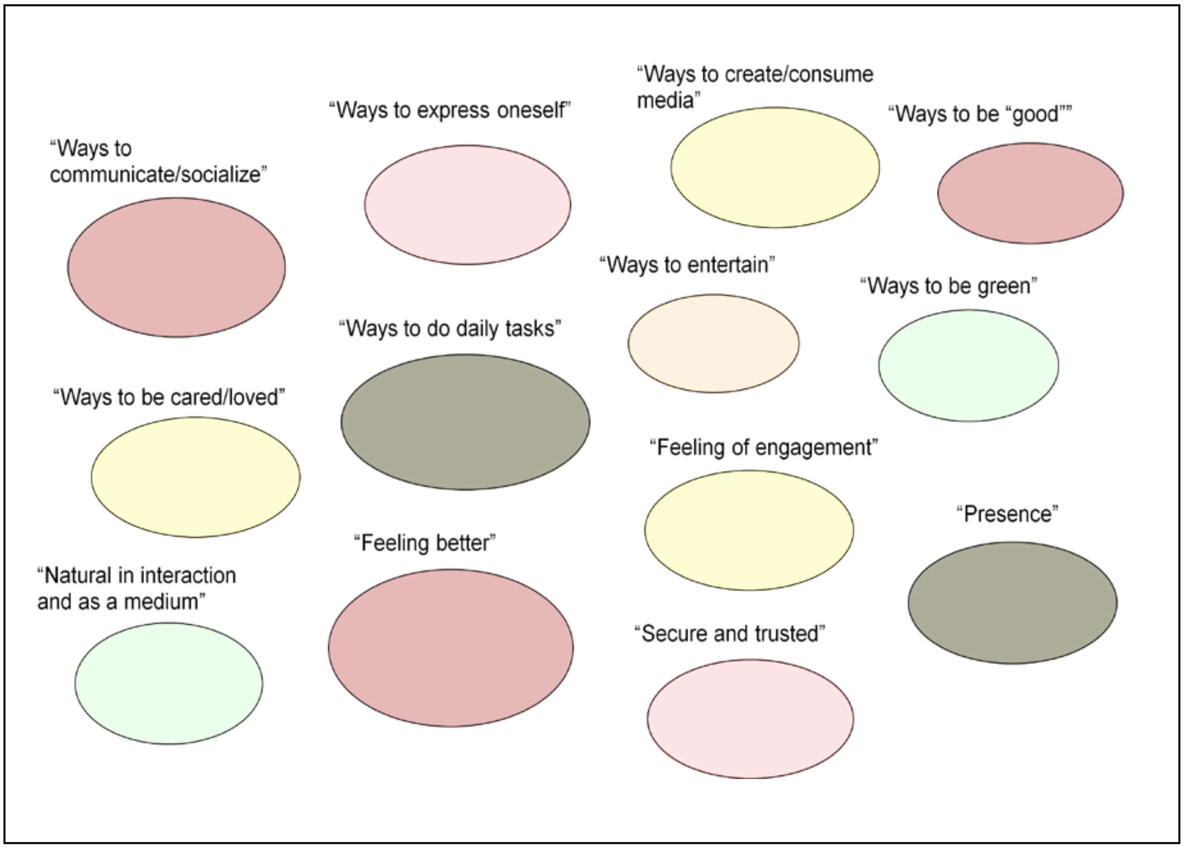

Figure 15: User Experience "to-be" and "to-do" examples

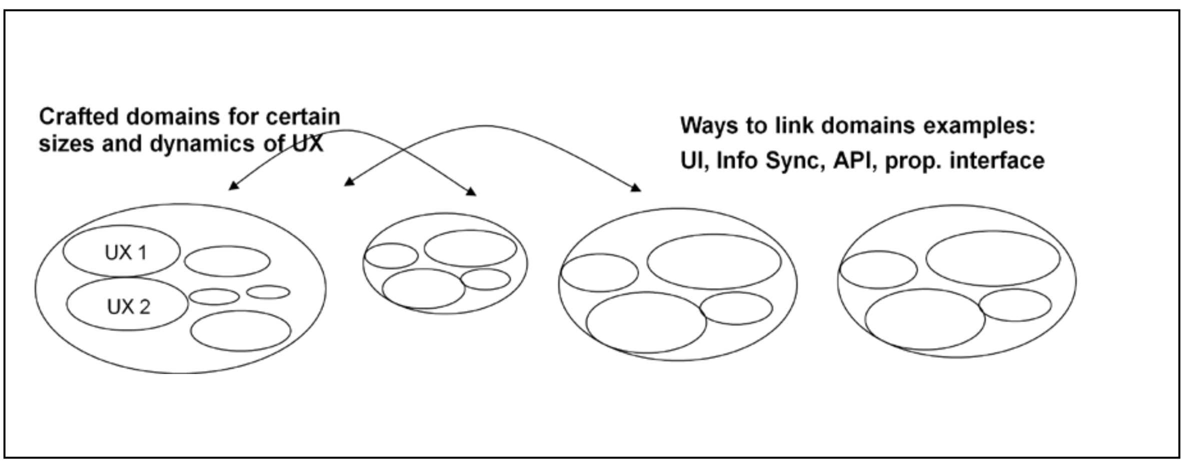

Figure 16: User experience domains, and linking

The UX domain and dynamics crafting is based on selected technologies, tools, APIs, interfaces, libraries, assets, and the like. An important part of the crafting is appropriate openness choices in member interfaces, technical interfaces, business cases, software APIs, which affect the possible dynamics and differentiation based on user experience in the concerned area. For instance, closed-member type interface does not allow differentiation in that area and thus does not leave much further value opportunities in that direction. An example considering a half-open interface would be an API which allows connectivity to other user experience domains with certain restrictions or preconditions while allowing free connectivity to another API, UX domain, application or similar. Accordingly, a totally open interface would not possess any restrictions to specifications, source code, participation to the development, commercialization, or use.

Above discussion envisioned a new value proposal for the business ecosystem based on a user experience domains and their linking in a platform. The value proposal needs to be leveraged by the members in the business ecosystem, thus requiring implementation and utilisation. In this case study, it is proposed that the software platform is driven by developers who actively use the platform, create applications, and implement solutions based on the user experiences domain proposals. Additionally, the developers further develop the platform elements, but still the platform has a certain level of stability and predictability for the development environment in terms of stable APIs and continuing activities around the platform. In order to further process with the ecosystem creation, the selected value proposal needs to be adapted to the existing business ecosystem(s) and environment to an appropriate extent. These are discussed in the next subchapters.

5.2.2 Adaptation to the Environment

The ecosystem adaptation involves multiple steps, as discussed in subchapter 3.3.4 Recreating Existing Business Ecosystems. These are: adaptation to the environment, adaptation to the existing business ecosystem, adaptation to the competing ecosystems, and finally, adaptation to the future insights. The environment adaptation is discussed in this subchapter.

It is best to start the ecosystem adaptation with a broad adaptation, an adaptation to the environment, in order to get a rough adaptation right. This includes for instance, analysing the regulative, regional and political environment. A clear example in this study case would be technologies which are not suitable to be used because of the legislation or not supported in the regional infrastructure.

The environment adaptation includes core selections with respect to dynamics, co-evolution, member types, and similar. These were actually already selected to be a part of the value proposal, thus the case ecosystem is led by developers (emphasizing member group). The user experience proposal includes dynamics that can be distributed and used to share value through the ecosystem.

5.2.3 Ecosystem Promise Adaptation

Earlier in the case study it was emphasised that the recreation of a business ecosystem starts with an analysis of the business environment with the analysis framework. Since the value proposal for the new business ecosystem is in place, it is possible to start to adapt the ecosystem promise with the analysed information, which was discussed in subchapter 3.3.4.3. The business landscape information, information about how the existing business ecosystem is working, information about the species and roles of the existing members need to be considered in the promise adaptation. Moreover, the results of the CI framework analysis as selected parameters and answers to specific questions need to be examined in the adaptation. At this point, there should be a rather comprehensive understanding of the business ecosystem operation, key species, roles, strategies, key assets, and the like through analyzes and determined action patterns. Now, the analysed information comes into active use.

In the case study of the thesis, following ecosystem member types are used, as shown in Figure 17. Thus, the case mobile software ecosystem consists of multiple members, who can be classified on nine types, as shown. Some of the members are stakeholders in the ecosystem that have paid member fees, are administrative or the like. Each member uses the software platform, leverages it and has a certain input to the ecosystem according to their role and strategy. In the illustrated figure, the software platform vendor represents a keystone, developers are niche players, and some vendors are dominators.

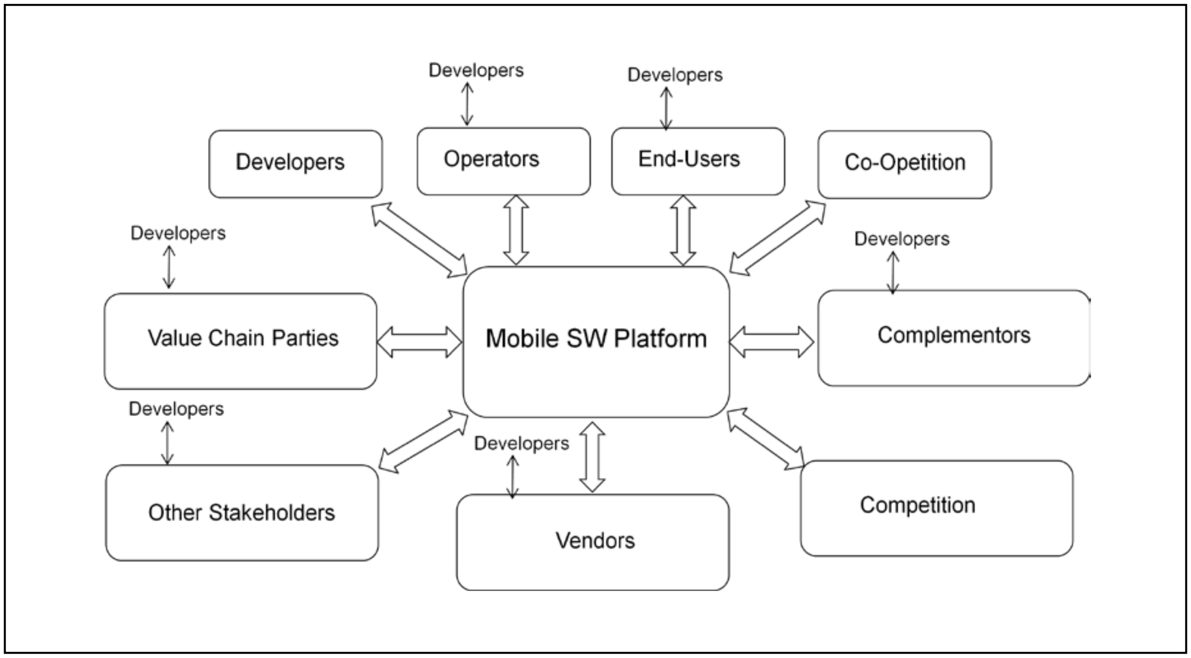

Figure 17: Mobile Software Platform Ecosystem Member Types

The existing key assets, new key assets, important channels, and operations are mapped to the UX value proposal in order to concretize the value proposal with the available assets, technologies and the like. After this, there exist both value proposal and a mapping of value to assets (physical, financial and intellectual), thus the ecosystem promise has execution potential and needs to be implemented.

Earlier, it was decided that developers lead the platform evolution. Now, the crafted UX proposal with mapped assets is further concretized by connecting the mapped assets to developers with software tools and development kits. Already in the asset mapping, it is important to understand the requirements of developers, in addition to the end-users to whom the UX proposal is mainly targeted. The developer requirements are taken into account with the platform value factors, as was shown in subchapter 3.3.4.1. However, it is probably most efficient to target to a certain developer segment in order to keep the end-user UX proposal with assets in focus. Thus, the thesis proposes that early adopters are targeted, as shown in Figure 3. The early adopters ensure that there is a big amount of developers in comparison to innovators, and early adopters likely do such elements, applications and services with the platform tools that are more targeted to mass end-user segment as well. Additionally, the early adopter developer segment includes all the early adopter developers from other members' developers, as shown in Figure 17.

A big part of the value proposal needs to be shared through the ecosystem in order to sustain health in the ecosystem. Furthermore, it is important to share problems, differentiation possibilities and ways to create new value with the shared assets as well. These will on and on improve the health of the ecosystem. This is the essential part of the ecosystem's promise, in other words: how to distribute value, enable further value creation in a sustainable manner, and steer the ecosystem evolution towards a favourable direction?

The member asset selection and linking with software tools and development kits per se build a promise for the members within the ecosystem. However, it is possible to construct the architecture further according to network externalities, innovation diffusion, and especially, openness versus closed –theories. These were elaborated in subchapters 2.2.2, 2.3 and 3.3.1.3 respectively. Additionally, these were discussed in subchapter 3.3.4.3 Ecosystem Promise Adaptation.

Different levels of openness in interfaces provide multitude of ways to share and distribute value as well as share problems within the network. The openness levels can be contemplated in multiple aspects and the different levels of openness make it possible to affect the evolution and have dynamics in the UX proposal. The evolution is accelerated towards a more open direction, thus allowing a more free access e.g. to an interface. The dynamics are implemented by allowing a certain range of openness, for instance, with an API or a specification. In respect to an API, it can be a packaged tool with multiple items, where some are more open than others. A further example of API could be a design tool that allows application design variation within a certain limit. A specification dynamics could be implemented with a certain predefined criteria that the implemented assets should be within the proposed range. As a principal rule, the members influencing most the ecosystem evolution by providing innovation should have more openness in interfaces to enable more innovation. Latest studies indicate the use of different openness levels as Eisenmann et al. (2008) highlight openness in member interface level and McQueen et al. (2008) in different layers of software. Additionally, recent industry news indicate increasing software development emphasis with multitude of APIs as Apple (Mar'09) announced iPhone OS 3.0 beta SDK.

With respect to network externalities, the previous openness level selections affect network effects. According to Eisenmann et al. (2008), a more open platform harnesses network effects. An efficient way to create network effects is by enabling an access to previous assets for the existing users and content. Thus, the new asset can use the existing value in another group and increase the starting value of the product. Similarly, a new group can increase the value of an existing group by adding users and assets there as well. This access and connectivity can be expanded to N-type network effects and openness in multiple layers, as elaborated in subchapter 3.3.1.3.

In this case study, the platform openness levels are rather open in order to enable fast adoption and use of the platform. Without going very deep in deliberating all the openness levels with respect to different interfaces and APIs, some general guidelines are given. Since the platform is driven by the developers, the interfaces and APIs are mostly open. It is possible to modify the interfaces and APIs in multiple ways to unleash the innovation. However, the tools and SDKs provide a certain proposed area for the developers to develop applications, services and the like as a default. If one changes the default set, the application needs to go through a separate verification process, in order to be accepted. Another possibility in the study case would be to emphasize the relationship of end-users and developers. It is likely, that the developers take very much account the end-users in developed applications and solutions in order to increase the application and solution use further. However, the idea is to emphasize the end-user produced content for the applications even more. For instance, the end-users can easily generate content with the application and other methods (media, information with the application e.g. top scores, usage data, and experiences). In this way, both the developers and end-users provide network effect lever for the platform use.

A significant part of the adaptation to the existing ecosystem is related to innovation diffusion. The innovation diffusion occurs though multiple channels in a social system. As the ecosystem consists of multiple individuals, groups, and organizations, the innovations are diffused within smaller groups and in the ecosystem as a whole. In order to adapt the ecosystem to the previous ecosystem, key assets should be pointed out and compared to the new key assets in terms of stages of the innovation diffusion process. Since the case study is a software platform, the main adaptation is related to the perceived characteristics of innovations because most of the solutions are based on technical solutions. Thus, the adaptation compares key assets in perceived characteristics (relative advantage, compatibility, triallability, and observability) and facilitates these characteristics. Additionally, the communication channels play an important role to distribute information about the new innovations and assets. A proper way to execute information distribution is to use both mass media channels (e.g. radio, television, papers, and internet) and interpersonal channels involving a few or more individuals. In terms of software platform, the mass media channels can be excellently used for marketing and informative purposes and the interpersonal channels in sharing expertise, for instance, with documentation, discussion forums, blogs, development portals, and the like.

An adaptation towards competing ecosystems needs to be considered, because in order to be healthy in the long run, the ecosystems cannot be totally isolated. There are similarities in comparison to adaptation to the existing ecosystem. Firstly, the key assets are identified with analyses processes and elaborated on, whether the assets could be linked, connected or combined to have synergies, or contemplated if new value can be created. The cross linkage of assets with competing ecosystems involve strategic decisions, negotiations and business modeling to identify opportunities and obstacles. Furthermore, the linked assets shape the ecosystem towards the future opportunities and require insight in decisions. These are discussed in the next subchapter.

5.2.4 Adaptation towards Future Insights

The future insights adaptation elaborates linkages between a new and the future promise and was discussed in subchapter 3.3.4.4. Regarding the case study's UX domain proposal, the UX domain, existing ecosystem and competitive ecosystem linking possibilities are examined. A great example of the linking could be to link assets and domains though a common rendezvous point or external place, thus not directly between the assets and domains, but through an external element. This allows flexibility for the UX domains to develop and only a certain protocol or API needs to be stable. These connection points to previous domains and ecosystems increase compatibility, and lower the adoption barrier. Additionally, if the interfaces can be kept stable for a longer time, the solutions within domains and solutions are built on top of the domain's value proposal, become more mature and functionality increases further.

The future insight is gained with the continuous CI process and changes in the dashboard which are updated frequently during the ecosystem evolvement. The highlighted areas are reflected to the overall value promise and vision of the ecosystem to determine further actions in active ecosystem management.

5.2.5 Continuous Management

Even though the case platform is driven by the developers, it is steered by the keystone member in the ecosystem already from the beginning with sets of strategic options and selections. However, the continuous management can be more described as continuous shaping and identification of opportunities. Moreover, the continuous management conceptualizes and crafts the new UX domains with respect to opportunities and future insight.

The UX domains are crafted on the basis of an addressable consumer market, new technologies, existing products, applications and services, and their suitability to the platform and members in the ecosystem. These initial selections craft an experience area for the activities and businesses to be build upon. It must be appealing for the consumers, most members of the ecosystem, especially for the developers in this case, who are driving the business ecosystem. Thus, the selections require careful consumer, developer, and other member understanding (needs, values) in order to have the new innovated user experiences and related technologies diffused. Adopter category understanding was discussed in 2.3.3 Time Dimension in Diffusion Theory).

A major part of the continuous management is the constant shaping of the ecosystem, because the health of the ecosystem needs to be actively improved. This is done with the dashboard, identified parameters and indications. In the case study, the parameters are related to key assets within UX domains, especially to the new domains. Since the UX domains are lever areas, the domain life cycle, activity and changes are monitored with multiple parameters.

5.2.6 Case Study Conclusions

The case study elaborated business ecosystem creation and its continuous management. It concretizes the theories presented in previous chapters by examining recreation of a business ecosystem with an adaptation to the environment. The case study of mobile software platform ecosystem was selected because of its topicality with respect to the latest activities the industry. Furthermore, the case study supports business landscape analyses in a big Finnish company, in which the author is involved in.

The main findings of the case study are presented in Table 3 below. Firstly, it was decided to invest in recreation of a business ecosystem, since the mobile device industry is an active existing field with many players. Analyzed information of the existing value proposals supported finding a new value proposal for the ecosystem, and a user experience (UX) domain value proposal was identified. This was a dynamic concept led by developers in the ecosystem, who create solutions with the predefined assets mapped to the UX proposal. Then, the value proposal was adapted to the existing and competitive ecosystem as well as future insights. Here, the key assets were identified, linked and diffused if appropriate. Those were also collected to a dashboard to be used in the active management.

The ecosystem management consisted of continuous monitoring and shaping with dashboard indications, strategies, and decision making. This involved constant opportunity seeking, diffusion facilitation, and asset identification, which were reflected to the ecosystem promise as a whole, and future insight as well. These opportunities and assets are used to create new UX domains, in addition to linking them to previous assets.

Strategic Action	Options	
Investment Decision	**Case: Business ecosystem recreation (adaptation)**	
Value proposal	•Finding value proposal -UX (user experience) value proposal, led by developers	ANALYSES •Analysing existing value proposals and factors -Finding an opportunity space for selections of possible assets for UX proposal •Constructing a dashboard with the existing value proposal and UX domain
Core Strategic Selections	•Adaptation to environment -Dynamic UX proposal, which is led by developers -UX domain a key influencing area -Selecting suitable regional areas, omitting regulated solutions	ANALYSES •Analysing existing influencing factors •Adding main influencing factors to the dashboard
Ecosystem Promise	•Adaptation to existing ecosystem -Star member architecture with extra developer hubs -Species: Keystone-Platform vendor, Niche players-Developers, Dominators-some vendors -Interfaces and APIs: Developers and End-user interfaces relatively open for fast adoption •Adaptation to competing ecosystems -Some interfaces compatible •Adaptation to future insights -Creating Rendez-Vouz points	ANALYSES •Updating dashboard parameters -Key assets -UX domain information -Channels information
Ecosystem Management	•Continuous ecosystem monitoring and shaping -UX domain crafting -Indentification of new assets and opportunities for UX domains -Diffusion facilitation -Enabling interface linkages	ANALYSES •Dashboard update -Updating the key parameters -Indications of deterioration, improvement, transformation -UX domain life cycle analysis emphasized

Table 3: Case Study Business Ecosystem Creation Steps and Strategic Actions

6 Conclusion and Discussion

The thesis elaborated on business ecosystem theories in creating and sustaining successful ecosystems. The study mainly used ecosystem theories proposed by Iansiti and Levien (2004a) and Moore (1996), which seem to provide powerful metaphors in comprehending the network activities as a whole. Iansiti and Levien (2004a), Moore (1996) and Corallo et al. (2007) note the limitations of existing networked business studies as being too internally focused, thus emphasising the internal nature of operational and innovative capabilities and omitting the management of external capabilities. Business ecosystem theories emphasise the external capabilities, which consist of capabilities enabled through the creation of a favourable environment within the ecosystem and assets that are not directly owned but critical for the members' success in the ecosystem.

As for creating and sustaining successful ecosystems, the thesis proposed two alternative approaches with and without adaptation to the environment. The approaches had multiple steps with strategic options, and the main findings were summarised in Figure 14 and Table 2. These findings delineate the options and issues faced in the ecosystem creation as well as in the management, and are in line with the ecosystem evolvement stages proposed by Moore (1996), though they emphasise more strategic steps and continuous management with ecosystem parameters.

With respect to ecosystem analysis and management, Iansiti and Levien (2004a) propose health measures in comprehending the dynamics of ecosystems. However, the thesis argues that in order to actively shape the ecosystem and proactively predict ecosystem evolution, not only compare ecosystems, additional parameters are needed in the management. The thesis proposed metrics and influencing factors for continuous management to be analysed with the constructed CI analysis framework and a dashboard including selected descriptive parameters. The dashboard is constantly updated during the ecosystem evolvement and it indicates possible locations of improvement, deterioration, and transformation, which can be further used in strategies and in decision making.

The thesis used innovation diffusion theory by Rogers (2003) and network externalities theory to complement ecosystem theories in the construction of the approaches. Furthermore, ‘openness versus closed’ proposed by Shapiro (1999) was extended and adapted to an ecosystem level. This is in line with the latest findings by Eisenmann et al. (2008) and McQueen et al. (2008).

The studied theories and the proposed approach of recreating the business ecosystem were reflected on a case business ecosystem study. This case was selected because of the topical nature of recent activities in the mobile device software industry, and to support related activities in business environment analyses in a big Finnish company. The case creates a mobile software business ecosystem, constructs a novel user experience domain approach with respect to ecosystems that is led by developers and steered by the platform vendor. The main findings were summarised in Table 3, which describe the options faced in ecosystem creation as well as the number of possibilities in business ecosystem recreation. The intention was not to comprehensively construct the whole ecosystem, but to delineate the options and key items at a high level with concrete examples.

The thesis argues that the proposed alternative approaches with the constructed analysis framework including descriptive parameters can be used in most cases of elaborating the business ecosystem creation. The options faced in strategic steps as well as the parameters vary depending on the case. In some cases, the steps in adaptation probably need to be done in a different order. However, the proposed approaches in ecosystem theory are keystone centric, and similarly, the case is platform-vendor centric. This is to say, the thesis did not consider alternative governance models in the ecosystem creation and management. Similar keystone-centric model limitations in a broad context are pointed out by Nachira et al. (2007), who state that keystone ecosystem models match the economic structure of USA where there is a predominant number of large enterprises at the centre of large value networks of suppliers. They continue that the digital business ecosystem model developed in Europe by Corallo et al. (2007) is less structured and more dynamic in terms of all actors complementing one another and leading to a more dynamic version of the division of labour, and is organized along one-dimensional value chains and two-dimensional value networks.

There are more limitations in the used approach. Since the thesis uses commonly recognised innovation diffusion theory, some of its shortcomings affect the study as well. Rogers (2003) list major shortcomings as well as proposals for overcoming them. The major shortcomings, which likely affect ecosystem evolvement in terms of innovation spreading, are the pro-innovation bias (the starting point that all innovations should be diffused by all the members as rapidly as possible) and the issue of equality after innovation diffusion (socioeconomic gaps between the members as a result of the spread of new ideas).

As far as further studies are concerned, more research attention should be given to different levels of openness in interfaces and APIs. As discussed, this includes multiple aspects in different levels. This could be an interesting topic for study further, since those provide points for members to access information, services, and assets to create value and increase business activities. Possible other studies should concentrate on comprehending the nature of a relationship between member types in the ecosystem; what are the most important drivers and enablers for different member types. Finally, the use of innovation diffusion theory also warrants more research to examine the diffusion of dissimilar ecosystems, thus to integrate and combine the ecosystems' business activities together.

7 Appendices

7.1 CI Analysis Methods

Analytical models	Collection
• Blind spot • Benchmark • Competitive position matrix • Core competencies analysis • Distinctive competence • Experience curve analysis • GAP analysis • Hermeneutics (interpretation & dialogue) • KIT (Key Intelligence Topics) • KSF • Market share analysis • Porter's five forces • Product lifecycle analysis • Role Gaming • S-Curve analysis • Scenario analysis • STEPP	• (CI Spider) • Traditional (news, journals, blogs, wikis etc.) • Triangular collection (verify information) • Environmental scanning • Competitor benchmark Examples of question set up include: • What issues CI must look at • Intellectual capital • Market share • Growth capabilities • Quality of product • Innovation • Price • Accuracy • Objectivity • Timeline • Dynamics

Table 4: CI analysis methods

7.2 Ecosystem Research and Development towards Knowledge Economy

Figure 18 summons EU commission interdisciplinary research initiative assumptions towards a vibrant knowledge economy. This includes democratic processes, competition, principles, theories as well as processes to foster innovation and dense communities of users. The original digital business ecosystem vision made in 2002 is revisited here on the strength of the outputs of four years of research by traversing most of the topics shown in this figure. (DBE Book, 2007)

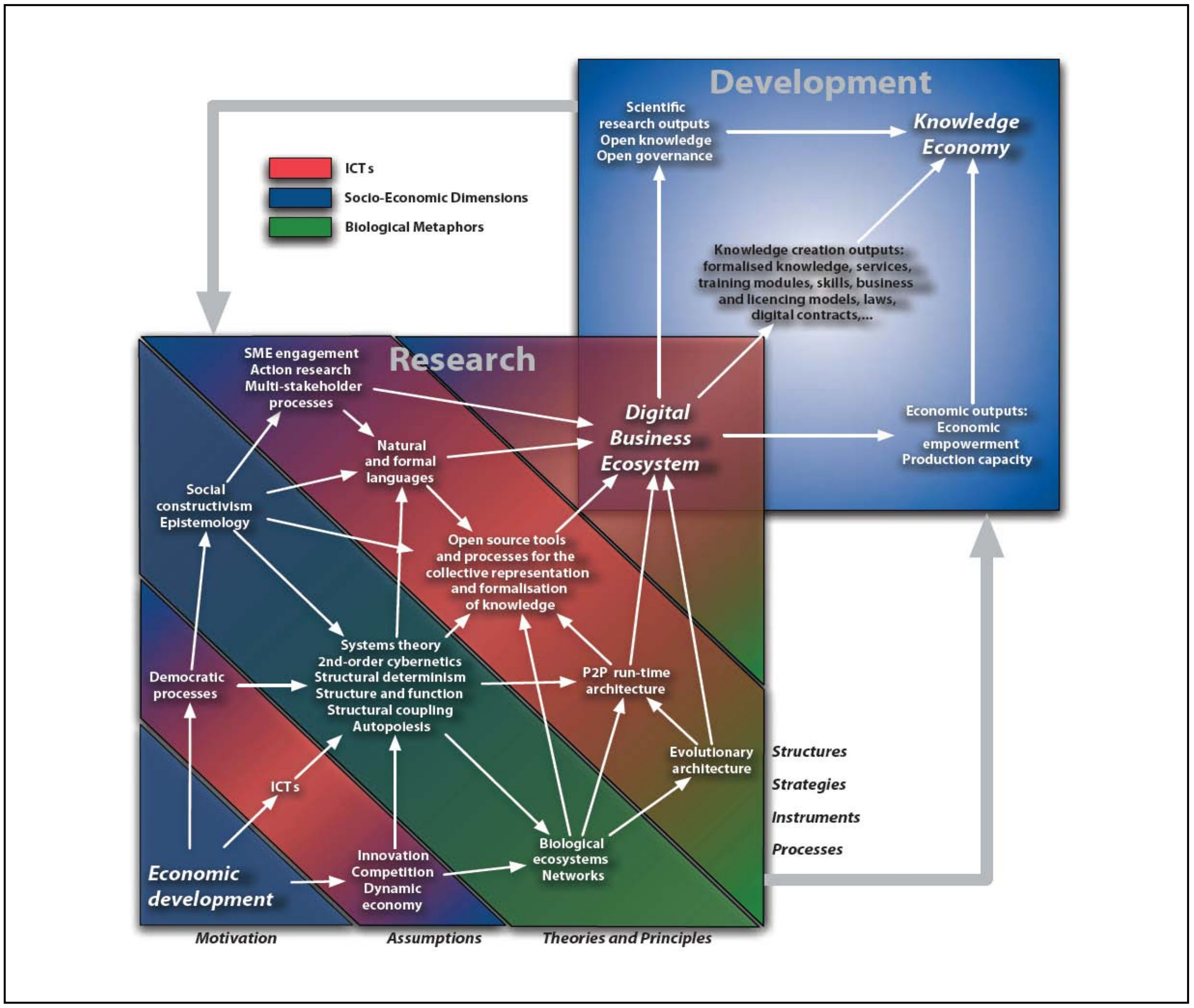

Figure 18: Research and Development of Digital Ecosystem (DBE Book, 2007)

7.3 Ecosystem Examples

Figure 19 shows an innovation ecosystem structure with four distinctive evolutionary layers: business ecosystem layer, digital ecosystem components, digital ecosystem-oriented platform, and network infrastructure. Another illustration of the Digital Business Ecosystem is depicted in Figure 20. That has three layers: business ecosystem, evolutionary environment layer and execution layer. Furthermore, it has a collective intelligence layer for information gathering. Figure 21 depicts two ecosystem structures with multiple connected nodes. Figure 22 illustrates an evolving ecosystem, where the colours are representing different elements in the ecosystem.

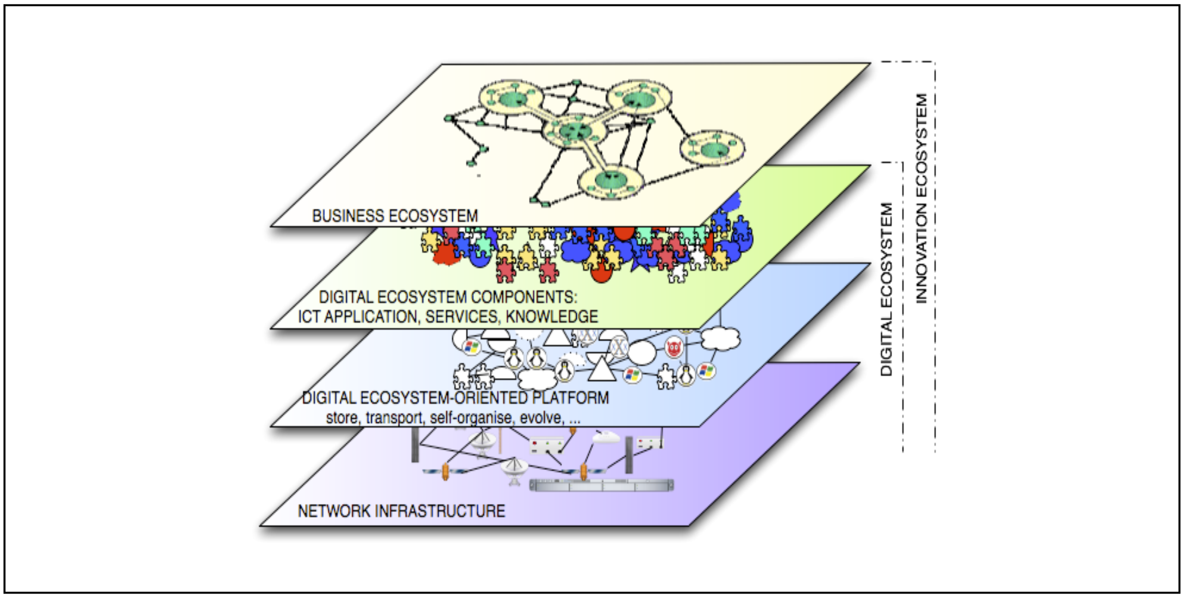

Figure 19: Innovation Ecosystem (Nachira F., 2006)

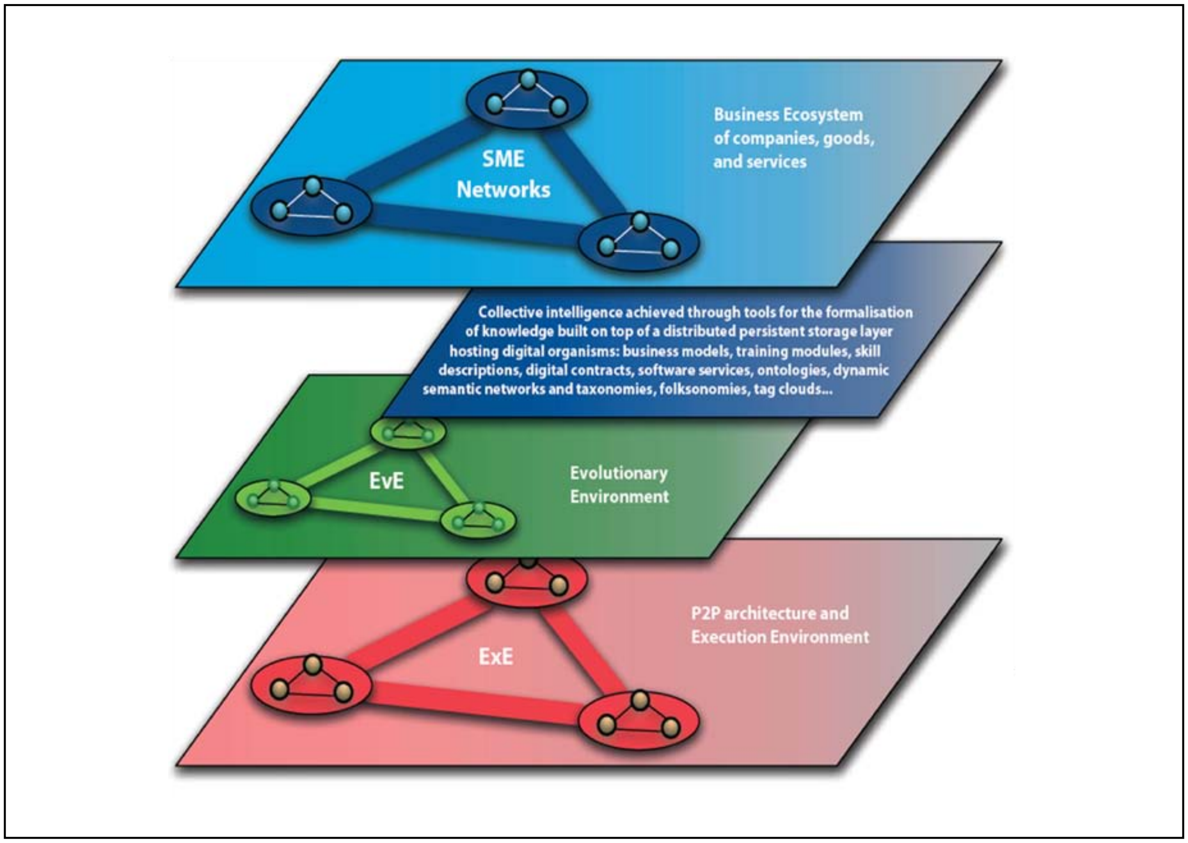

Figure 20: Stack view of Digital Business Ecosystem (DBE Book, 2007)

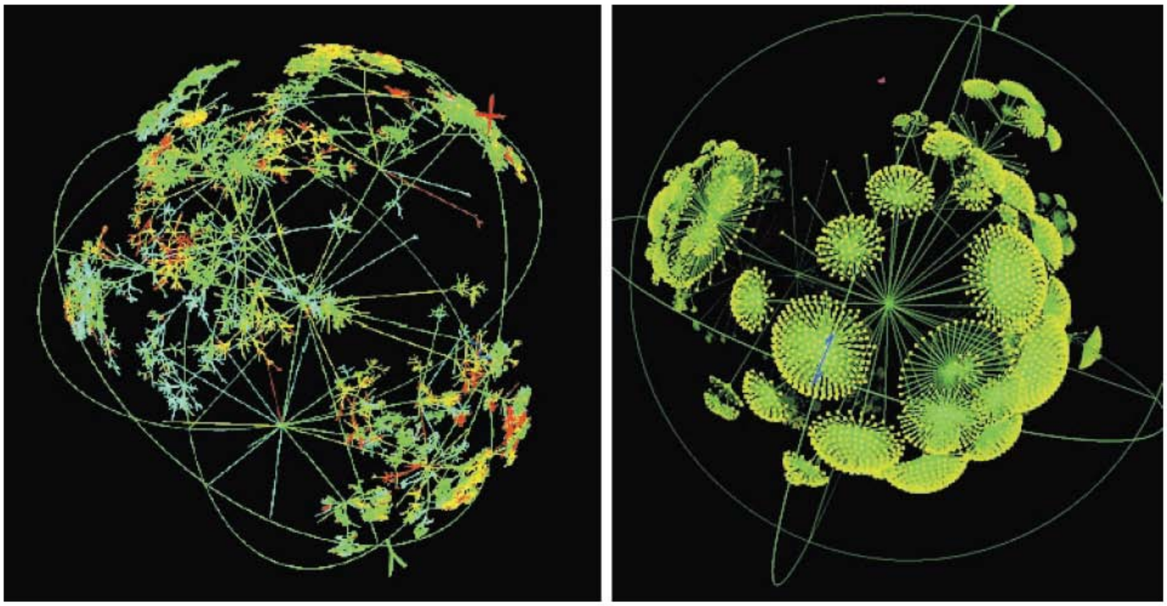

Figure 21: Ecosystem Structure with Multiple Nodes (DBE Book, 2007)

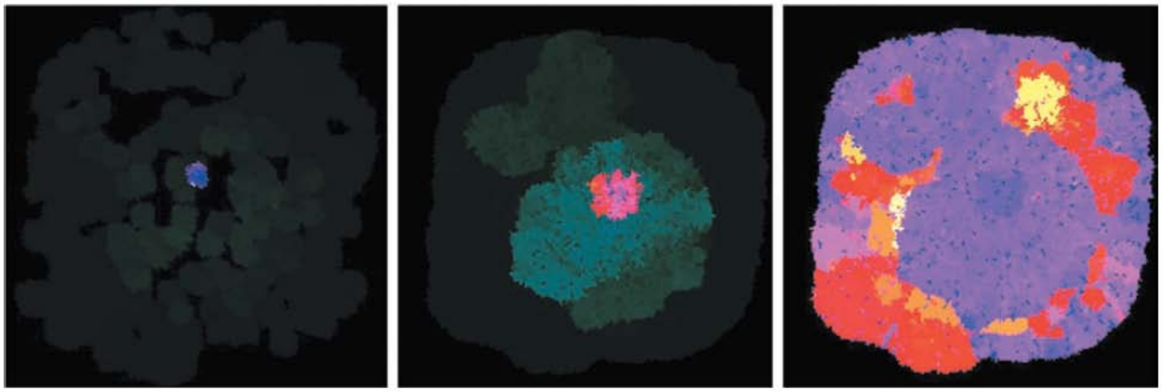

Figure 22: Illustration of an Evolving Ecosystem (DBE Book, 2007)

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