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ESTABLISHING A PLATFORM ECOSYSTEM: CASE STUDY ON EARLY ADOPTERS

Master of Science Thesis

Professor Marko Seppänen as the Examiner and the topic approved by the Faculty Council of the Faculty of Business and Built Environment on October 5th 2016

ABSTRACT

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Google, Facebook, Amazon, Apple and many more. The success of companies behind platform ecosystems is widely known. In this context, a platform is considered to be a marketplace where transactions between two or more user groups take place. Platform economy is causing a disruption in the global markets. The mankind is facing the fourth industrial revolution, where the way how people work, live, and even relate to each other is changing dramatically. The accumulation of value in platform ecosystems is no longer linear like in traditional business models, nor is the pricing model as simple as in a traditional supply chain.

In this thesis, the learning points from already implemented platform ecosystem projects were collected. The study was conducted as a case study complemented with a comprehensive literature review. A case study was selected as the research method as the aim on this thesis was to find out how the Finnish companies have implemented the platforms and also why they decided to utilize this particular business model. The study included two types of companies – international benchmarks and Finnish traditional pipeline companies having some kind of platform.

As a result, a list of critical characteristics –a platform canvas – is proposed to facilitate platform creation and development. In addition, this thesis provides a collection of learning points from the case companies, with which current and future Finnish platform owners can avoid pitfalls and gain success with less effort and better probability.

There are only a handful of Finnish manufacturing companies that are actively developing a platform ecosystem. Those companies are relatively old, large in size, and have a history of profitable business. The studied companies rely heavily on the implementation of Internet of Things and analyzing of big data. They know well the value the platform can provide as well as the producers and users of the value. However, there is room for improvement in finding the way to capture value to the platform owner as well as exploiting the network effects. The case companies have defined and opened their boundary resources much less than the international benchmarks. This may hinder the expansion – and ultimately the success – of their platforms. The companies need more understanding about the prerequisites – like value capturing models – of a successful platform ecosystem as well as training and tools to develop the platforms.

TIIVISTELMÄ

SORRI, KRISTA: Alustaekosysteemin luominen: Tapaustutkimus varhaisista hyödyntäjistä
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Google, Facebook, Amazon, Apple ja monet muut tunnetut, suuret ja kannattavat yritykset, ovat luoneet liiketoimintaansa alustaekosysteemin ympärille. Tässä yhteydessä alustalla tarkoitetaan digitaalisesti toteutettua markkinapaikkaa, jossa kahden tai useamman ryhmän väliset transaktiot tapahtuvat. Alustatalous aiheuttaa häiriötä kansainvälisillä markkinoilla. Ihmiskunta on kohtaamassa uuden teollisen vallankumouksen, jossa ihmisten tapa työskennellä, elää ja jopa olla tekemisissä keskenään, on muuttumassa dramaattisesti. Alustaekosysteemissä arvo ei kumuloidu enää lineaarisesti, kuten perinteisissä liiketoimintamalleissa, eikä hinnoittelu ole enää yhtä yksinkertaista kuin perinteisissä toimitusketjuissa.

Tämä diplomityö kuvaa olemassa olevien alustaekosysteemiprojektien opit. Työ toteutettiin kirjallisuuskatsauksella tuettuna tapaustutkimuksena. Tapaustutkimukseen päädyttiin, koska haluttiin selvittää, miten ja miksi suomalaiset yritykset ovat lähteneet mukaan alustatalouteen. Tutkimuksessa on mukana kahden tyyppisiä yrityksiä: kansainvälisiä benchmark-yrityksiä ja suomalaisia valmistavan teollisuuden yrityksiä, joilla on olemassa jonkinlainen digitaalinen alusta.

Tuloksena syntyi lista ominaisuuksista, jotka tulee huomioida alustaekosysteemiä luotaessa. Luomistyötä tukemaan tehtiin alustaliiketoimintamallin määrittelytyökalu, joka ohjaa yritysjohtajia ekosysteemin suunnittelussa ja kehittämisessä. Lisäksi tämä työ esittelee listan tunnistettuja tekijöitä, joista tähän mennessä toteutuneista projekteista voidaan ottaa opiksi.

Suomalaisia valmistavan teollisuuden yrityksiä, jotka kehittävät omaa alustaekosysteemiä, on vain muutamia. Nuo yritykset ovat kaikki suhteellisen vanhoja, suuria ja ne ovat olleet pitkään kannattavia. Tutkitut yritykset panostavat samanaikaisesti teollisen internetin sekä suuren datamäärän analysoinnin kehittämiseen. Ne tunnistavat alustatalouden luoman arvon sekä alustalle arvoa luovat ja sitä käyttävät markkinaosapuolet. Niille on kuitenkin kehitettävää siinä, miten ne itse voisivat hyötyä alustataloudesta ja siinä, miten ne voisivat hyödyntää verkostovaikutuksia. Suomalaiset tutkitut yritykset ovat määritelleet ja avanneet huomattavasti vähemmän rajaresurssejaan verrattuna kansainvälisiin benchmark-yrityksiin. Tämä voi heikentää suomalaisten alustojen käytön laajenemista. Suomalaisten yritysten tulee kehittää ymmärrystään alustatalouden liiketoimintamallien erilaisuuksista verrattuna perinteisiin liiketoimintamalleihin kouluttautumalla ja hyödyntämällä kehittämiseen luotuja työkaluja. Näin tehtyään näillä alustaekosysteemeillä on täydet mahdollisuudet kasvaa jopa kansainvälisiksi menestyksiksi.

PREFACE

Like Walt Disney once said: “If you can dream it, you can do it”. Writing this thesis was one day only a dream – today it is finalized. The study and writing this thesis has been a learning experience for me – both personally and professionally. The topic was interesting but simultaneously challenging. At the beginning I knew nothing about it, now I know something.

This Master of Science thesis was written in the Faculty of Business and Built Environment in Tampere University of Technology. It is a part of the IPLATE project (Integrating platform competences toward network effects) funded by Tekes (the Finnish Funding Agency for Innovation). The IPLATE project approaches platforms as an interactive, collaborative multisided marketplace; integrating technical competences with creating business from understanding the value creation possibilities within the platform. This approach stems from the clear understanding that in a platform, firms’ capability to govern its position is a key for it to create and capture value. This study contributes to IPLATE by collecting the learning points from already implemented platform ecosystem projects and by creating general guidelines, with which current and future Finnish platform owners can avoid pitfalls and gain success with less effort. The research is conducted as a case study complemented with a comprehensive literature review. As a result list of critical characteristics is provided, in a form of a platform canvas, to facilitate platform creation and development.

I want to thank the personnel of case companies for investing time and effort for this project. Without them the study would have been only a dull literature review. I especially want to thank Professor Marko Seppänen for giving me this opportunity. I appreciate his guidance and support during the process – both frank feedback and the gentle pushes to right direction. I also want to thank all of my fellow students, especially Linda, Mika, Mikko, Meri, Pekka and Sari. You gave me inspiration, support and quite a few laughs.

Finally I want to thank my family. My parents have supported me during my studies both mentally and in practice. Without them, this journey wouldn’t have been possible. Also my warmest thanks to my son Niilo, who stayed quiet while I studied. I promise to spend more time with you in the future.

Krista Sorri

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ABBREVIATIONS

TEKES	Finnish Funding Agency for Innovation
IPLATE	Integrating Platform Competences Toward Network Effects. A Project, founded by the Finnish Funding Agency for Innovation, which aims to find ways for Finnish companies to succeed in platform economy
IoT	Internet of Things
GDP	Gross Domestic Product
API	Application Programming Interface
R & D	Research and Development
TUT	Tampere University of Technology
VTT	Technical Research Centre of Finland ltd
BC	Before Christ
JIT	Just In Time, production philosophy
SDK	Software Development Kit
GmbH	Gesellschaft mit beschränkter Haftung, which is German for "company with limited liability", is a type of legal entity
iOS	iOS (formerly iPhone OS) is a mobile operating system created and developed by Apple Inc. exclusively for its hardware
Oyj	Public Limited Company
Oy	Limited Company
CPQ	Configure, Price, Quote, is software that helps companies accurately define the price of goods across a huge and constantly changing spectrum of variables.
ERP	Enterprise resource planning is the integrated management of core business processes, often in real-time and mediated by software and technology
PaaS	Platform as a Service. A monetization model where the fee is depending on the amount of using the platform

1. INTRODUCTION

Platform economy is causing a disruption in the global markets. The mankind is facing a fourth industrial revolution, where the way people work, live and even relate to each other is changing dramatically. The change can be considered to be even more fundamental than during the three previous industrial revolutions, which were invention of steam engines in late 18th century, mass production in late 19th century and compute revolution in late 20th century. The disruption is acute as the development of innovations and diffusion of technologies much faster than during the previous revolutions. (Schwab 2016, pp.6–8)

Platforms and platform economy as terms have developed in three phases. During the first phase the terms platform and product platform were used in describing basis of variation in product families. Companies used these platforms to gain benefits in scale. During the second phase the platform was considered to be a control point of an industrial value network. This control point gained income without generating any value. Today, in the third phase of the development, platform is considered to be a marketplace where transactions between two or more user groups take place. (Ailisto et al. 2016) An example of a two-sided marketplace is an operating system where the platform owner provides service to two sides of customers (users and developers). Similarly, a credit card is an example of a two-sided platform, as it serves two different markets (card holder and retailer). On the other hand, online store like Amazon is a multisided platform as it had to attract three markets before it can be successful – sellers, buyers and payment intermediators like PayPal or credit card companies. From the perspective of this study, both types are equally important. All principles apply to both, so both types are referred as platform ecosystems in this thesis.

In near future, quite a few new technologies supporting the diffusion of platform ecosystems are approaching the expansion phase in technology lifecycle as the major technical obstacles are about to be overcome. The Global Agenda Council on the Future of Software & Society of World Economic Forum conducted a survey in 2015, which describes the becoming change satisfyingly. In that report six software and service megatrends and 21 technology shifts, about to happen in next 11 years, are identified. The shifts include among others, the Internet of things (IoT), wearable internet, implantable technologies, block chain technology, sharing economy, the connected home and smart cities.(Global Agenda Council on the Future & of Software & Society 2015) These shifts and the estimated timing of each shift is shown in Figure 1. From platform ecosystem point of view IoT, block chain and sharing economy will probably be the most

important ones (Schwab 2016, pp.18–20). The most obvious one is the sharing economy as many of current platform ecosystems – like AirBnB and Uber – are utilizing it already. The IoT helps platforms to gain network effects as the number of things connected to internet has already passed the number of people is expected to increase dramatically during the following few years (Vermesan & Friess 2014, p.9). The tipping point of IoT means that over one trillion sensors are connected to the internet. According to the Deep Shift report that will happen already in 2022. This is expected to lower the costs of delivering services as well as increase productivity in general. It can, however, also change the labor markets and the expected skills required from employees. The future of block-chain technology in platform interactions is more controversial. It certainly has benefits to the platform users, but are the current intermediates in financial markets willing to waive their power? When a technology paradigm meddles with peoples' money, it may take a while, before it gains required trust level from companies and individuals. (Shrier, Iarossi, et al. 2016) While the Global Agenda Council on the Future & of Software & Society believes the tipping point of block chain will be in 2023, there are estimations, the tipping point may be even five years earlier (Anon 2016b). Bitcoin, as a solution related to block-chain, is expected to reach its tipping point four years later (in 2027 according to Global Agenda Council). The tipping point is defined to be reached when 10% of global gross domestic product (GDP) is stored on block-chain. This will mean that all kinds of value exchange can be stored to block-chain and the transparency of those will be increased.(Global Agenda Council on the Future & of Software & Society 2015, p.137,155)

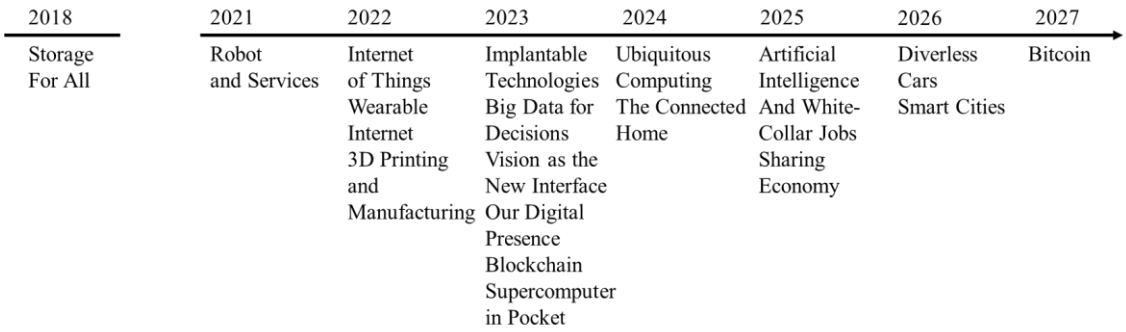

Figure 1.*Average Year Each Shift Is Expected to Occur According to Deep Shift Report* (Global Agenda Council on the Future & of Software & Society 2015)

Utilizing platforms enables value creation to all participants. The power of the platform is based on a new business model where an interactive ecosystem is created by using technology in connecting people, organizations and resources. (Parker et al. 2016, p.15) When the network effects are exploited well, the benefits can be remarkable. The platforms create value – in addition to profits to companies (especially platform owners) – in three ways. Platforms enable actors to connect with each other. An example of this type of value creating platform is Alibaba. Second type of value is in sharing resources – like Wikipedia does. The third type of value comes from common processes, struc-

tures and routines. Credit card companies and their platforms are good examples of this type of value. (Eloranta & Turunen 2016). The widely shared value is one of the characteristics that pull users to the marketplace. The monetization and value capture on the other hand may be divided completely differently.

People are connected to internet constantly – at least most of the time while awake (Simon 2013, p.21). While connected they create data constantly whether they are aware of it or not. The created data may or may not be important to someone. It can be valuable to other network members and therefore it can be considered to be an asset to the data owner (Brown 2016). Together with the technological shifts and megatrends in software and services mentioned above these aspects have caused disruption, which enable the blooming of platform ecosystems. The disruption revolutionizes the way institutions and corporations collaborate with individuals (Schwab 2016, pp.50–53). This profound change has created pressure to companies around different businesses to adopt collaborative business models, embrace ecosystems and even building their own digital platforms (Simon 2013, pp.23–24).

To be successful in the changed environment, the company should have management, which is able to facilitate digital innovation and collaboration. (Gurbaxani 2016) Companies need to understand that actions it takes, effect the whole ecosystem it operates in. Innovations across the ecosystem and the diversity in organizations also effect to technological evolution (Iansiti & Levien 2004). While most of the companies are not really software companies, when operating in a digital platform they should understand the dynamics in software industry. They would benefit, had they begun to act like a software company and understanding that the sources in value creation have changed fundamentally. This has shifted the source of competitive advantage towards software i.e. in this case towards digital platforms. (Gurbaxani 2016)

Like many other countries in the world, Finnish economy has been suffering from low growth rate since the global recession hit in 2008. Low growth in Finnish economy has lasted currently nearly a decade and has led to high unemployment rate. Though there are a group of companies that are still successful and profitable, the general situation is weak. Many Finnish companies need to find ways to improve their financial status. The Finnish government has taken activities to improve the companies' situation by launching key initiatives, which aim to reduce governance and legal restrictions in business. Unfortunately, the activities have not been as efficient as expected. (Harmaakorpi & Rinkkinen 2015) This thesis proposes that platform economy can be a solution for those companies.

The salvation for the recession in Germany was found from the Mittelstand companies. Mittelstand companies are such that have 250-499 employees and less than 50M€ in revenue. For this reason, this study focuses in finding solutions, with which the Finnish Mittelstand companies (a Mittelstand and headquartered in Finland, n=51) could benefit

from platform ecosystems. According to a Finnish research (Ali-Yrkkö & Rouvinen 2015) 30 % of Finnish Mittelstand companies find that their products or services need updating and 32% find sales, marketing and distribution is limiting their growth. In the same study, digitalization is seen as an enabler to improve both products and processes. Especially robotics, internet of things (IoT), cloud services, and big data utilization in some respect, are seen as possibilities and the companies are planning to invest to these areas. Utilizing open data and APIs (Application Programming Interfaces) does not attract Mittelstand companies. At the same time almost all big companies are using open data in some extent. While platforms as an ecosystem share data and connect network members with it, Finnish Mittelstand companies seem to have different priorities.

Two questions are investigated in this thesis:

1. What can be learnt from the international benchmark platforms and the early adopters in Finland?
2. How to enable Finnish companies – especially Mittelstand – to create a platform ecosystem?

Platform economy is nowadays widely researched and especially IT start-ups are well aware of it. The traditional manufacturing focused companies on the other hand, seldom find it to be a possibility for them. In this study the terminology is explained in a manner that manufacturing focused companies can easily relate to it. A tool for designing the platform business model – Platform canvas – is introduced.

This study is conducted as a case study. The first reason in selecting this method was the limited number of research available. Digital platforms and platform economy are a new field of research. Also most of the research has been done abroad and therefore will not be able to pose the attributes relevant to especially Finnish companies and culture. To be able to create solution it is utterly important to understand the special requirements in Finland. Let it be language, size of the national population or reluctance to take risks.

The process begun by selecting the case companies followed by analyzing the companies based on openly available data. The third phase was to create a structure, with which the critical characteristics for successful platform ecosystem were summarized. This is called Platform Canvas. To fill the canvas, required available information was collected from open sources and input to the document. The fifth phase was to interview the Finnish case companies and revise the canvases. The final phase of the empirical study is analysis of the data collected.

The study includes two types of companies – Finnish traditional manufacturers, which have opened their boundary resources and platform benchmarks, which include four international well known platforms and one Finnish company that offers industrial plat-

forms the case companies could benefit from. The study was conducted by collecting public data, interviewing case company representatives and analyzing the accumulated information.

There are two main results in this thesis- platform canvas and learning points from already implemented platforms. After a comprehensive literature review the critical characteristics of a platform ecosystem were defined. The most important ones were included into the platform canvas. The characteristics in the platform canvas are: Value, Producers of value, Users of value, Capture of value, Filtering, Network effects, Governance and Resilience. A few guiding questions were embedded to the canvas to help the user to understand the essence of each characteristic.

The thesis starts by giving an overview of the theories available in literature. The second section explains the research methods used in this study. It covers all phases of the study from initial analysis covering case selection to the methods used in the final analysis of the cases in question. Platform economy is a relatively new field of research and therefore the sources of information are quite limited but diverse. In the third section the findings of the study are presented. The rest of this thesis focuses on discussing what can be learnt from the study and what conclusions to be made according to the findings.

2. LITERATURE REVIEW

A comprehensive literature review was conducted in order to create an understanding how previous research uses the terms related to platforms and platform ecosystems. The target was to be able to utilize common terminology in the results in order to help the companies to discuss about it.

2.1 A Brief History of Platform Definitions

The history of platforms is long, but in respect of digital marketplaces and ecosystems, the term has been used only for a few years. The term platform can be understood in a dozen different ways (Anon 2016a). The definitions can be divided in three types (Simon 2013, p.22): Physical and infrastructure (such as platforms in train stations where people meet, or a standard system architecture in a computer (Anon 2016a)), technological (like cell phones connecting people) and media (like two-sided platforms such as newspapers or television where people consume the content and advertises reach the masses).

Rapid technological evolution, increasing complexity in technologies and increased complexity in (inter)company operations due to globalization have increased the popularity of platform markets. The platform based approach improves standardized offering and enables simplification and rationalization of company operations. Hence, platform approach makes it possible to increase the efficiency and effectiveness of operations as well as variety management. (Mäkinen et al. 2014)

As mentioned earlier in the introduction chapter the platform and platform economy as terms have developed in three phases. During the first phase the term was mainly used by researchers and development engineers, who used the term in describing frameworks of new generation products and services, on which customer or product variations were developed. The product variations were made out of platform modules. For example, Nokia 3310-product family was based on a product platform. The first model was introduced in 2000, followed by other versions during the next couple of years. The phone versions were customized according to the retailer requirements, sales areas and even by consumer wishes (as it had interchangeable covers). In a study made in 2004 (Kristjansson et al. 2004) the platform was defined to be “a collection of core assets that are reused to achieve a competitive advantage”. In the article they reported to have found 14 different definitions of product platforms, which included 12 different types of

reuse – from reusing architectural rules to reuse of interfaces. Already in this research, platform was seen also as a tool for planning, strategic thinking and decision making.

During the second phase platform was understood to be a control point of an industrial value network. This led to the definition according to which platform was a product, service or technology, which one company (or a group of companies) controlled and other companies used as a foundation to their products. Industry standards that establish specifications and procedures to maximize the reliability of products, materials and services (like Wi-Fi i.e. IEEE 802.11 standard) can be used as an example. In 2014, Annabel Garwer and Michael A. Cusumano introduced their understanding of two different types of platform – internal and external platforms (Gawer & Cusumano 2014). Their conclusion was that the reusability of parts and processes is considered to be an internal platform, as those are utilized inside a company or supply chain. The external (or industry) platforms on the other hand are foundations for many companies to utilize in developing complementary innovations. The latter type of platform is expected to potentially generate network effects.

In this study the focus is in platforms as a marketplace, as this is the most recent type of platforms and therefore can offer the biggest opportunity to Finnish companies. However, the existence of internal platforms is accepted. During the study process some of the cases are found to have had an internal technical platform much earlier than the platform as a marketplace.

2.2 Platform as a Marketplace

Today, in the third phase of the development, platform is considered to be a marketplace where transactions between two or more user groups take place. (Ailisto et al. 2016)

In this paper, the focus is on two- or multisided platforms as marketplaces that are executed digitally, hence create a platform ecosystem. In this context, platform makes value creation and capture possible for all participants. It is a business, which enables external producers and consumers to create value by interactions between each other. A platform sets a participative and open infrastructure for the interactions. It is also responsible for the governance of the infrastructure and interactions. The purpose of the platform is to facilitate the exchange of products, which can be goods, services or even social currency. (Parker et al. 2016, pp.3–5) Facebook is one of the platforms where sharing of personal information is in many ways a social currency. It provides value to the friends who read the feeds, but also value for Facebook as it can sell the information to external companies, which find the value from well matched marketing.

These two- and multisided platforms can be considered to be matchmakers that bring members of different groups together. They sell access to the target group or target groups. This type of matchmakers have been used for thousands of years – at least from

money lenders in ancient Athens around 300 BC. (Evans David & Schmalensee 2016, pp.1–2) Today the hype around two- and multisided platforms is ongoing due to the digitalization of the matchmakers. The same rules still apply though. The main difference compared to the past matchmakers, modern platforms are implemented digitally. The digital technology expands the reach, convenience, speed and efficiency tremendously compared to the traditional way (Parker et al. 2016, p.60). The challenge is to understand how the rules of economies differ from the business of traditional production focused companies when the demands of different groups are interdependent. A newspaper – traditional or digital- is a good example. Generating content costs money, which needs to be charged from the customers. There are two types of customers – advertisers and readers. The newspaper has to have enough readers to attract advertisers and vice versa. (Evans David & Schmalensee 2016, pp.31–32) This is called the chicken-and-egg problem (Choudary 2015, p.214). Platforms create value by presence and activity of users. When platforms are starting out their business they do not have much value to offer. It is utmost important to attract users in all sides of the markets.

The aim of the platform is to reduce barriers to participate i.e. reduce friction. Friction can be for example lack of trust in the ecosystem. One example to reduce this type of friction was the launch of AliPay (pro forma system inside Alibaba group). The expansion in sales through Alibaba (big Chinese e-commerce platform) was prevented by lack of trust. Customers did not trust to get the products they paid for from a new seller so the interaction was hindered. Alibaba founded the AliPay where the customer paid the invoice and the seller received the money only after the customer had received the product. After this, the expansion of interactions in Alibaba boomed. Getting friction right is essential to platform success. Platforms must be designed and implemented in a way that balances traction and friction. This way it enables the sustainable and repeatable interactions by balancing the quality and quantity of them. (Choudary 2015, pp.187–188) The opportunity for a platform often arises when there is too much friction in the market, which hinders the different user groups to deal with each other(Evans David & Schmalensee 2016, p.36). Some friction is needed in order to maintain the quality, but it needs to be carefully designed in the system. Well planned friction can increase the trust between the users. In case the friction does not ensure the quality nor increase the trust, it will reduce the traction of the platform. (Choudary 2015, pp.190–191)

The transformation from pipeline to platform requires three shifts. Firstly, the company need to shift focus from controlling its inimitable, scarce and valuable resources to understanding that its most important asset is the network of producers and consumers. Without opening the borders of the company, sharing and increasing the value is impossible. Secondly, the company should orientate more to external interactions instead of optimizing the chain of product activities. The emphasis should be more on persuading participants than in dictating processes. Ecosystem governance is an essential skill in shifting from pipelines to platforms. The third important change in orientation is to fo-

cus on ecosystem value instead of customer value. While competition in platform world is more complicated, the Porters five forces of competition still apply (Parker et al. 2016, p.207,210). The forces behave differently and new factors arise. Companies behind platforms can intentionally manipulate network effects and make new markets and growing the existing market. Also the whole ecosystem created by the platform is sharing the jointly created value. (Van-Alstyne et al. 2016)

2.3 Differences between Platforms and Pipelines

In this subchapter, the main differences between traditional pipeline businesses and platform economy are described. Ten main differences were identified from the reviewed literature. These characteristics were selected to be the main differences as all of them were considered to be important by more than one researcher. The differences are (in alphabetical order):

- Change tolerance (Choudary 2015; Simon 2013; Schwab 2016),
- Data reliance (Choudary 2015; Parker et al. 2016; Simon 2013),
- Disruption (Parker et al. 2016; Schwab 2016; Vazquez 2016),
- Monetization (Evans David & Schmalensee 2016; Parker et al. 2016; Simon 2013)
- Number of market sides (Ailisto et al. 2016; Parker et al. 2016),
- Roles (Choudary 2015; Tiwana 2014)
- Scale (Evans David & Schmalensee 2016; Parker et al. 2016)
- Structure (Evans David & Schmalensee 2016; Parker et al. 2016),
- Trust (Evans David & Schmalensee 2016; Parker et al. 2016) and
- Value creation and consumption (Choudary 2015; Evans et al. 2006; Furr 2016)

In the end of this chapter the benefits as well as weaknesses of the platform approach are summarized. The goal is to provide a comprehensive overview of the required change in attitude when moving towards the platform paradigm.

Change Tolerance

Organizations should be able to operate effectively also in turbulent market situations. This ability is called change tolerance. When a company is highly tolerant to change, it can – in addition to adapting to it – also cause market turbulence to benefit itself from it. (Simon 2013, pp.135–138). In pipeline business the organization can at its widest to be considered to be the supply chain. In platform business the entire ecosystem, which generates value and profit must be tolerant to change (Simon 2013, p.24). While the world is facing the fourth industrial revolution where uncertainty is the prevailing condition, the companies need to be able to adapt to changing world. It is difficult to predict the speed and scale of disruption and the impacts of new innovations. (Schwab 2016, pp.50–51)

Platforms need to be built in a robust manner in order to be scalable and sustainable (Choudary 2015, pp.79–80). Platform managers need to make sure that the quality of interactions is not decreasing when the amount of interactions increase. Platforms need to be able to segregate the high quality contributors from the low quality ones. It is also equally important to develop this ability continuously. (Choudary 2015, pp.292–295) For the quality maintenance the platform owner can use, in addition to previously mentioned curation methods, the boundary resources. The boundary resources will be covered in more detail in chapter 2.3.

Data Reliance

All platforms use data in some extent (Choudary 2015, p.62) and data can be transformed to information. Pipeline companies utilize data, but mostly they collect data internally. Platforms on the other hand can use data in developing and optimizing the whole ecosystem. They can outcompete the traditional competitors with the overwhelming amount of data. Platforms can use multisided network analysis as a tool for improved ecosystem leverage and its ability to generate value to the users.(Parker et al. 2016, pp.217–219) For example, the platform can collect information about, which routes the users use and generate heat maps based on the information. With these the users can find most popular routes and make decision based on facts whether to take them (e.g. if those are popular sport routes) or not (e.g. when trying to avoid traffic jams).

Platforms use technology to collect personal information about their users and customers. These include, for instance, information about the previous purchases made by the user in question or someone like him. Through this data the platform is able to target advertises accurately. (Simon 2013, pp.137–138) Pipeline companies have had customer relationship management systems for years, but many of them are still having trouble in understanding their customers. In some cases, they do not even understand what the profile of a good customer is. In worst cases, the pipelines do not even agree on the definition of a customer. Successful platform companies have understood the importance of profound understanding of customer profile and their requirements. That is why platforms tend to use sophisticated data-mining methods. The better recommendations customers get, the more sale platform creates. (Simon 2013, pp.166–167)

Though many pipeline companies also utilize data in process development, the platforms can sell the data as such. It can be said that successful platforms are effectively utilizing data for monetizing. The more they receive data from the users, the more ways they can make money. Data is used to orchestrate the complete ecosystem. (Choudary 2015, p.38) A good example of utilizing data for capturing value is Google. The sales of advertisements rely strongly on well matched ads and potential customers of the advertiser.

Disruption

Disruption means that a smaller company with relatively small resources can challenge incumbent business and even be successful in it. While the incumbents focus on existing, often profitable, customers, the newcomers can attack to the overlooked product or service segments. The dangerous changes for incumbents are such where the value for the customers increase very fast. The established companies are often too slow to react and the challengers are able to invade the market. (Bower & Christensen 1995) Disruption in industries has several different sources. New technologies create new ways to serve current needs and therefore disrupt the current value chains. Disruption can also be caused by innovative and agile competitors. New patterns of consumer behaviour are a big disruptor, as companies must adapt to those. (Schwab 2016, pp.51–52)

There are three main types of disruption: High-end, low-end and new market disruption (Vazquez 2016). High-end disruption, where the new offering is superior to the incumbents' offering is rather rare in platform as it is very expensive and difficult to make profitable. The incumbent must be challenged head-to-head in a visible way, but also contest the entire customer portfolio. In these situations, incumbents often hit back aggressively. The optimal way to implement a high-end disruption is to partner with incumbents rather than become a direct competitor. This however, is hardly possible in the case of platforms as the platform itself is the new offering. Low-end disruptors make a product more affordable and in platform case they can change the dynamics of the whole business. While they may be less visible at the outset, they are as dangerous rivals. The low-end type of disruption is dangerous, because it comes unexpectedly from an unknown direction. It can be compared to be the threat of substitute products or services, which was one of the Porter's five competitive forces (Porter 1980). The incumbents do not see them coming or they consider them to be unimportant. Suddenly the new market disruptors are challenging the economics and rationale of an entire industry. The platform disruptors effect inside an industry but also stretch the industry boundaries. (Vazquez 2016)

Internet-enabled disruption started already in 1990s, when internet applications created highly efficient pipelines for distributing products. This affected businesses from newspapers to mail order shopping and music companies. Today when entire companies can be built into the cloud, the internet can be considered as a creation infrastructure and coordination mechanism. Platforms are creating completely new business models by utilizing these capabilities. At the same time, digital and physical worlds are converging allowing users to control appliances via internet. This combined to the extended value creation ecosystem create two advantages to platforms over pipelines. These are superior marginal economics of production and distribution and possibility to leverage network effects. (Parker et al. 2016, pp.63–65)

When the disruption is based on products it effects only one industry, while platform based disruption effects beyond industry boundaries. One example is internet music service Spotify, offering “seamless music experience”. When streaming was introduced as a way to listen music not only supply chain of compact discs was effected, but also the cd-player sales collapsed. Also the record companies and artists faced a new challenge as they had to find a new business model to charge the audience. In most dramatic situations the platform can collapse a complete industry. Like Netflix did to the video rental business. On the other hand, the platforms help members of the community to share, earn from and utilize excess capacity. (Vazquez 2016)

The economic advantages alone lead to significant disruption in traditional industries, but the platforms are disrupting in other ways too. Platforms conquer the markets by minimizing the barriers of usage by acting as self-service systems. This way it opens new sources of supply and re-designs the value process. Platforms also inspire people to use products in new ways. This is possible, because of the trust-building mechanisms, like AliPay, which was covered few chapters earlier, embedded into the platforms. (Parker et al. 2016, pp.66–67)

Agile an innovative companies utilizing digital platforms cause disruption when overtaking the market by creating value to the customer in new ways. Business leaders need to understand that the new rivals come from completely new directions and have new rules of competition. They also need to understand that the disruption affects both demand and supply side of the business. Simultaneously, companies can widen their leverage to their customer base by crossing the traditional business boundaries. (Schwab 2016, pp.51–53)

Monetization and Capture of Value

As platform is a business model, it needs to make money to the shareholders. However, the money making dynamics totally differ from the traditional pipeline business. In pipeline industries monetization has quite straight forward principles. Price needs to be set above cots in order to gain profit. In platforms one group of users can participate for free or in some cases the platform owner may even pay them for participation. This means that naturally the other side will then pay more. The side where the platform loses money is called subsidy side and the side where platform makes its profits is called money side. Naturally the optimum case would be not to lose money in either side of the platform, but this is rarely possible. (Evans David & Schmalensee 2016, pp.31–33)

Deciding who to charge, and how much, is a very important question and it has big effect on the success of the platform. Basically there are four pricing choices: Charging all users, charging one side and subsidizing another, charging most users but subsidizing super users, whose presence attracts many other users or charging some users full price, but subsidizing the price sensitive users. The platforms rarely charge all users, because

it wants to courage the participation. While different groups value differently the importance to contact other groups, the platform should use pricing principle where one side is charged and the other subsidized. In some cases, only small portion of the users are attracting a large number of others – like celebrities on social media. In those cases, these few should be subsidized and the major part of users charged full price. A good example are the young Youtubers. Their videos are used as marketing media. Companies like Microsoft give out their products (e.g. Xbox) to the Youtubers, who then use the product in the video and the followers are likely to choose that specific product over the competing product. The difficulty in pricing is to define, when the platform wants to make sure also the price sensitive users stay on-board. Those users are difficult to find and the group may change when the market changes. (Parker et al. 2016, pp.123–124)

Platforms are less likely to survive by focusing on only few profitable customers as their success usually relies on curating a vast number of passionate users and encouraging them to participate actively and in innovative ways. This leads users to become paying customers. (Simon 2013, p.142)

An additional layer of complexity in capturing the value of platforms comes from the billing unit – whether to set the price to access, usage or both. A platform owner needs to consider how price sensitive each group is. This also needs to be considered in pipeline businesses but in platforms the price-value ratio is more complex to evaluate, as all groups are needed for the value creation. For a platform owner, it is also important to understand, which group need which, how much and why. This helps in defining the money side and subsidy side. Finally, the platform owner must consider whether one group controls the interactions. In the case where usage is initiated by only one group, an incentive should be considered to activate this group. While platforms in competitive industries may be able to follow the pricing of competitors, the pioneering platforms have to figure out the optimal principles by themselves. It is also important to remember that the market circumstances change and therefore platforms need to revisit and rebalance their pricing principles regularly to protect their revenue flows. (Evans David & Schmalensee 2016, pp.96–98)

Number of Market Sides

In the world of platforms, the nature of supply changes. When in pipeline businesses are lean and focus on just-in-time inventory (JIT), the platforms do not necessarily own anything. This sharing economy changes the rules of the competition, when traditional firms have to cover the fixed costs, which platform companies do not even have. By delinking assets from value platforms lower the market entry barriers for service providers and producers. This way the number of new sources of supply increase dramatically. Simultaneously the consumer behavior is changing, as people use products and services in different ways than in traditional pipeline businesses. (Parker et al. 2016, pp.9–10)

An example of this is AirBnB, which is probably the biggest company offering overnighting, but does not own a single ho(s)tel. The fixed costs lay on the property owner.

While pipelines normally are single sided, when the process proceeds in only one direction, platforms need to create a multisided marketplace in order to be successful. Multisided marketplace has three key qualities: it serves two or more types of customers, connections between different customers create direct and indirect network effects and a third party has control over the market and transmits the transactions between the customer groups. (Ailisto et al. 2016) Apple owns a good example of a multisided platform. One customer group consists of the consumers who buy the devices (like phones and tablets). Another customer type is the application provider. The consumers' value using the applications and Apple value the revenue stream from that. Third customer group consists of the advertisers. Advertisements are shown during the application usage. Consumers may value the new ideas received from advertisements and Apple gets another revenue stream. Consumers provide ratings of the applications, which other consumers find valuable. All participants produce and capture value.

Roles

The roles in pipeline business and platform ecosystems vary significantly. In pipelines the roles are clear. Supplier produces the value – may it be material, product or service – and the user consumes the value. In platform ecosystems the user may also be producer and vice versa. The names are referring to the roles in value process. (Choudary 2015) If we take Google as an example. When someone makes a search in Google he or she is using the value of the platform. Simultaneously he or she also gives information to the Google search algorithm so that when someone else is making a similar search the platform is capable to give more precise search results. So the person was also a value producer. When designing a platform ecosystem, it is essential to understand how the roles differ from traditional businesses. When the producers are also users of the value, the platform attracts them more.

Scale

Platforms enable scalable growth more efficiently than pipelines. Pipelines rely on gatekeepers to manage the value flow from producer to the consumers. Unfortunately, gatekeepers are an inefficient way to control the value sharing. While platforms grow scale rapidly, because the gatekeeping is automatized by using market signals from the whole community. It can be stated that in previous industrial era the companies were successful when they maximized the economies of supply scale. Today biggest platforms are enabled by expanding the economies of scale in demand side – the network effects. (Parker et al. 2016, pp.18–19)

Simultaneously the selection for the consumer widens. They can find solutions that suit better to their needs and therefore offer better value to them. Consumers no longer need to buy products in bundles and in many cases the producers administrative costs are reducing. Platforms normally are not self-sufficient in creating the value. Hence the matchmakers must pay attention to their business environments. The platform together with the surroundings create an ecosystem. The ecosystem consists of all the infrastructure, institutions, businesses and people, which interact with each other or otherwise effect to the value creation. (Evans David & Schmalensee 2016, pp.7–8) As an example: a digital web based platform will not be feasible if using the data network is too expensive for the user or they find it too slow.

As platforms operate in ecosystems, the scale of operations is no longer accomplished only by increasing resources –labor and other – in the business. Instead, the scale is created by facilitating and leveraging the interactions in the ecosystem. In platform based business it is possible to create huge business with minimal investment. This way of scaling is called utilizing network effects. Network effects increase the value of the ecosystem, as more value is created and changed within the ecosystem. As a result, the ecosystem attracts even more users, the scaling increases and the ecosystem has created a positive accelerating swirl. The bigger the value created, the bigger is the demand for value consumption. (Choudary 2015, pp.74–75)

Network effects in economy means that the benefits a platform creates to its users depend on the amount of users of the platform. There are two types of network effects: direct and indirect effects. Direct effects depend directly on the number of users of the platform. The indirect effects depend on the amount and quality of supplementary and compatible applications. The main metric to measure the success of a platform is to understand the ability of the platform to lure different user groups to be active in the network.(Ailisto et al. 2016) One main benefit in network effect protects the platform from diminishing as users seldom leave a functioning platform. (Edelman 2015).

The more often users participate to the platforms, the more they contribute value in the form of exchanging social currencies such as reputation (Choudary 2015, pp.57–58). Clearly one strength of a platform compared to a pipeline is a loyal and vocal community of users. In addition to creating value to the product, the community has a major role in marketing the platform. Platform companies rarely use significant amount of money to conventional marketing. It relies on enthusiastic recommendations of users to their friends and other social network members. (Simon 2013, pp.140–141)

In order to scale in a manner that ensures repeatability and sustainability of the interactions, platforms need to have a scaling strategy. The strategy needs to cover scaling of production, consumption, social curation, community culture as well as minimizing interaction risks and strengthening of filters through data acquisition (Choudary 2015, p.298)

Structure

Pipeline describes the traditional system currently used by most of businesses that are built around products or services. The value is created and transferred in a step-by-step arrangement. In pipelines producers are in one end of the process and consumers in the other end. Producer designs a product or service, produces it and offers it to the customer, who buys it. It is a simple and linear process while platform resembles more a value matrix (Parker et al. 2016, p.6). The difference is illustrated in Figure 1. The left side resembles the currently dominant pipeline system and the right side the platform matrix. The number of sides in the picture resembles the number of market sides. In the example there are three sides like in a triangle, but for example Facebook has six market sides (Advertisers, Business (senders and receivers), Friends (senders and receivers) and App developers) (Evans David & Schmalensee 2016, p.110). Pipeline depicts a very straight-forward system, where supplier supplies, producer produces and consumer buys and uses the end product.

Platform system is more complex as all connections are in both directions. A producer produces the value, but simultaneously also receives data from the platform and can utilize it to developing its products and processes. Consumers buy the product and simultaneously provide data of expectations and service behavior.

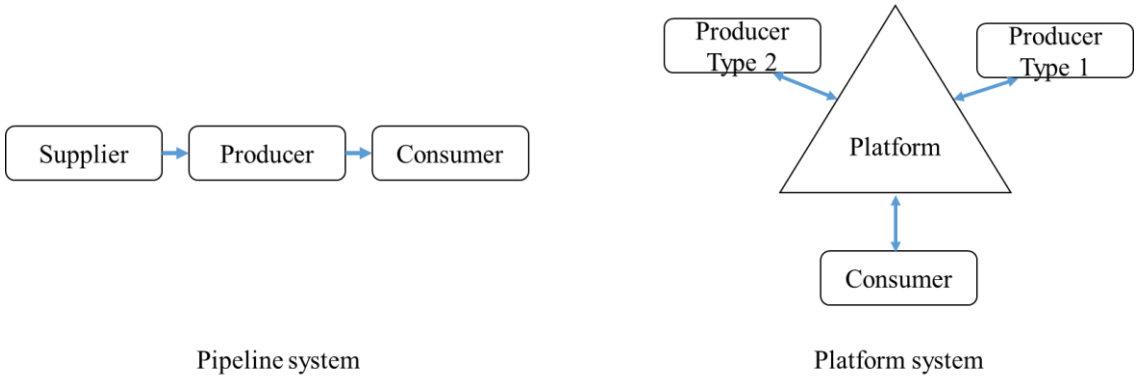

Figure 2. *Simplified illustration of differences of pipeline and platform systems*

A good example of the multisided platform is Google. One type of producer is the content provider like a company website. Another type of producer of value are the advertiser, and the consumers are the users of the Google search. The consumers are also co-producers of value, as Google uses its algorithm to improve the search engine according to the searches made by the users. In these cases, the role is called prosumer. A prosumer can be understood to be professional consumer (Simon 2013, p.6), but in this study, it is describing a mixed role, which is a combination of producer and consumer.

This role is clear especially in sharing economy type of platforms (like AirBnB), where the same person can provide the product (rent out his or her home) and be a consumer (stay in someone else's home). It is relatively easy to identify whether a system is a pipeline or a platform by examining to how many types of groups the system provides value. (Evans David & Schmalensee 2016, pp.15–16)

Many businesses are still pipeline-based, but so far the platform has almost always won, when it has entered into a traditionally managed market (Van-Alstyne et al. 2016). The main reason for that is that the very design of the business is different. While pipelines push value to customers, platforms allow also external producers and consumers to exchange value throughout all groups involved. The platform owner governs the economic and social interactions as it provides the open plug-and-play infrastructure to the participants. This way platforms leverage the ability to create and scale value outside the organization in an open ecosystem (Choudary 2015, pp.25–34).

When designing the platform structure, three key characteristics need to be defined: The participants, the value unit and the filter. This way the core interaction of the value-creation mission is established. To make the core interaction inevitable the platform must attract consumers, create an infrastructure and set the interaction governance principles, which facilitate the value creation, match the right user to another and balance these three functions. This may be conducted by requiring key information during registration phase. In order to attract consumers, the platform has to solve the chicken-and-egg problem. Meaning, it has to figure out, how to attract users to create value before the platform has enough users and therefore value. For facilitating the interactions between users, the platform needs to reduce the barriers of usage. This may be done by establishing technological enablers like a filtering or enabling trust to be built between the users, like user scoring system. To match the user with another with the right product or service, the platform needs to utilize data. The exchanged information becomes more accurate and useful by the increased amount of data and the accuracy of filters. All these functions are essential for the platform success.(Parker et al. 2016, pp.38–44)

Platforms are disrupting the traditional businesses as they transform the familiar processes like value creation and customer behavior. This way they are transforming the structure of major industries and forcing traditional companies to re-evaluate their current business models. Pipeline businesses have an opportunity to start behaving like a platform by connecting multiple products and services and by interacting by using data. When their customers start to engage and be more interactive, new forms of value are appearing also in the traditional businesses. (Parker et al. 2016, pp.73–75)

The platform based disruptive enterprises have a deep societal change. They will give us new opportunities by changing how we interact with each other as well as transform the traditional business rules. (Vazquez 2016) Alibaba in an excellent example of how companies can place an order to a new partner and trust the quality and schedule of the

delivery will correspond the order regardless the fact that the supplier may be on the opposite side of the world. Before Alibaba the distance combined with the cultural differences prevented the commerce, which today is a common business model.

Trust

Trust is always important in business, but in platform systems it is even more essential. Trust is the level of comfort engaging oneself in the platform taken the associated risk into account (Parker et al. 2016, p.192). Platform users often make business with a previously unknown business partner, who may operate in the opposite side of the world. The users have different cultural backgrounds and legal systems. It is utmost important that all users can trust each other – or at least the system. Therefore, platform owner must create a trust creation and curation system. This may be executed with a feedback or evaluation systems like the TrustPass Alibaba created in early 2000s'. (Evans David & Schmalensee 2016, pp.58–60) Another way to tackle the trust issue is to create a curating system, which maintains the quality of interactions (Parker et al. 2016, p.68). The curating system may include for instance ability to remove hostile or impropriate messages from the system. Thus, trust is such an important thing for the platform to succeed that it needs to be one of the key measures at least during the start-up phase of the platform. (Parker et al. 2016, pp.189–193)

Value Creation and Consumption

The value creation in platforms differ fundamentally from the pipeline businesses. In pipelines the value is created by the lean and linear supply chain and every step aims to appropriate maximum value to itself (Cox 2013). In platform businesses all participants create and share value. While the consumer behavior reforms also the value consumption changes. (Parker et al. 2016, p.67)

The challenge in value creation for platforms is to engage enough all types of customer groups as interactions are valuable – not just technology or products. The platform has to attract large number of users and the growth rate is not linear (Furr 2016). The platform has to acquire a critical mass of users in order to ignite. All user groups need to be attracted before value arises. (Evans David & Schmalensee 2016, p.36) Panoptix was a technology platform owned by Johnson Controls. It was a building efficiency solution. It was marketed to be an easy-to-use, app-based, open platform including service and support that would make it easier and more affordable for facility owners to achieve better building performance (http://investors.johnsoncontrols.com/news-and-events/press-releases/johnson-controls-inc/2011/04-10-2011). It was introduced in 2011 and shut down in 2015, because it was not able to attract the critical mass.

Especially when the company has been in a pipeline business and wants to transform its operational model and value offering to platform, attracting the user requires active

guiding in the original value chain. The company itself needs to evolve too. At first, some external complementors are added, then product is supported with blended complementors and community management. Only after succeeding in those, can company succeed in hybrid business model management. The real challenge is to have a viable and flexible business model that is able to capture value both in product business and in hybrid business. (Furr 2016)

Platform can be successful only when it creates long term cumulative value to user groups – especially the producers. The cumulative value can be either reputation, influence, collection or learning filters. Simultaneously all participants should be encouraged to repeatedly participate. (Choudary 2015, pp.184–186)

In recent studies it has been found that the biggest profits are gained, when company has opened its platform to third party technologies and products. These complementing products increase customer value. (Ailisto et al. 2016) A pioneering example of this is the App Store by Apple Inc. At first Apple tried to make everything by itself, but only after opening the APIs and letting 3rd party developers in the ecosystem, the App Store became a success story.

2.4 Benefits and Weaknesses of Platform Approach

There are several benefits in utilizing platforms compared to traditional pipelines but it has also some weaknesses. Hence, the companies need to carefully evaluate and consider, whether the platform is the right business model for them. Each case is unique so there are no direct instructions for platform owners to give. The following paragraphs summarize both aspects.

Benefits

Network effects are probably the most obvious benefit. As described earlier, the increasing number of platform users, increase the value to all user groups. The network effect is the source of competitive advance, which can lead to market dominance (Parker et al. 2016, p.33). For gaining maximum benefit from the network effects the platform ecosystem must attract enough users in all sides of the ecosystem. After solving the chicken-and-egg problem, the platform reaches the critical mass of all user groups. This causes ignition and self-reinforced growth begins. (Evans David & Schmalensee 2016, pp.75–77)

There are four types of network effects: same side or cross side effects, which both can be either positive or negative (Parker et al. 2016, pp.29–34). The types of network effects are summarized in Figure 3 below. When activities of a participant on one side of the market benefit another participant on the same side of the market, the effect is considered to be same side effect. For example, effects the value producers have on other

value producers. Same side effects can also be referred to be direct effects (Evans David & Schmalensee 2016, p.22). When the effect is positive, the benefits increase when the number of users in the same side increases. Early days of the telephone is a good example of this. When the number of phones increased, the value of owning the phone increases as one could reach more people by using it. The same side effects can become negative for example when the number of users or the volume of information exceeds the platforms' ability to serve the customers or filter the information. The cross side effects are created by a participant on one side of the market, but it impacts the participants on the other side if the platform. In this case the value producers effect to the value users. Cross side effects can also be referred as indirect effects (Evans David & Schmalensee 2016, p.25). The positive cross side effect is reached when for example number of customers using a booking system increases the interest of more restaurants to allow bookings to be done through the system. Often the cross side effects work in both ways. Like in the booking example, the more restaurants are available in the system, the more consumers are interested to use it. Cross side effect becomes negative, when the complexity increases too much. For example, in cases when the number of restaurants gets so large that it becomes difficult to find the preferred restaurant.

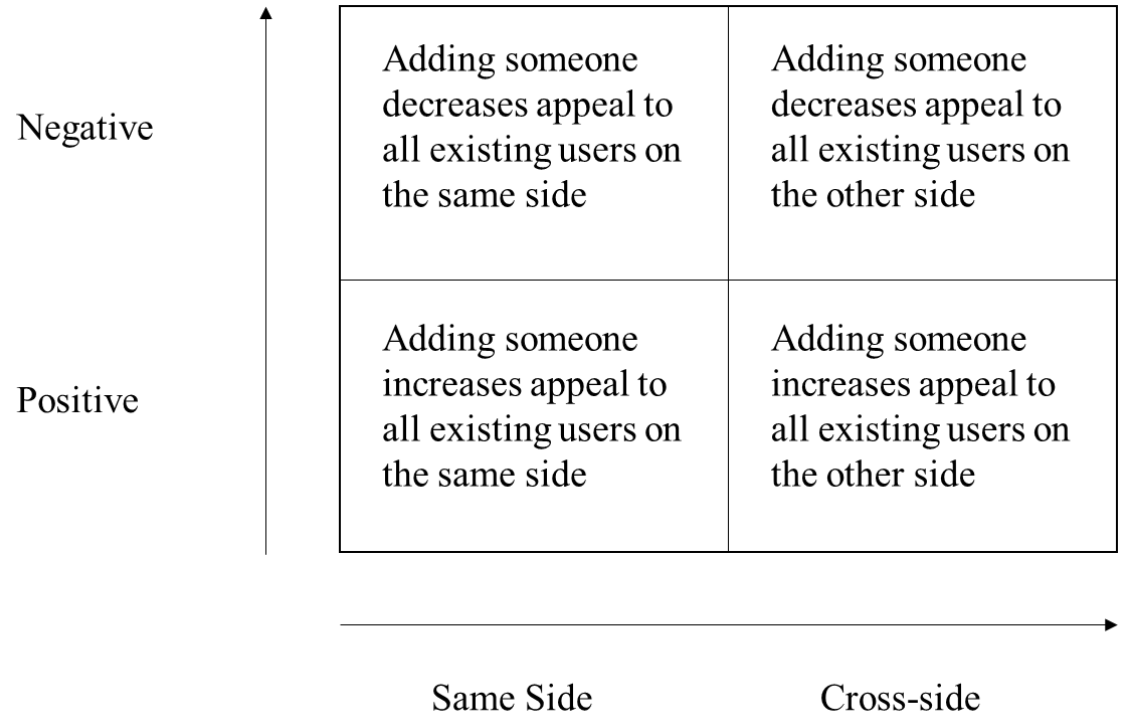

Figure 3. *Four Types of Network Effects in Platforms according to A. Tiwana*
(Tiwana 2014, p.36)

Second benefit in platform ecosystems compared to pipelines is that platforms can scale supply with smaller marginal costs than pipelines. Platforms often can scale without

investments to infrastructure and they usually benefit from low distribution costs. AirBnB is an excellent example of this as described earlier. Both systems utilize internet in scaling the demand. (Choudary 2015, p.74)

When used properly, platforms also enable risk mitigation through diversification. Many businesses have noticed that specialization can be difficult strategy to follow. (Simon 2013, pp.153–155). One part of risk mitigation is the de-linking of assets from value. This enables the platform owner to sell the use of the asset to the biggest economic value. This increases the efficiency and value significantly. The de-linking can be done e.g. by time-slicing the usage of an expensive machine and selling the extra capacity to partners, who need the type of machine, but cannot afford to buy one. (Parker et al. 2016, pp.69–70)

Platforms are also a good tool in widening the brand coverage and increase its value as they support organic user-driven management processes. In many cases the brand has become an icon describing the purpose of the platform – like to Google. This is called with a verb 'branding'. (Simon 2013, pp.155–157)

A great benefit platforms provide is the reduction of needed middlemen i.e. disintermediation. While consumers can interact directly to the producer, services like travel agencies or insurance brokers are no longer required. One can state that the platform owner is a new type of middleman. While traditional middlemen were rather inefficient as their service were rather manual, platforms provide efficient and quickly scalable algorithms and social feedback. (Parker et al. 2016, pp.71–72)

By default, platforms lure great number of companies to the network and through that, they support fast innovation. While all partners are innovating new applications and features can be launched in high clock speed. With active partners the products introduced are probably going to be successful. Naturally the platform owner must also do research and development internally. While innovation becomes success only after it is popular, platforms are an excellent way to spread them. (Simon 2013, pp.161–164)

Platforms also gain significant amount of customer information. They are more aware of the customer profiles and requirements than traditional pipeline companies. (Simon 2013, pp.166–167) In order platforms to be successful, the organization behind it, must be agile and able to predict the future. This make it easy for them to adapt to quick changes in technologies or business environments. When combining these two characteristics, it is safe to say that platforms reach new customers faster than pipelines and are more capable to respond to their requirements. (Simon 2013, pp.167–168) When a platform like Amazon predicts the future, it has massive amount of data from its customers and trends. This helps it to estimate the most probable future.

Platforms also provide reliable and up-to-date information to its users by aggregating the information from multiple sources in often unorganized markets. This makes users' decision making faster, easier and even cheaper. In a long run, it can also develop the market to function more effectively.(Parker et al. 2016, pp.72–73)

Weaknesses

Large companies have historically benefited from barriers to entry to the industry. This means that new entrants have faced challenges when trying to enter the market. Market conditions may have hindered competition by supporting the existing companies. Reasons vary from size of needed investments to existing companies lobbying the officials. In platform world, the physical barrier to entry do not protect platform companies in similar manner. (Simon 2013, pp.31–32) While the physical barriers are significantly lower, platform creates virtual barriers of entry, as the first entrant often has ignited and created a large network. (Simon 2013, pp.158–159)

The pricing is more complicated in platform systems than in traditional pipeline businesses. While pipelines only need to consider the price compared to costs and profit demands, the platform owner need to consider both price level and structure. Meaning that the platform owner need to understand the price sensitivity level of each group and which groups to charge and how much. Platform owner also need to decide, whether it is going to charge per usage or per access. (Evans David & Schmalensee 2016, p.91) Getting the pricing structure and level right is essential for the platform to grow and be profitable in a long run (Evans David & Schmalensee 2016, p.36).

Platforms are often exposed to lure theft, scams and general misconduct. Advertising networks make a lot of money from so called click frauds. Those are clicks generated to cause costs to advertiser without any actual interest to the product. These are often orchestrated by rival companies. Another misconduct is illegal advertising, which is against the platforms terms of service. (Simon 2013, pp.170–172)

As concluded earlier, trust is an important aspect in keeping the platform alive. Misbehaving users, who for instance are not trustworthy, are offensive or mispresenting themselves, eventually hinder the platform usage. Interactions become risky and users leave the platform. Therefore, there has to be a quality maintenance system, which prevents low-quality users to enter the platform. This requires platforms to create an often expensive system and supporting process to pre-evaluate the entrants. (Evans David & Schmalensee 2016, pp.138–139)

One more important thing to understand is that a platform is not genie of the lamp. It is not able to save dying technologies or businesses. It is not a solution, when the actual product is too expensive or out of date. It is more important to see platform as a tool to focus more on customers and their needs. (Simon 2013, p.170)

2.5 Types of Digital Platforms

According to a report about platform economy, which was initiated by the office of council of state (Ailisto et al. 2016), one way of classifying the platforms is to consider the scale of network effects and the readiness of the customers (whether the market pulls the product of requires a technology push). In Figure 4 below, the different types are illustrated in a matrix of these classifications.

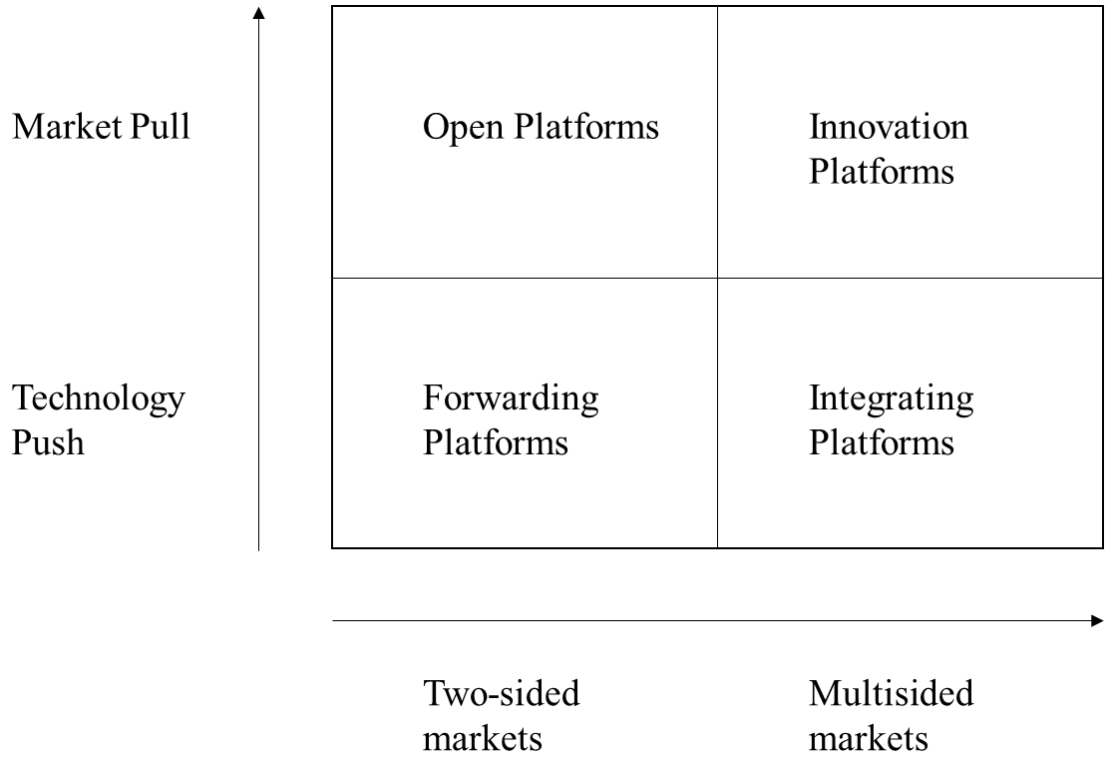

Figure 4. *Platform classifications according to Ailisto et al. 2016*

The first is "Forwarding platform", which reorganizes resources and assets of open markets. These are typical marketplaces for two-sided markets. A typical example of this type is AirBnB, which is a peer-to-peer online marketplace and homestay network that enables people to list or rent short-term lodging in residential properties. When markets start the pull, but markets are still two sided, it is time for open platform to arise. In open platforms, no member of the network "owns" the customer, but all groups try to utilize the free resources to offer new products to new customers. Alibaba trading platform represents this type of platform. If the market stays requiring technology push, but becomes multisided, integrative platforms are needed. In these cases, the key company owns the customers, but focuses on collecting other companies around them. An example of this type of platform is Santander All-in-one (http://www.allinone.fi/?_ga=1.138478963.1965680278.1481655469). It combines all

motoring i.e. car owning related services together. The ecosystem offers new and used cars, insurances and maintenance services with a fixed monthly fee. The target is to create wider solutions and offering to the customers of the key company. In optimal case, the multisided market pulls the platform. In these cases, an innovation platform is required to serve the customers. In innovation platforms customers are controlled in an oligopolistic manner. All companies offer products, which complement each other regardless of the producer. Rules and user experience are kept stable. A well-known example of this type of platform is Apple Store. (Ailisto et al. 2016)

Platform's types can also be described as an architectural stack. All platforms include three basic layers: Network-Marketplace-Community layer, Infrastructure layer and Data layer. The difference between platforms is in the degree each of the layers dominate. Each platform is unique, but three basic configurations can be named based on which layer is the most dominant. All layers play a role, though one layer is dominant. Platform stack of layers can evolve over time. Usually the network effects are built over time, which causes increasing the importance of network-marketplace-community layer. Simultaneously the importance of infrastructure layer becomes proportionally smaller. The platform stack helps defining and executing new platform ideas through describing the difference between platforms. It is the first phase in designing robust platform architecture. (Choudary 2015, pp.60–62)

Third way of classifying platforms is to use its total architecture. In this way there are three types of platforms: Internal platforms, Supply chain platforms and Industrial ecosystem platforms, which are multi-industry platforms. Internal platforms are product and service platforms and applications related to those, which operate within an organization for example intranet-based systems. The supply chain platforms function in closed environment, which is usually defined by the lead-company of the supply chain. These are often extranet based platforms. The industrial ecosystem is normally open to third parties and internet based.(Ailisto et al. 2016)

Fourth way to define different platform types is to divide them into four types, which are: transaction platforms, innovation platforms, integrated platforms and investment platforms. When using these types, the transaction platform acts as an intermediate, which facilitates the exchange between users. Innovation platforms are the foundation on which the third parties are developing complementary products. Integrated platforms on the other hand are combinations of transaction and innovation platforms. The fourth type, the investment platforms- are companies, which have a strategic portfolio of platforms and which either invest to platforms actively or act as a holding company. (Evans et al. 2016)

2.6 Boundary Resources

In order to attract the 3rd party developers the platform owner needs to make sure all required rules, agreements and interfaces are existing and pre-defined in order to enable third-parties individual innovations and operations. After all, one of the important roles of a platform owner is to facilitate the development process, for which the 3rd party developers are crucial to. (Bianco 2013) In this thesis the technical boundary resources are classified according to the study made by Ailisto et al, because it has affected to the selection of the case companies.

There are two types of boundary resources – technical and social boundary resources (Ailisto et al. 2016). Social boundary resources can also be referred as co-operational boundary resources. Though in the literature the co-operational ones seem to be noticed rarely. With the boundary resources the platform owner can either increase or limit the possibilities of application development (Ailisto et al. 2016). In the following chapters the main boundary resources are explained.

Technical Boundary Resources

The technical boundary resources are: Application programming interfaces (APIs), Software Development Kits (SDK) and scripts (Ailisto et al. 2016). When a platform wants to utilize the additional developing resources of external companies, it creates an application programming interface (Parker et al. 2016, p.143). APIs are interfaces between applications and services provided by operating systems. They may also be interfaces between modules in the operating system. The API receives information from the application and gives back information the application requires. The programmer sees the API, but not the actual system module. For example, if the application need to use an object, the API may allocate memory for it and returns a pointer to the application, so that it can find the memory. By using the API, application developer can utilize prewritten code made by the system developer. (Evans et al. 2006, p.27)

APIs are machine-to-machine interfaces with well-defined data structures that are essential for high quality system architectures. They make it easy to share data and processes. As interoperability is a driver of growth in web based businesses, successful implementation of APIs results flexibility and improved efficiency through re-usable artefacts. By utilizing APIs costly repetition of laborious tasks can be avoided and in the best situation even automated. Any organization should consider APIs as a cost-saving measure as systems become more and more online. APIs also make modular system architecture possible (Flanders et al. 2015). APIs can be considered to be doors, through which firms are able to expand to new markets, which were earlier out of reach (Iyer & Subramaniam 2015). According to programmableweb.com there are over 15’000 APIs available and the number is increasing rapidly (Berlind & Santos 2016).

APIs provide multiple ways to generate business growth. They are not just a technical concepts, but strategically significant business opportunities (Iyer & Subramaniam 2015). When a company wants to benefit from API economy, it has to understand what API management requires. First of all, the APIs and documentation related to them has to be published in a portal where from the developers can find them. Second, the developers must have possibility to test the APIs and subscribe them after being identified. The API provider has to also manage the access control and authentication via e.g. API keys. The usage needs also to be controlled and monitored in order to be able to charge for the usage. (Fremantle et al. 2015, pp.368–369)

Software development kits allow 3rd parties to develop applications for platforms. While APIs open the gate, SDKs offer the tools (Ailisto et al. 2016). SDK is a collection of software, which often contains sample code with example programs and libraries. SDKs usually offer technical documentation and some even sample graphics, which can be incorporated into the application. SDKs are usually free of charge, because the platform owners want to encourage the 3rd parties to develop applications to their platform. (Sharpened Productions 2016). It can be said that SDKs provide an easy package for developers, within which they can create a new application without searching the compatible components required to make the program run properly. As its simplest the structure of a SDK includes only a series of APIs and the related documentation. On the other hand the developers can be offered a fully integrated development environments. (Bianco 2013) The third group of technical boundary resources are scripts. This group includes all other technical solutions to enable expanding the functionalities of the platform. (Ailisto et al. 2016)

Social Boundary Resources

The social boundary resources include resources that are “softer” than the digital code, but are equally important in defining the openness of a platform. These boundary resources include largely the legal aspects of the platform co-operation. The agreement between app developers and platform owners are defined in the *terms and conditions*. The ownership of information and intellectual property rights are described in *trademark licensing* document. Both previously mentioned documents are legally binding. *Design review and marketing guidelines* offer instructions and ensure the quality of processes, marketing principles and most importantly those ensure the common user experience. (Ailisto et al. 2016)

The *joint monetization model* is also a social boundary resource. It is important for both platform owners and app developers to understand how the value is captured. Especially when the network effect multiplies the size of the ecosystem. Monetizing is a very difficult question. Any way of charging the user may decrease the amount of users, but not charging at all is a free service, not a business. (Parker et al. 2016)

3. RESEARCH METHODS

The study is conducted as a case study. A case study method was selected since the aim on this thesis is to find out how the Finnish companies have implemented the platforms and also why they decided to utilize this business model. Case study does not give generalizable theoretical results, but is a good method to use, when studying contemporary events especially when it is possible to make direct observations and interview the persons who have been involved in the event. (Yin 2003, pp.7–8). The creating of an ecosystem can be considered to be such an event. There is also relatively small amount of literature available in platform research from the past few years. As the aim of this thesis is to find proposal of practical tools for the Finnish industry and to understand what can be learnt from the early adopters, a case study is an appropriate method.

Finnish manufacturing companies that have opened a platform are benchmarked against international well known platform companies. The study includes two types of companies. The first group includes five benchmarks - four global international benchmarks and one Finnish company, which has potential to become a partner to the other Finnish companies. In the first phase, eight platforms such as AppStore from Apple and Predix (by General Electric) were reviewed so that international benchmarks could be identified. In order to have comparable information in both groups, four companies were selected to the benchmark group. Five companies of the second group were selected from a Finnish publication (Ailisto et al. 2016), which is one of the studies conducted for the Prime Ministers' Office. In addition to these companies, three well know Finnish companies, which have introduced publicly their digitalization strategies, were also included. During the search of appropriate companies, one different, but interesting company providing technology platform was identified. This company provides a technical platform, which could help the case companies in implementing their marketplaces. It has the knowledge to integrate IoT to CPQ (Configure-Price-Quote) platform. Therefore, this company was included to the benchmark group. All Finnish companies selected to the subject group of this study have a history of a traditional pipeline business i.e. they have a physical product (and in some cases also service) to sell.

The initial analysis was done to 24 companies. After this the scope was delineated to manufacturing companies and benchmarks, which lead to eight case companies and five benchmarks (one of which was the Finnish technology platform).

The initial analysis included creating an overall picture of the companies by utilizing publicly available information, mainly through internet. The analysis included basic information of the company, such as operating area, place of headquarter, year of foun-

dation, financials and ownership as well as utilization of social media. Last area was the most obvious – existence of a platform and its history. The financial information included revenue information, available profit information (EBIT, Net income or Operating profit whichever was available) and amount of investment to R&D. The information was collected from the annual reports of the companies and in case of Finnish companies also from through Asiakastieto Oy. In cases of ownership the biggest shareholders were identified from stock exchange information or from the therefore this information was not analyzed from the private companies.

After the initial analysis, the focus was to create a picture of the critical characteristics of a platform. This led to a comprehensive literature review. After reviewing previous literature, 16 sources of information were identified as original sources. Each source had an original set of critical characteristics. Those were collected and similar criteria were grouped together. This lead to 18 different characteristics of which some were mentioned in most of the sources and some just once or twice. The most popular ones were selected to the initial version of a platform canvas. The canvas was tested with the open data available and reviewed by researchers from Tampere University of Technology (TUT) and VTT. After a couple of iteration rounds, a first jointly agreed version of platform canvas was created.

A platform canvas was made of all eight cases by using the open data available. After finalizing those, interviews with the Finnish case companies were conducted online, mainly via Skype for Business (previously known as Lync). The interviews were documented in the platform canvases. In order to ensure the documentation was done properly, the canvases of each company were sent for approval right after the meetings. In these interviews the usability of the canvas was examined. The companies were also asked to tell which the biggest pitfalls in their platform implementation projects have been. The results of these interviews were consolidated into one document characteristic by characteristic. After consolidation the findings were analyzed by searching the commonalities as well as the differences between the cases and the cases compared to the benchmarks.

4. EMPIRICAL STUDY

In this chapter the empirical study process is described. The process begun by selecting the case companies, followed by analyzing the companies based on openly available data. The third phase was to create a structure with which the critical characteristics for a successful platform ecosystem were summarized. This is called a Platform Canvas. To fill the canvas, required available information was collected from open sources and input to the document. The fifth phase was to interview the Finnish case companies and revise the canvases. The final phase of the empirical study is analysis of the data collected. This empirical study chapter will be followed by discussion and conclusions chapters.

4.1 Selecting the Case Companies

In order to find the correct case companies, the public data of 24 companies were analyzed. These companies were found from other studies, websites like itewiki.fi and APISuomi.fi and some are just icons that must be part of platform studies. An initial analysis was done to all 24 potential companies. The initial analysis included basic information of the company like when it was founded, what is its geographical operating area, who owns it and how many employees it has. Secondly the analysis included key economic metrics like revenue, profit information (EBIT or net profit, which ever was available) and how much the company invests in research and development. The economic information was collected from annual reports, magazines, and in the case of the private Finnish companies, also from information provided by Suomen Asiakastieto Oy. The third section of the initial analysis covered the company products. Whether there were hardware products, which kind on platform is available (if any), what the name of the platform is and when it was launched. The last section included information about the interest in social media of the companies. Which medium it uses and how many followers it has. Based on these information, the company was either included in or excluded from the study.

The first group consist of four global firms as international benchmarks for platform economy. These companies are: Alibaba, Amazon, Apple and Predix. The benchmark group also includes one Finnish company, which has interesting offering available. In the first phase also Ernst & Young (E&Y), Daimler (e.g. Moovel GmbH), Panoptix, Uber and AirBnB were considered. The exclusion of these had several reasons. E&Y is purely a service company and this study focuses on companies that have had transformation from a traditional pipeline business to platform business. Moovel GmbH is cur-

rently a set of apps using iOS and Android operating system. It might become a platform, but it is not currently one. Secondly Moovel GmbH focuses more to sharing economy than platform economy. The focus on sharing economy was the reason to not to include neither Uber nor AirBnB to this study. Panoptix was not able to solve the chicken-and-egg problem and therefore it is no longer in business.

The Finnish company in benchmark-group in Wapice Oy. It has already launched an IoT platform called IoT-Ticket as well as a CPQ platform called Summium. CPQ platform helps sales people in selling customized or mass customized products. The sales representative can configure the product in a mobile app during the customer meeting and send the quotation immediately. After getting the confirmation from the customer the order can be transferred to the ERP-system (Enterprise Resource Planning system) for the production to manufacture. The same CPQ can be utilized similarly when selling services. In best cases both products and services are sold in the same CPQ-system. For example, products including freight and possibly even installation service can be quoted by clicking the preferred option.

The second group of companies were mainly selected from a Finnish publication (Ailisto et al. 2016). From that study companies that have opened either technical of social boundary resources were included. One company accepted to the original publication does not have the corporation level headquarter in Finland, but as it was the only one in that particular area of business, it was also included to the list of case companies.

In addition to these companies two well know Finnish companies, which have introduced a digitalization strategy, were also included. Both of these Finnish companies have a history of a traditional pipeline business i.e. they have a physical product (and in some extent also service) to sell.

Using these definitions, 12 companies were selected as cases, four of which were international benchmarks. Those four were included only in the public data section as these companies are widely analyzed by economists around the world.

4.2 Analysis of the Cases Based on Public Information

The Finnish companies differ significantly from the international benchmarks. The first difference is obvious, though in some extent surprising. The benchmarks are on average about 20 years old (though Predix is part of the GE Group) while the roots of the Finnish companies reach on average to 1940s. The oldest Finnish company has been founded already in 1905. Though the variation in both groups is big, the difference is significant. This leads to the second difference between the two groups. Most of the benchmarks are companies of computer era while the Finnish companies are operating in more traditional industries. The third difference is related to the company structure. None of the Finnish platforms is incorporated, but are still part of the platform owner

company. In global benchmarks Predix is incorporated and App store by Apple is not. Amazon started as a platform and included the product business afterwards – both in the same company. Alibaba is a cluster of platforms having a very effective distribution system.

All of the case companies are profitable (except one, but even that has a history of profitability). The profitability was defined by the profit information from the annual reports (EBIT or Net income). All of the companies are big, though the size still differs a lot – both in revenue and headcount vice. A general rule is that all Finnish companies are much smaller than the global benchmarks. Even the size of Finnish companies varies a lot. The biggest company is about 50 times bigger than the smallest one. Both in revenue and in headcount. Two of the companies are subsidiaries of a bigger corporation (both Finnish). Five out of the eight Finnish companies were public. All benchmarks are directly public corporations. The typical investment to R&D in the Finnish case companies was 2% of the revenue. Also in this some variation was seen. The rate varied between 1,3% to 10%. From the global benchmarks the actual numbers are not available, but the importance if R&D is seen important according to the annual reports. The only benchmark company releasing the amount of R&D investment is Amazon. It used in 2015 13,3% of its revenue to R&D.

Most of the platforms of Finnish companies were launched in 2013-14. The global benchmarks have started roughly a decade earlier. The opportunity for a traditional pipeline company to become a platform owner seem to be a more recent idea.

All case companies are relatively active in social media. Typical Finnish platform owner manages 6-7 social media channels. While the benchmarks manage 4-7 channels. All benchmarks have their accounts/profiles in Facebook, LinkedIn, YouTube and Twitter. Those are also the most popular channels of Finnish companies (six or seven out of eight active in these channels). Finnish companies are a little bit more active in Instagram (five out of eight Finnish companies versus 2 out of four international ones). In addition to these some companies are utilizing Google+, Pinterest (idea sharing), Dialog, Vimeo (video sharing) or Weibo (Chinese competitor of Facebook). It seems, that in general all of the case companies are active in social media so there is no significant difference found in there. Having said that, it has to be noted that the volume of followers the global benchmarks have is much greater. For example, when most Finnish companies have in Facebook few thousands of followers (except one, which have over 300 000), the international benchmarks are followed by millions to over 20 million followers. Same applies to LinkedIn where the follower count of Finnish companies can be multiplied by 100 (few thousands to 20 000 followers compared to hundreds of thousands to 2,5 million followers). It is worth noticing that the variation in numbers of followers is big in both groups. When comparing the numbers, it is important to remember

that the current size of the companies and their customer bases are also completely different.

4.3 Platform Canvas

Already in the beginning of the study, it became clear that the company representatives needed to be interviewed in order to get thorough enough information about their process of establishing a platform ecosystem and about the possible difficulties they might have had during the process. The interview should compare the real cases against the theories and see in which extent they are equivalent to each other. After creating the first list of questions, it became evident that some kind of structure was going to be needed for keeping the interviews structured and getting information instead of random phrases. Similar challenge is in strategy creation processes when large amount of data needs to be structured somehow. In strategy process a Business Model Canvas (Osterwalder & Pigneur 2010, pp.12–44) is used to structure the data to become information. For the similar need, a Platform Canvas was created.

During the comprehensive literature review 16 sources – articles and books – were identified as original sources, which were cited in other sources. From the original sources each characteristic, the writer has found important were collected and grouped according to the meaning described in the source. After grouping the terms 18 critical characteristics for establishing a platform ecosystem were identified. Each of the characteristics were given a name that describes it. The summary of these findings can be found from Table 1 below followed by the explanations of these terms.

Table 1. *Sources and characteristics in the lowering order of prevalence*

Source			Platform key elements																	
			Network effects	Governance	Producers	Consumers	Value	Change tolerance	Monetizing	Matching	Traction	Cost of multihoming	Filtering	Facilitate	Creation Tools	Core interaction	Simplicity	Maintainability	Tools for consumption	Metrics
Cusumano, M. A., Gawer, A.	2002	The Elements of Platform Leadership	X	X	X			X												
Evans, D., S., Hagiu, A., Schmalensee R.	2006	Invisible Engines- How Software Platforms Drive Innovation and Transform Industries	X	X	X	X	X	X	X	X		X		X						
Simon, P.	2011	The Age of the Platform	X	X		X		X									X			
Kouris, I., Kleer, R.	2012	Business models in two-sided markets: an assessment of strategies for app platforms	X		X	X			X			X				X				
Tiwana, A.	2013	Platform ecosystems	X	X	X	X		X				X					X	X		X
Bonchek M., Choudary, S. P.	2013	Three elements of a Successful Platform Strategy	X	X			X	X	X		X		X	X			X			
Westhead, M.	2014	Platforms - Two/multi-sided markets	X	X	X	X	X		X			X								
Boudreau, K. J., Jeppesen, L. B.	2014	Unpaid crowd complementors: The platform network effect mirage	X	X	X	X	X	X				X								
Choudary, S.P.	2015	Platform Scale		X	X	X	X						X		X			X	X	
Edelman, B.	2015	How to Launch Your Digital Platform	X	X	X	X	X	X	X	X	X									
Abeysinghe A.	2015	Platform for digital transformation	X	X			X						X		X	X				
Parker,G et al	2016	Platform Revolution	X	X	X	X	X	X	X	X	X		X	X		X				X
Moazed, A.	2016	What is a Platform?	X		X	X	X													
Evans, D., S., Schmalensee R.	2016	Matchmakers	X	X	X	X	X		X	X	X				X				X	
Hyatt, M.	2016	Why you need a platform to succeed	X	X	X	X				X										
Abeysinghe A.	2016	Building a digital enterprise- learning from experience	X				X	X		X	X			X	X			X		X

Change tolerance was referred also as modular, plug-n-play, durable and evolvable. When analyzing the meanings behind the terms, all of them emphasize the importance to be adaptive to change. The platform ecosystem should have open interfaces, modular structure and simple change management process to be agile enough preferably proactively. Second characteristic in alphabetical order is *Core interaction*, which refers to the exchange of value, which is single most important type of activity in the platform ecosystem. At least according to Parker et al (Parker et al. 2016, p.295). Kouris and Kleer describe the similar idea by using term bilateral market power of the platform (Kouris & Kleer 2012). The next characteristic was *Multihoming*, which refer to the expenses the platform participant has to pay in case he or she wants to participate to more than one platform (Tiwana 2014, p.36) and the cost of switching from one platform to another (Boudreau & Jeppesen 2015). *Tools for creation* is the next characteristic. With this the writers like Choudary, have referred to e.g. SDKs, APIs and other boundary resources, which make the 3rd party participation easier(Choudary 2015, p.143). The fifth characteristic found is *facilitation*. This means the platforms' ability to help the participants to exchange value. Let it be the easiness of use, the speed of finding the information etc. (Evans et al. 2006, p.199). The following two characteristics are quite near each other – filtering and matching. *Filtering* describes the algorithms ability to filter a massive amount of data in a way that it enables the quick and precise *matching* of value producer and value user. This way the value exchange is efficient and the platform attracts the participants (Parker et al. 2016, pp.296–297). The eight characteristic in *Governance*. The literature describes this characteristic with several terms, of which governance is the most popular. The others are control, rules, access control and trust. Governance by rules and e.g. access control increases trust within the community. The next characteristic – *maintainability* – could also be considered to be part of change tolerance, but two out of three sources that found maintainability important separated it from the tolerance to change. Hence it was kept separate also in this study. Maintainability includes things like tools or automation of common enterprise architecture practices (Abeysinghe 2016). Two sources also mentioned *Metrics* being important characteristic of a platform ecosystem (Parker et al. 2016, pp.272–273; Tiwana 2014, pp.124–125). Characteristic, which is important in any type of business – also in platform ecosystems – is monetizing the value. The literature refers to this by pointing out the importance of *capturing* the value and creating feasible pricing models that maintains or even increases the traction towards the platform.(Parker et al. 2016, pp.106–110) The most popular and therefore most important of the characteristics is the *Network effect.* All sources refer to network effects. Some emphasize it more than others, but all find it important and particularly specific to platform ecosystems. Nearly as popular are the characteristics producer and user, which were important characteristics according to 12 sources. To the *producer* of the value different scholars refer by different terms. Some use complementors, some market side 1 and some even combine all sides and refer to them only as participants. To the value *user* side researchers refer often also as consumers, customers and end-users. All these terms are used also in traditional pipeline busi-

ness though in the traditional businesses the roles do not mix like they do in platform ecosystems. The three last characteristics were *simplicity, tools for consumption* and *traction*. The traction refers to platforms ability to attract and pull participants (Parker et al. 2016, p.45). The tools for consumption involves for instance widgets, newsfeed or static interfaces (Choudary 2015, p.143). Simplicity means the ease of use (Simon 2013, pp.142–143).

Characteristics were put into order according to prevalence in sources. The prevalence varied between 3 and 16 so that the mean was 6,8 and median 5. As described in Table 1, there were seven characteristics that had prevalence over the mean. When listing the most popular characteristics in three most cited sources, where at least two of them has mentioned the characteristic to be important, a second list of seven characteristics is originated. First six of the characteristics are the same in both lists. The seventh is different. In prevalence list the seventh is monetizing and in the latter list it is filtering. From business ecosystem point of view both were seen important enough to be included in the canvas. The monetizing as capturing value also to the platform owner is essential as platform owners typically are companies, not charitable organizations. The filtering is seen important to all participants. Platform owner aims to have an ecosystem, where the platform continues to attract the participants. This is partly ensured by providing a desired match easily.

The eight important characteristics were decided to be included in the platform canvas. In addition to them, a few identifying information were naturally also included. Those were the name of the platform ecosystem, the name of the technical platform (whether it is an internal or industrial platform), date when the canvas is edited and the version of the document. All of the characteristics were included in a template so that each characteristic had a box where the information could be added. The template can be found in Appendix 1.

After the most important characteristics were identified and selected, a couple of guiding questions were included in each of the sections in the platform canvas (see Appendix 1). These questions are supposed to help the platform owners to evaluate their platforms from different perspectives. While developing the ecosystem potentially for the first time, the becoming platform owner can benefit from pre-defined questions as the way of thinking is much different than in a traditional business. If we take the Value-section as an example. It is not enough to think, which friction the platform reduces. It is equally important to identify all different values the interaction creates and how the platform attracts the users of all sides. The platform owner must have an idea of how the tools and services in the platform solve the chicken-and-egg problem and how the platform keeps the interest of users. Lastly the platform owner should have a clear picture of how the tools and services provided help facilitating the interactions, value creation and value exchange.

The main value in using the canvas is that it guides the user through all perspectives needed and this way ensures that the platform owner takes into account all critical perspectives. One could describe the platform canvas to be a poka-yoke error-proofing tool for organizations planning to establish a platform ecosystem.

4.4 Analysis of the Canvases before the Interviews

When analyzing the filled canvases of the Finnish companies it needs to be remembered, that the analysis is based on public data available and shall be reviewed together with the case companies in later stage. Keeping this in mind it can be stated that the case companies have been eager to start digitalization, but all of the companies have missed some important characteristics of the platform ecosystems. Hence the implementation of platform ecosystems has not probably resulted as much benefits as the companies assumed. In the following paragraphs all characteristics are analyzed in more detail.

The *producers* of the value have been well identified by all the case companies. Nearly all of the companies are partly relying on data created by their machines. This is a positive finding while the diffusion of IoT is increasing every day. Unfortunately, only two of the case companies have started to benefit from the 3rd party developers. Similarly, the *users* of the value have been well identified. Some platform owners have clearly more emphasis in supporting management in decision making while some focus more in improving the efficiency of machine itself or supporting the designing a personalized machine. Only one of the case companies has created a platform ecosystem to the traditional consumers. This might be the reason why their ecosystem is taken into account several types of users from 3rd party developers and B2B partners to individual consumers.

The defining the *value* the ecosystem provides to the users is also defined in all cases. Surprisingly, less than half of the case companies have identified a clear value to a 3rd party representative. This may hinder significantly their ability to gain positive network effects as the value creation is limited to a two sided market.

The situation changes dramatically when reviewing the *filtering* capabilities of the ecosystems. As mentioned earlier in Table 1, filtering is seen by the academics as one of the most important characteristics. When examining the case platform ecosystems nearly half of the cases do not have any clear filters and from the rest half have only predefined profiles for filtering. Only two companies have flexible matching system by letting the platform user to decide, which filters to use in order to find the best value. The situation is even worse when investigating the ability to increase revenues and profit with the ecosystem. It seems that most of the companies see that the main *capture* the platform ecosystem can offer is to sell more. The actual value created by the platform is given free of charge to the ecosystem participants. All participants are subsidized and all

costs are carried by the platform owner seemingly in order to gain more machine sales. This leads to rather low utilization of potential *network effects*. All case ecosystems have potential to positive network effects. All ecosystems have potential in either same side and cross side network effects, some even both. Most of the potential network effects are same side effects i.e. direct effects. For example, platform users can utilize designs made by other users or they can find ways to utilize their products that other users have found beneficial. The potential indirect effects are most evident in the case, where the platform is embedded into the product the company manufactures. In this case e.g. production hours and productivity information can be shared with the client. This reduces the amount of required manual reporting and more clients are likely to get interested in the platform. Neither the user amounts nor revenues from the platform are available, so the amount of network effects is difficult to define. However, when the 3rd parties are mostly not participating and the case platforms are not famous in international magazines, one can estimate that the potential has not realized yet.

An important characteristic in ensuring the users that they can trust the platform is to have good *governance* process in place. The ecosystem needs to be open enough, but not too open. Nearly half of the ecosystems do not have clear governance system in place. The only limitation for the participant is that they in most cases need to own a product made by the platform owner. Two of the case ecosystems have a simple registration process and one clearly states that offensive material will be removed from the platform. The positive side in governance characteristic is that the platforms seem to be easy to use, which should attract the users.

The final set of characteristics is the *resilience*. In platform canvas the resilience is measured by the level of utilizing boundary resources. Almost all case platforms have open APIs available. Nearly half offer SDKs, but only two readymade scripts. In social boundary resources the situation is rather similar. Modularity is well in place and platform owners require to accept their terms and conditions. The design, review and marketing guidelines as well as trademark licensing procedures are in place in only one platform. This can be explained by the fact that 3rd party designers are mainly non-existing. The level of boundary resources in use is illustrated in Table 2. Due to confidentiality reasons the companies are coded with spelling alphabets.

Table 2. *Existing boundary resources by anonymized case companies*

Boundary Resource	**Company**							
Technical	**Alpha**	**Bravo**	**Charlie**	**Delta**	**Echo**	**Foxtrot**	**Golf**	**Hotel**
API	X	X	(X)	X	X	X	X	X
SDK	X	-	-	-	X	-	X	-
Scripts	X	-	-	-	-	-	X	-
Co-operative								
Trademark Licensing	-	-	-	-	-	X	-	-
Terms & Conditions	X	-	-	-	X	-	X	-
Design, review and marketing guidelines	-	-	-	-	-	-	X	-
Modular	X	-	X	-	X	X	-	-

The situation in utilizing boundary resources looks to be polarized. Half of the companies share none or only one boundary resource. The other half has shared both technical and social boundary resources. Company Charlie has not yet opened an API, but has made a decision to open them. Another thing to be noticed is that the level of implementation in technical boundary resources seem to be higher than in social ones. Also only one company has not opened a single technical boundary resource while the corresponding number in social resources is three. APIs seem to be quite well implemented, but design review and marketing guidelines are mainly missing. This leads to a dilemma, where 3rd party developers do get the tools to make applications, but no rules or guidance to the implementation. When this is combined with the fact that trademark licensing is another weakly implemented boundary resource, there is a risk that the trademark and brand of the platform owner can be effected by 3rd party misbehavior.

The difference compared to the global benchmarks is significant. Boundary resources the global benchmarks have opened can be seen in Table 3. It is fair to say that the international benchmarks have opened all boundary resources they can possibly need in in order to maximize the network effects. A positive finding is that the Finnish benchmark has opened its boundary resources diversely also. In addition to opening all technical boundary resources it has also taken into consideration the social boundary resources started to open those also.

Table 3. *Existing boundary resources by benchmarks*

Boundary Resource	**Company**				
Technical	**Alibaba**	**Amazon**	**Apple**	**Predix (GE)**	**Wapice**
API	X	X	X	X	X
SDK	X	X	X	X	X
Scripts	X	X	X	X	X
Co-operative					
Trademark Licensing	X	X	X	X	X
Terms & Conditions	X	X	X	X	X
Design, review and marketing guidelines	-	X	X	X	-
Modular	X	X	X	X	-

In addition, when considering the sources, from which the Finnish cases were selected, the utilization of boundary resources gives more positive picture than the real life situation is. In fact, when the openness in the most open companies looks like this, it can be concluded that the implementation rate in Finnish companies low.

4.5 Interviews

The interviews were held during October 2016. Six of the eight Finnish case companies participated to the interviews. Most of the contacted companies, were happy to be interviewed, which was critical as there were only a few companies in total to fit the scope. Even though everyone in current business life are very busy and time is very valuable resource. The interviews were conducted via Skype. Each of the interviews took about one hour. All participants received information package of the research project as well as the platform canvas filled with the open information of their specific platform ecosystem. The information package was sent to the participants already after the first contact so that enough time was ensured to get familiarized with the subject.

One of the Finnish case companies revealed that they have been developing their platform for over a decade. The first attempt to provide this type of service was already during the early years of this millennia. Though they were not successful with the first version, it shows that there is innovative entrepreneurship and courage in Finland.

There was also an interesting finding concerning the organizing the platform ecosystem development in companies. The responsible organization in case companies varied a lot. It was either sales, marketing, technology development or information management. Bit surprisingly in one Finnish case company no responsible organization - let alone responsible person – was found despite several attempts. Therefore, it was impossible to conduct an interview with them. The most common responsible organization was a business development organization. However, even that had some variation. Some

companies have included strategy development to business development and some companies are focusing in service business development. When taking into account that only eight companies were selected as cases, it can be said that the platform ecosystem development is clearly searching its place in the organizations. Currently there is no common way how to organize it.

In the interviews, the canvas in question was reviewed characteristic by characteristic. The company representative had the possibility to correct and modify the conclusions made according to the open information. In addition to the characteristics, the company representative was asked to tell which the success stories in their project were, which the pitfalls they encountered were and whether the company has a clear strategy for digitalization. The final question covered was about the feasibility of the canvas.

4.6 Analysis after the Interviews

Already after a couple first interviews it became evident that person who is not working in a particular trade, cannot analyze the quality of a platform ecosystem by using only public data available. The public information gives only rough approximations of the status and feasibility of the platform ecosystem in case the analysis is done by a person outside the business in question. Especially the value capture is very difficult to describe and analyze without deeper knowledge about the market. The best results were reached when the company representative was open and searching for ideas for developing the existing platform.

Most of the companies have created the platform by internal resources. The companies have also spent quite a lot of effort to ensure the systems are safe to use and hackers would not find it interesting enough to hack the platform. It is safe to say that technical knowledge is in place. The platforms are well implemented in technical respect. For instance, the users can utilize predefined reports, but they can make own databases for reporting purposes also.

Some of the companies have faced difficulties after launching the first version of the service as they realized that they did not understand the business of their customers well enough. This lead to the situation where they were not able to understand the friction to be solved well enough and therefore failed to create value the users needed. In general, the network effects are both hard to describe and utilize.

Most of the case platforms are just trying to attract new users in order to gain enough data and solve the chicken-and-egg problem. This means that the monetizing has not been implemented, or even considered, yet.

Companies find it valuable to own the big amount of data stored in the platform. This is seen to potentially be used for creating new business opportunities in the future. How-

ever, so far only one of the companies have clear plans to capture extra value from the platform. They plan to open a marketplace for a document type of product, which typically several companies have done and spend a lot of money unnecessarily, but after implementation of the marketplace the information could be shared against reasonable amount of money. This company is planning to multiply the current business and to change the whole market.

Another case company has faced the fact that nature of data stored in their platform was obstructing the growth of their platform. The data is relating to individuals and therefore very sensitive. Using it is strictly governed in most countries. Many ideas of developing the platform has been ruled out, because of legal aspects. In order to grow the platform has to target its offering to new business areas. It remains to be seen, will the platform be able to solve the problem and to gain eventually substantial benefit from the network effects.

Two of the interviewed companies co-operate with learning institutions. They have donated their software's to the institutions. Through this they believe the students will demand the same system to work with when they are employed after graduation.

83% of the interviewed companies found the main benefit from their platform to come from increased product sales. Half of the platforms are embedded into a machine and therefore require a large investment to be made. The systems can read information created by machines made by other manufacturers (as long as the data is in standard format). The companies that monetized the platform itself typically used regular fees by the amount of use (per user or per activity etc.). One used a license fee also together with the service fee.

The value is mainly captured by two sides of the platform, but in two cases only one side gained the value. In these cases, there was a clear special reason why it was so. One platform was focusing in growing the user amount and did not want to charge any market sides. The other company was had special type of data and had not so far been able to solve the confidentiality issues.

The main challenge is in utilizing the network effects. Half of the platforms were benefitting from any network effects at all. All of the platforms had the potential existing, but the means were not found yet.

4.7 Learning Points from the Benchmarks

In this chapter some key decisions in the history of the benchmarks are introduced. In addition, also some key attributes of the platforms are briefly presented.

The dot-com bubble nearly killed Amazon. In early 2001 it made the biggest ever annual loss. Still in January 2002 it became the first online retailer ever to make profit.(Simon 2013, pp.43–44) In 1997 the founder of Amazon, Jeff Bezos, has said that though the company could be profitable, it would be the biggest mistake it could make. He believed that it was more important to invest all extra money to developing the company.(Mahajan et al. 2002) Amazon chose the "get big fast"-strategy and managed to survive. Bezos understood that it is important to be able to be the first company in the market to be able to "make a significant move in a market". It is not enough to be present first. The significant change Amazon provided was clearly more simple buying process – it was the first company to take registration in use. Customers did not have to give all needed information during every time they purchased something. Amazon focused on *improving customer experience.* To top it off, other companies needed the same feature and Amazon got *licensing* income. (Simon 2013, pp.45–47) The third important aspect is *recommendations* based on business intelligence. Customers appreciate getting recommendations for what to buy. These can be given based on the information, what other customers have bought, ratings they have given. Amazon has created a system that can be taught to give better proposals over time. (Simon 2013, pp.51–54) Also Apple uses similar recommendation system. Its Genius-system uses collaborative filtering in creating playlists in iTunes. Collaborative filtering means that the system is able to filter information or patterns by using collaboration of multiple agents, data sources etc.

Another common factor Apple has with Amazon is the will to be innovative. Both of the companies seem to have the ability to see the future. Both of the companies also understand the importance of customer experience. For Apple it has for a long time meant simplicity, ease of use, which lead to the customer to enjoy using their products. Though Apple started to use this philosophy already with its products, the same applies to its platform. (Simon 2013, pp.67–70)

To open the platform for third-party developers was not an easy decision for Apple. When it created the iOS operating system, Apple had total control over it. No third party was able to access it. Apple did not want anyone to "pollute its integrity". Basically all applications (web-based excluded) for the first iPhone were designed by Apple. Soon after launching the first iPhone, Apple released the first software development kit and few months later launched the App Store. Luckily for Apple, it understood the importance of *co-operation* with partners, developers and suppliers. Apple still has the control, over which application is accepted into the App Store. After a while it became

evident that the third-party applications were the solution for the chicken-and-egg problem of smart phones. In 2015, eight years after the launch of App Store, there were 1,5 million apps available. Had Apple kept iOS closed, the company would look completely different today. (Evans David & Schmalensee 2016, pp.115–118)

Jack Ma, the founder of the third benchmark, Alibaba, started the platform, because there was a clear *friction to be reduced*. The telecommunication in China was so poor that Internet was to be a fast and cost efficient channel to ensure business information to flow. (Evans David & Schmalensee 2016, p.59) Also he understood the importance of putting customer first. (Clark 2016, p.106) Alibaba is a good example of the challenge many new platforms face. Getting the platform big enough requires time and especially money. Collecting enough *capital* may be very difficult. One has to convince the venture capitalists to invest to a project, which in many cases seems to be a black hole sucking limitless amount of money and giving no profit.(Clark 2016, pp.111–119)

Another challenge Alibaba had in its early days were lack of *trust* between the market sides as seller did not know whether the customer is never going to buy the purchase (Clark 2016, p.121) and vice versa. Alibaba solved this by creating AliPay – a system where customer pays when making the order, but the system releases the money after the goods are delivered.(Evans David & Schmalensee 2016, p.62)

Alibaba is, like Amazon, providing cloud services also. Its vision is to utilize big data in helping Chinese manufacturers to improve communication throughout the whole supply chain. The cloud services are important part of the business of Predix also. Predix is one the operating systems for the *industrial internet*. It aims to connect machines, data and people on industrial internet.(Kellner 2014) Though Predix is an industrial platform it has created a comprehensive *supporting* network and *community* for *developers*. This enables it to benefit from *network effects*.

Wapice has indicated that using CPQ has increased sales. In some cases, even tens of percents. The actual numbers are not disclosed as those are company confidential information of their customers. Being able to make the quotation promptly even during the customer meeting, reduces the risk that customer changes his mind. Additionally, customer can instantly make changes as needed. Using the graphic modelling rules (mass)configuration is possible within minutes. Today all companies have their data in their own servers, but technically a cloud based marketplace is feasible already today. Similarly, the IoT-solution is already viable. It enables operational efficiency and business model innovation for industrial companies. The platform supports supervisory monitoring, control, automation and advanced reporting functionalities. It is able to adapt industrial standards and it allows efficient condition, maintenance and reliability management. Being big data enabled analyzing large amount of historical data is easy.

5. DISCUSSION

In this chapter the findings from case companies are reflected to the theories. The aim is to be able to find the possible contradictions and if any found, whether those challenge or reaffirm the theories. First to be reviewed are the critical characteristics. The review includes the theoretical review of the canvas – what was included and some excluded characteristics – followed by the review of the implementation of the critical characteristics in the case companies. Then the managerial implications of the platform approach are reviewed. The last subchapter covers success stories and pitfalls the case companies have experienced.

5.1 Critical Characteristics

The critical characteristics were selected through an inclusive literature review. There is a lot of variation in the sources in what characteristics are considered important when developing a platform ecosystem. Arguably this stems from the short history if digital platforms. However, in order to make a tool for the forthcoming platform owners, some guidelines are needed. The elements of the Platform Canvas were selected based on how often they appeared. While it was a sensible way to select the characteristics some interesting aspects were excluded – or at least not made clear enough. These aspects were: Core interaction, Pull-facilitate-match, Innovation and Platform stack. These are reviewed in the following chapter.

Additional Aspects in Literature

The core interaction describes the most important activity on the platform (Parker et al. 2016, pp.38–44). It includes three factors: the participants, the value unit and the filters. All of these factors are included in the Platform Canvas. The importance in understanding the core interaction is to be able to use the Platform Canvas as designed. In order to define the core interaction both value producer and value consumer roles need to be described in detail and understood thoroughly. It is also important to understand that the role of the user may be different in different interactions. Whereas many types of users may play the same role in the interactions. As an example: in Facebook, a company or a customer may make a status update in their own page, both of them can also receive the update and even react to those. The company may also make an advertisement in the ad column. The second factor in core interaction is the value. Each and every interaction in a platform starts from creating value by the producer. The last factor in defining the core interaction is filtering, which is also included in the Platform Canvas. The filters are

based on algorithms. Those software-based tools enable the exchange of value between right producers and appropriate consumers. Each platform has to manage the exchange of value by using the filters. To ensure the core interaction, all of these three factors are important to be remembered when designing the platform structure.

The second aspect to remember is *the pull-facilitate-match* (Parker et al. 2016, pp.44–49). While the core interaction described why the platform is existing, the pull-facilitate-match describes, how the interaction is enabled. In order to be successful the platform must pull users, facilitate the interaction between them and match producers and consumers effectively. While the pipeline business relies heavily to pushing the products and services to consumers, the platform has to be able to pull the users as they are part of the value creation. Users won't come to platform unless it has value and the value exists only if the platform has users. The chicken-and-egg challenge is profound and needs to be solved before the platform can be successful. The case companies in this study have the possibility to avoid the chicken-and-egg challenge as they are all building their platforms on the foundation of an existing pipeline business (Parker et al. 2016, p.59). The second thing a platform must enable is facilitating the value creation. Unlike pipelines platforms do not control the value creation, but they create an infrastructure where the value can be created and exchanged. To facilitate the interactions, the platform needs to reduce barriers to usage as well as provide tools for collaboration. In reducing the barriers, the platform has to be careful as it needs to balance the openness and trust. The final key activity for a platform is matching the users with each other. This way it can ensure the most relevant exchange of goods and services efficiently. To get the right data, the company has to develop a data acquisition strategy, which takes into account the differences in users' willingness to share their data. The data available may be very diverse. The platform can improve its ability to match by getting more data and improving the accuracy of the filters it uses. All three aspects are again equally important in ensuring the success of a platform. All characteristics needed for the evaluation of the platforms' ability to pull-facilitate-match are included to the Platform canvas. However, one has to understand these aspects need to be considered when designing the platform.

One thing, which has not been evident so far, is that the platforms should also encourage innovation. While platforms are open and even require partnerships, it cultivates innovation. Platform partners are incentivized to innovate and this way spreading the charm of the platform. The beauty is that even a small and agile start-up can have much to offer to a giant platform simultaneously the start-ups benefit also by getting the attention of possibly millions of platform users. While the products may have been the baseline of pipeline companies, they are about be seen as part of the overall offering of the platform. (Simon 2013, pp.160–164)

The last aspect for the platform developer to understand is the architectural framework, on which the platforms are based on – referred as Platform Stack (Choudary 2015, pp.60–65). Each platform has three distinct layers. Depending on the type of the platform each of the platforms has a unique stack of these layers. The first layer is called network or community layer. This includes the participants and their relationships. This layer may connect users directly to each other or to a community through the layer, depending on the requirements of the value sharing. To enable value creation, platforms need an infrastructure layer. It is used mainly to enable external produce on to of this infrastructure. On development platforms (like operating systems) this layer is dominant. The third layer – data – is needed in cases when there is too much value creation in a platform a third layer is needed to ensure the efficiency in searches. Every platform uses data. The data layer is needed to enable efficient matching of relevant content. There are three basic configurations of platform stack. In marketplace/community platforms where the network is the key source of value, the network layer is dominant. In infrastructure platforms the infrastructure layer is dominant. The third one is self-explanatorily data platform, which has a dominant data layer. All layers are needed to have a successful platform. This aspect is not clearly covered in the Platform Canvas, hence the platform owner has to evaluate this separately.

Implementation in Case Platforms

The critical characteristics were defined by the literature review. The most important ones were collected to the platform canvas. The characteristics mentioned in the platform canvas are: Value, Producers of value, Users of value, Capture of value, Filtering, Network effects, Governance and Resilience (see Appendix 1). The key findings of all of these are addressed in this chapter.

A positive finding was that *value* was defined in all cases. Utilizing data to create information for improving efficiency is the most important and common value created in case platforms. Another popular value is reducing the number of different interfaces. Some case platforms also provide work instructions or part libraries for product designers. Only one case considered sharing the information being the key value. One case found an important value to be that the reports from the platform provide full traceability and can be used as quality report. The theories put more emphasis on the sharing aspect in platform ecosystems than the Finnish case companies.

Producers were also well identified in all cases. Mainly the value producers were machines supported by information inputted by operator. 3rd party app developers are very rare. Only one platform has 3rd party app developers. All platforms can read data produced by machines made by another supplier as long as it is in standardized format. The lack of 3rd party app developers may become a growth hindering factor. All Finnish case platforms are B2B-platforms in a very narrow industry each. The amount of users is likely to remain smaller than in B2C platforms, or in cases like Predix, but that does not

mean the platform owner has enough resources to develop all applications their customers need.

Users of the value were clear to all platform owners. Mainly the platforms are designed to provide analysis of the big amount of data collected in it. They provide access to readymade reports and/or access to data, from which the customers can create reports for their particular use. Only one platform uses user data to focus their marketing better. None of the platforms are currently selling the data to an outsider, but one has considered it.

Though *filtering* the value to match the user needs was seen as one critical characteristic in the literature, is not even considered in half of the cases. Two has predefined filters to different roles and two wide range of different filters, from which the user can select from. The reasons can be that the platform was in three cases embedded into the product the company sold, the customers can make reports by themselves and the fact that the platform is focused to business customers. Still some filtering was expected to be in place.

When the missing filtering was a surprise, even bigger surprise was the lack plans of monetizing and *capturing the value* from the platform to the owner. The platforms were still in pull phase and therefore only three were having any license or user fee. This is understandable and typical according the literature also, but surprise was that some of the platforms had not even considered how to monetize the value in the future. In three platforms the major value was seen to come from selling more products. Luckily some positive examples were existing. One had clear vision of creating a marketplace and another was considering to possibly sell the user data to outside companies.

The *network effects* are not benefited to the full potential, though those research proves them to be the major asset in platform ecosystems. One of the platforms is including sensitive information, sharing of which is legally restricted. This platform has compelling reason not to take advantage of the cross-side network effects, but even it could benefit more from the same side network effects. Two of the platforms are making cooperation with learning institutes and planning to increase the platform pull this way. Many of the platform owners have not considered the network effects at all. This seems to be in relation to the thoroughness of planning the capture. The same companies that have clear understanding of the ways they plan to monetize, also have the clearest understanding of the possible network effects.

The final characteristics are the boundary resources under the conjunctive factor, resilience. The boundary resources – both technical and social – are seen important in the literature. Despite this, the Finnish platforms have opened only some of their boundary resources. This will diminish the success possibilities of the platforms. Especially the social boundary resources, like trademark licensing and design and marketing guide-

lines, are poorly implemented. This may have serious effects on the brand management of the companies and it needs to be considered as a risk to the company. In case the 3rd party developers are making applications that do not work properly in the platform, the platform brand can suffer.

IoT is a major factor in most of the Finnish platforms. While the Deep Shift -report (Global Agenda Council on the Future & of Software & Society 2015) is claiming that the IoT tipping point is about to be realized in 2022, the Finnish companies have been aware of it well in advance. However, the IoT as an enabler of increased revenues and profits has not been considered well enough. A marketplace capitalizing IoT in its full potential is still an opportunity waiting to become reality.

According to the interviews half of the interviewees found the platform canvas to be a valuable concept for managers and directors in strategical level. It was also found to be a clear and structured approach, though some facilitation was still clearly needed in using it. The other half had no clear opinion about it. In companies, where the platform owner was in more operational level, the canvas was not seen to give any value as such. In the beginning of this research the canvas was seen potentially giving value to the rivals also when analyzing the success of another platform. This might be too difficult task even with the tool. One needs to understand the business in question thoroughly in order to be able to analyze the platform success factors

5.2 Managing the Platform Approach

The platform management and cultural aspects in companies are summarized in this chapter. The main findings relate to managing the openness of platforms, the ownership of platform development in the organizations and the phase of lifecycle the platforms are now.

Some of the companies protect their platform information very strictly. Not only were they protecting the future visions, but also some of the companies revealed nothing more than the public information created mainly to marketing needs. This may be partly a trust issue, but quite clearly it was also depending on the company culture. Utilizing internal resources in coding the platform is common. This is seen as a way to make it hard to imitate the system. While this is an important aspect to remember, the companies also need to remember that it is equally important to share the code and scripts in order to enable the 3rd party application designers to develop the complementary applications. The companies also prefer using their own developers in creating the code, though there are service providers in the market. Keeping the balance in *managing the openness* is essential in ensuring the success of the platform ecosystem. In platforms the value is created by the interactions between market sides. The system needs to be created having this in mind. (Choudary 2015, p.88) The value of openness apparently has not

clarified to part of the case companies yet. This leads to a question, whether also more companies are not providing platforms, because they still think they are the masters of knowledge and do not want to open their business. A change in ways of thinking and in company cultures is required.

The business ownership of platforms in the case companies vary a lot. This probably results from the fact that platform ecosystems is a young business area. Similarly, in early 1990's the ownership of quality systems was varying, before most of the companies ended up creating a separate quality organization to support the maintenance of the quality system. It can be expected that in the future the platform management will similarly find its place in the organizations. Whether it is in the sales, marketing, business development or information management. It might also be a separate organization managed by a Chief Platform Officer. Where ever in the organization the responsibility lies, it has to be clear to the whole organization as well as all market sides of the platform.

Most of the companies are currently focusing in ensuring the platform is pulling new users to the platform. Some of the companies had clear target on the magnitude of the amount of users they need, before the best value could be gained. The companies, which had identified the different phases of developing the platform had the clearest vision and strategies also. The same companies also had a clear view on how to capture their share of the value exchanged through the platform. None of the companies revealed the profitability levels of their platforms. This is quite understandable as the ecosystems are just on the first phase and focusing in pulling new users.

Finnish platform companies are all active in social media. This should give them visibility as soon as they get enough followers. There are no specific number of followers a platform should have in order it to be beneficial to the platform. Using the social media is a good start anyhow.

5.3 Success Stories and Pitfalls

Luckily, there are case companies to study and interview. During the interviews the companies were asked to share learning points from their platform projects. The main findings are summarized in this chapter.

In case a company wants to create a platform ecosystem around sensitive information – let it be military, health or other legally protected information – it should very carefully evaluate all current and possibly forthcoming barriers. Not all industries can self-evidently utilize platform ecosystems. This situation may change when the block chain technology is readily available. Already today, there are schemes focusing in creating a system, which allows establishing a privacy preserving digital avatars that still can be trusted. It requires to use so called permissioned block chains. In addition the system shall be very resilient against attacks in order to preserve the network integrity. This

type of system shall protect the individual identities and will potentially be in compliance with legislation in many countries. (Shrier, Wu, et al. 2016)

One interesting way of pulling the users was in a case, where the platform can be used to design product application the company sells. They are giving out the program to colleges and universities educating designers. Another platform utilized similar approach with their embedded software product. They provided simulator software to similar institutes. This way the designers and machine operators are used to work with that particular system and are likely to prefer it also in work. This way the platform will get new users and the company behind it more sales. The simulators can also be used in designing most effective ways to work, which many customer companies, according to the interviews, find beneficial.

Another company is providing their qualification management system also to other companies in other industries openly as long as they are using their platform. The qualifications may be different, but the management system supports it anyway. The same company had a clear vision of a marketplace. They are planning to open a marketplace where quality critical specifications can be sold by any platform participant, but the platform owner gets a small cut from each interaction. This was so far the best planned multisided platform found from Finland and has big business potential.

One interviewee mentioned, it was very beneficial business vice that the platform can use data provided by machines made by other manufacturers. They customers have dozens of machines doing the same process. In case one wants to replace the old supplier, it is easier to replace it machine by machine. The customers are likely be reluctant to change all machines at the same time, but when the new company is able to sell one machine and show the superiority of its system, it may get the whole business eventually.

One company also shared that their platform project has proceeded by trial and error – two steps forward, one back. The first mistake they made was that they thought they knew, what their customers needed. After a year or two, they noticed that and started over. Similar learnings have been for few times during the decade they have been in platform business. This shows that companies need help and guidance in designing the platform ecosystems.

6. CONCLUSIONS

6.1 Theoretical Contribution

Today, platform is considered to be a marketplace where transactions between two or more user groups take place (Ailisto et al. 2016). In this paper the focus was on two- and multisided platforms as marketplaces that are executed digitally, hence create a platform ecosystem. In this context platform makes value creation possible for all participants. It is a business, which enables external producers and consumers to create value by interactions between each other. Platform sets a participative and open infrastructure for the interactions. It is also responsible for the governance of the infrastructure and interactions. The purpose of the platform is to facilitate the exchange of products, which can be goods, services or even social currency. (Parker et al. 2016, pp.3–5)

These two- and multisided platforms can be considered to be matchmakers that bring members of different groups together. They sell access to the target group or target groups. (Evans David & Schmalensee 2016, pp.1–2) Today the hype around two- and multisided platforms is ongoing due to the digitalization of the matchmakers. The digital technology expands the reach, convenience, speed and efficiency tremendously compared to the traditional way (Parker et al. 2016, p.60).

In context of digital ecosystems, there is quite limited amount of scientific literature available and the researcher have rather much variation in their understanding of the important characteristics of a platform ecosystem. This became evident through an encompassing literature review made in this study (see Appendix 2). During the literature review 16 sources – articles and books – were identified as original sources, which were cited in other sources. From the original sources each characteristic, the writer had found important were collected and grouped according to the meaning described in the source. After grouping(Sorri et al. 2016) the terms 18 critical characteristics for establishing a platform ecosystem were identified. Each of the characteristics were given a name that describes it. Eight most important characteristic were found to be value, producers of value, users of value, capture of value, network effects, filtering, governance and resilience. This knowledge was used in creating the platform canvas (see Appendix 1 (Sorri et al. 2016)).

The canvas is designed so that it can be used in planning and developing platform ecosystems. Each characteristic can be defined by answering to facilitative questions. First the value shall be defined, followed by producers and users of the value. It is very important to remember that the producers and users may be the same market sides. The

following phase is to understand the opportunities related to the network effects. Management needs to understand will the effects be direct, indirect of both and what kind of scalability requirements the platform faces due to this. This effects to the requirements for the filtering abilities of the platform. After these aspects are reviewed and planned the system side of the canvas can be filled. First the management needs to define the governance and curation aspects. The final phase in design is to make sure the resilience of the platform. This is done by opening both technical and social boundary resources. Platform canvas leads the management through the whole planning process when used properly. The process itself is quite straight forward, but the management is required to have comprehensive knowledge about the customers and their expectations as well as the differences in the business model compared to the traditional one. If possible, it could be beneficial to include some market representatives to the planning group.

The transformation from pipeline to platform requires three shifts. First the company needs to shift focus from controlling its inimitable, scarce and valuable resources to understanding that the most important asset it has is the network of producers and consumers. Without opening the boarders of the company, sharing and increasing the value is impossible. Secondly the company should orientate more to external interactions instead of optimizing the chain of product activities. The emphasis should be more on persuading participants than in dictating processes. Ecosystem governance is an essential skill in shifting from pipelines to platforms. The third important change in orientation is to focus on ecosystem value instead of customer value. (Parker et al. 2016, p.207,210).

The Finnish companies were traditional pipeline companies who are relying in their platforms to the analysis of big data enabled by the IoT. The IoT helps platforms to gain network effects as the number of things connected to internet has already passed the number of people is expected to increase dramatically during the following few years (Vermesan & Friess 2014, p.9)

6.2 Managerial Recommendations

Though it was not expected to find old companies in this list, it was not surprising that the most active companies all are, and have been, profitable. Another significant difference was the amount the companies invested in R&D. While only one of the global benchmark companies revealed the value of its R&D investment as a share of revenue it was nearly seven times as big as the average investment in Finnish case companies. While the benchmarks are mainly developing the platform ecosystem itself, the Finnish companies most likely use part of the R&D investment also to product development. It is safe to say that the low investment probably hinders at least the speed of development in their platform ecosystem. The platform owners are recommended to evaluate the scale of their investment to platform development and to increase it if possible.

The platform canvas was tested with companies and platforms, which already exist. In order to ensure the feasibility, the canvas should be tested with few cases that are still in idea phase. This way the lead time of the process of the platform creation and implementation can be measured and compared to the cases in this study.

The Finnish platform owners seem to have forgotten the aspect of value capturing. Many of the companies find the platform to be a service concept. In order to gain benefit to the platform owner a monetization concept needs to be developed. During the pull phase it is not necessary to get profit of the platform, but as the fourth industrial revolution proceeds the importance of capturing the value also from the platform becomes more and more important. The monetization – let it be licensing, selling business intelligence information or selling the platform as a service-concept (PaaS) – needs to be reviewed by the platform owners. The decision may be difficult to make and probably requires testing, so it is never too early to start planning it.

Importance of utilizing network effects is the third important platform specific characteristic, which has not been understood properly enough in Finnish cases. The importance of network effects is clear success factor proven by the global benchmarks. IPLATE fortunately focuses on this aspect already, but also entrepreneur associations and business services by Ministry of Economic Affairs and Employment need to increase the information sharing and training to Finnish companies. This applies to the whole platform ecosystem as a business model, but especially to network effects, capturing the value and managing the openness in ecosystems.

Both in benefitting from value capture and network effects, a marketplace utilizing IoT could be an opportunity worthwhile to explore. The marketplace could be a CPQ-platform combined with IoT-platform. In this case, the aftermarket services and spare part sales can offer more value to all parties. In case a group of companies having similar customers is added to the concept the effect will be even bigger. This type of platform ecosystem should give a reasonable value capture to all members including the platform owner. Surely the network effects would be more probable than in platforms that can offer products from only one manufacturer. While there are companies having the knowledge of IoT combined with CPQ, a partnership between platform owners should be considered. The partnership could be by customer types, let it be machine workshops, harbors or owners of detached houses.

The third aspect Finnish companies need to understand more is the importance of boundary resources. While the companies seem to have some idea of opening the technical boundary resources they also need to understand the importance of social boundary resources – especially from brand management and risk management perspectives. The guidelines and licensing agreements need to be clear and in place before 3rd parties are involved.

As a summary it can be concluded that in general Finnish companies have not yet realized the opportunities platform ecosystems offer. Some positive examples are existing, but even those are in rather early phase of the life cycle of the ecosystem. The Finnish Mittelstand companies are passive in platform business. More training and information sharing to all sizes of companies is needed if the potential that platform ecosystems provide is to be exploited. Platform canvas is one potential tool for companies to use when evaluating the possibilities to become a platform owner.

The management of every company should read at least one book about the platform ecosystems. After understanding the theory, they will have an understanding about the possibilities – if any – their company has in this type of business. The management shall understand that the business model will be different and require different type on skills to manage. The openness requires new type of company culture and trust (which can be managed for example with well managed boundary resources). The management must clarify to themselves, is there a special value their platform can offer. It may be reasonable in some cases just to join an already existing platform rather than creating a new one.

Companies that plan to create a platform ecosystem should have a proficient technology partner. It is waste of effort for a traditional manufacturing company to hire experts to make the required software coding when there are plenty of skillful partner candidates. The management should also clarify to themselves how they can benefit from IoT. They should evaluate what new type of business opportunities the IoT and platform can offer together. After understanding this baseline, a group of experts should form a project team. The team shall include experts from the company, which is forming the platform ecosystem, but also people from the software company and preferably a representative from each of the planned market side. The team can then utilize the platform canvas to make sure all required aspects are covered. Finally the boundary resources – let them be technical or co-operative – shall be documented and shared.

6.3 Limitations and evaluation of the study

It was a surprising to find out, how small amount of companies have created any kind of platform in Finland. Though the scope of the study was on manufacturing companies, eight companies is still a small number. None of the companies were belonging to the Mittelstand group. This limited the number of cases to unfortunately small number, which naturally weakens the reliability of the results. Nor was this study able to find solutions directed especially to the Mittelstand companies.

Though case studies are never a type of research to make normative conclusions, more cases would have given better understanding of the planning and implementation processes of the case platforms. Manufacturing companies that have started to think about

platforms, but have not done any (or very little) concrete actions towards implementing a platform ecosystem, would be a good scope for the next study. Most of the case companies in this study were on business to business markets. In those cases, the network effects can be extensive in case the IoT can be included to the platform.

The quality of the interviews improved through the whole process. It might have been a good idea to plan two interviews per company as some questions arose only after a couple of interviews. It is a fine line to balance. To engage adequate number of companies, the required amount of resources – like time – should be relatively small. However, if the time invested is too small, the results are bound to be incomplete.

The platform canvas was created to structure the interviews. Hence some aspects were compelled to be left out. These aspects may help companies to use the canvas. Therefore, those are included in this thesis. When the canvas is introduced to wider public there should be a set of instructions included to it. These instructions should include the directional questions for filling the document as well as aspects of core interaction, pull-facilitate-match and platform stack. These help the platform developers to tune their thinking to the new business model.

The platform canvas was a good tool in structuring the interviews. It also helped to challenge the platform owners to open their thinking. Especially in cases, where the company representative was looking for improvement ideas. The canvas is most effective when used internally when the disclosure issues can be disregarded.

6.4 Proposals for future studies

This study has been a very interesting one to conduct. Quite a few of the preconceived assumptions were found to be false. It was rather surprising to find that the Finnish companies that are active in developing platform ecosystems were all fairly old. Even the youngest company was founded years before the oldest of the benchmark companies. The reason for this maybe that the Finnish companies were all traditional pipeline-type companies. Their platforms rely heavily on data created by machines and big data analysis. This can be seen as a common factor in all cases. The platforms are compatible with machines manufactured by other suppliers as long as the data is provided in standard format. At the same time the companies are very careful in opening the boundary resources. It seems that they strongly rely on their own knowledge and are not ready to take advantage of the openness emphasized in the literature. This leads to a question, whether also more companies are not providing platforms, because they still think they are the masters of knowledge and do not want to open their business. On the other hand, the reason may be that the companies are not aware of the differences between pipeline business and platform ecosystem business model. It would be interesting to study is this a cultural issue or just a result of the fact that platform ecosystems are such a young

business area. In any case a change in ways of thinking and in company cultures is required. Hopefully the change is on its way already.

The platform canvas was created to help companies in planning when they are about to open a platform, the interviewed platform owners were not exactly the right target group as their companies already had the platform in place. The canvas should be tested also with companies, which are just planning to open a platform ecosystem. During the initial analysis of Finnish companies, a couple of potential future platform owners were identified for this purpose. The study would be especially beneficial in case the company could combine IoT to the platform.

The platform canvas should also be visually developed to more inviting looking. The current version is very practical, but in order to become more compelling template the design should be developed to more visual direction. Some sketches have already been done, but this work needs to be continued.

A CPQ-IoT marketplace research project should be conducted. Though there are several companies offering either IoT-platforms or CPQ-platforms, a company able to successfully create a marketplace combining both of these two, may become the owner of a dominant platform in this business and gain millions if not billions of revenues. At least in earlier cases the first platform has become the dominant design, “the platform”.

All of these future projects require funds. In the current world the fundraising is very challenging. Hopefully some of the Finnish companies involved in this study, find the opportunities of the future so interesting that they feel compelled to provide financial support to the further research.

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APPENDIX 1: PLATFORM CANVAS

<table>
<tr><td colspan="2">Platform Ecosystem:</td><td colspan="2">Date:
Version</td></tr>
<tr><td colspan="2">Technical platform:</td><td colspan="2"></td></tr>
<tr><td>Producers: Who are the producers and what motivates them to create value? Through which channels producers produce value?</td><td>Users : Who are the end-user and what motivates them to consume value? Through which channels they consume the value?</td><td rowspan="5">Governance: How are the tools lowering the usage barriers (skills, time/effort, investments, resource or access barriers)? Which creation / Curation and Customization / Consumption tools and services platform should provide to enable the interaction?</td><td>Resilience: To what extent boundary resources are defined? Is the platform design simple or modular?</td></tr>
<tr><td colspan="2">Value: What are the different values created? How the platform attracts the users? How the tools and services solve the chicken and egg problem? How those help keeping the interest of users? Which friction the platform reduces? How do the tools and services help facilitating the interactions, value creation and value exchange?</td><td>Technical boundary resources
__ API
__ SDK
__ Scripts</td></tr>
<tr><td colspan="2">Filtering: Which filters platform needs to serve relavant content to consumers and to connect them with relevant producer? What data is acquired to match the producer and user?</td><td>Co-operative boundary resources
__ Trademark Licensing
__ Terms & Conditions</td></tr>
<tr><td colspan="2">Capture / Monetizing: What currency consumer provides to the producer in exchange for value? How does platform capture some portion of this currency to itself? Monetization plan?</td><td>__ Design, review and marketing guidelines
__ Modular</td></tr>
<tr><td colspan="2">Network Effects: Which type of network effects are achieved? Same-side-effects / cross-side effects? Positive/ negative?</td><td></td></tr>
</table>

APPENDIX 2: LITERATURE SUMMARY

Source			Platform key elements																	
			Network effects	Governance	Producers	Consumers	Value	Change tolerance	Monetizing	Matching	Traction	Cost of multihoming	Filtering	Facilitate	Creation Tools	Core interaction	Simplicity	Maintainability	Tools for consumption	Metrics
Cusumano, M. A., Gawer, A.	2002	The Elements of Platform Leadership	X	X	X			X												
Evans, D., S., Hagiu, A., Schmalensee R.	2006	Invisible Engines- How Software Platforms Drive Innovation and Transform Industries	X	X	X	X	X	X	X	X		X		X						
Simon, P.	2011	The Age of the Platform	X	X		X		X									X			
Kouris, I., Kleer, R.	2012	Business models in two-sided markets: an assessment of strategies for app platforms	X		X	X			X			X				X				
Tiwana, A.	2013	Platform ecosystems	X	X	X	X		X				X					X	X		X
Bonchek M., Choudary, S. P.	2013	Three elements of a Successful Platform Strategy	X	X			X	X	X		X		X	X			X			
Westhead, M.	2014	Platforms - Two/multi-sided markets	X	X	X	X	X		X			X								
Boudreau, K. J., Jeppesen, L. B.	2014	Unpaid crowd complementors: The platform network effect mirage	X	X	X	X	X	X				X								
Choudary, S.P.	2015	Platform Scale		X	X	X	X						X		X			X	X	
Edelman, B.	2015	How to Launch Your Digital Platform	X	X	X	X	X	X	X	X	X									
Abeysinghe A.	2015	Platform for digital transformation	X	X			X						X		X	X				
Parker,G et al	2016	Platform Revolution	X	X	X	X	X	X	X	X	X		X	X		X				X
Moazed, A.	2016	What is a Platform?	X		X	X	X													
Evans, D., S., Schmalensee R.	2016	Matchmakers	X	X	X	X	X		X	X	X				X				X	
Hyatt, M.	2016	Why you need a platform to succeed	X	X	X	X				X										
Abeysinghe A.	2016	Building a digital enterprise- learning from experience	X				X	X		X	X			X	X			X		X