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ABSTRACT

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Abstract

Studying what makes platform businesses successful has interested researchers throughout the 2010s and especially what kind of business models may help to gain this success is much discussed. Currently, only a few percent of freight documents distributed between different EU-countries are fully digital. The European Commission has proposed regulation for the digitalization of freight information and this would create a demand for a platform that enables better electronical documentation and sharing of freight transportation information.

This master's thesis addresses the case of DBE Core platform and its business model options. The DBE Core platform is a multisided digital platform that automates the exchange of supply chain and logistics data between companies from requests for product catalogs or quotations through ordering, logistics to invoice handling and payments. DBE Core had drafted four different business models and deciding between these different models and comparing the business model proposals for other platforms' business models operating in the same field was the core of this study.

This qualitative study used mainly textual data, like websites of similar companies, news articles and previous research, as data gathering methods. Information, such as articles and other documents, about the current competitive environment and information sharing systems in transportation with the focus on maritime industry was gathered and analyzed. Based on academic literature and information gathered about similar businesses working in the field, a business model proposal was made and tested using business model stress test. For this purpose, a design science methodology was used.

To determine and test the best business model option, similar information sharing platform companies and operators were mapped and examined. Overall, five companies or projects were chosen, and when comparing their business models with the potential business models proposed by DBE Core, it was concluded that few of them had so called pure business models but were more or less hybrid models. For DBE Core, two of the suggested business models, transactional model and partnership model, showed such similarities in business model component level, that they were tested as one model in stress testing. It could be concluded that the best business model proposition for DBE Core is a hybrid model. This study shows that there is no clear way to define which business model proposition is the best in platform business, but it rather proves that when a new innovation and a platform is considering to enter the market and grow, ongoing improvement and consideration of the business model is necessary.

Key words	Business model, information sharing, platform business, business model stress test

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Tiivistelmä

Läpi 2010-luvun tutkijoita on kiinnostanut, mikä tekee alustayrityksistä menestyviä ja etenkin minkälaiset liiketoimintamallit mahdollistavat tämän menestyksen. Tällä hetkellä vain muutama prosentti eri EU-maiden välillä välitetystä rahtidokumenteista on sähköisessä muodossa. Euroopan komissio on ehdottanut lainsäädäntöä rahtitietojen digitalisoimiseksi ja tämän tullessa voimaan, se loisi kysynnän alustalle, joka mahdollistaa paremman sähköisen dokumentaation jaon kuljetustoimialalla.

Tämä pro gradu tutkielma keskittyy DBE Core alustan tapaukseen ja sen liiketoimintamallivaihtoehtoihin. DBE Core on useampipuolinen digitaalinen alusta, joka automatisoi toimitusketju- ja logistiikkadatan vaihdannan usean yrityksen välillä. DBE Core on luonut neljä eri liiketoimintamallia ja tämä työ keskittyy antamaan ehdotuksen perustuen näihin ehdotelmiin. Lisäksi työ vertaa samalla alalla toimivien alustayritysten liiketoimintamalleja tapausyrityksen liiketoimintamalleihin.

Tämä kvalitatiivinen tutkimus hyödyntää enimmäkseen tekstuaalista dataa, kuten samankaltaisten yritysten nettisivuja, uutisartikkeleita sekä edeltävää tutkimusta. Tutkielmaa varten kerättiin ja analysoitiin tietoa artikkeleista ja muista dokumenteista, jotka käsittelivät tämänhetkisestä kilpailuympäristöä ja tiedonjakomalleja kuljetusalalla, etenkin meriteollisuudessa. Akateemiseen tutkimukseen ja muiden alustayritysten liiketoiminnasta kerättyyn tietoon perustuen luotiin liiketoimintamalliehdotus, jota testattiin stressitestillä. Tätä varten tutkimusmetodologiaksi valikoitui design science.

Parhaan liiketoimintamallin määrittämiseksi ja testaamiseksi samankaltaisia tiedonjakoalustayrityksiä kartoitettiin ja tutkittiin. Viisi eri yritystä tai projektia valittiin lähempään tarkasteluun, ja näitä liiketoimintamalleja vertaamalla DBE Coren ehdotettuihin liiketoimintamalleihin tultiin johtopäätökseen, että kaikki eivät olleen niin sanottuja puhtaita malleja, vaan hybridimalleja. DBE Coren kaksi liiketoimintamalliehdotusta, transaktionaalinen malli ja yhteistyömalli, osoittautuivat komponenttitasolla niin samankaltaisiksi, että ne testattiin stressitestin avulla yhtenä mallina. Loppupäätelmänä on, että DBE Corelle sopisi parhaiten niin sanottu hybridimalli. Tämä tutkimus näyttää, että ei ole yhtä selvää parasta liiketoimintamalliehdotusta yritykselle, vaan se osoittaa ennemminkin sen, että uuden innovatiivisen alustan tullessa markkinoille ja pyrkiessä kasvuun, liiketoimintamallin jatkuva kehittäminen ja uudelleenharkinta on välttämätöntä.

Asiasanat	Liiketoimintamalli, tiedonjako, alustayritykset, liiketoimintamallin stressitesti

UNIVERSITY OF TURKU
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UNIVERSITÄT PASSAU

INFORMATION SHARING PLATFORM BUSINESS MODELS IN TRANSPORTATION INDUSTRY

Case DBE Core Ltd.

Master´s Thesis
in Information Systems Science

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The originality of this thesis has been checked in accordance with the University of Turku quality assurance system using the Turnitin OriginalityCheck service.

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List of Abbreviations

BM	Business Model
NaaS	Network-as-a-Service (DBE Core's own terminology)
PaaS	Platform-as-a-Service
PEPPOL	Pan European Public eProcurement On-Line
REST API	REpresentational State Transfer Application Programming Interface
SaaS	Software-as-a-Service
UBL	Universal Business Language
UI	User Interface
UN/CEFACT	The United Nations Centre for Trade Facilitation and Electronic Business

1 INTRODUCTION

1.1 Background of the study

Digitalization has offered unimaginable amount of new ways of constructing a business model. Having a fully online business is not a rare sight nowadays, and platform-based businesses, such as Google, Facebook and Amazon, are among the best-performing companies in the world. Platforms offering services for the B2B-side are also part of the new digital normal. Studying what makes platform businesses successful has interested researchers throughout the 2010s and especially what kind of business models may help to gain this success is much discussed.

In 2018, the EU Commission made a proposal for EU regulation on electronic freight transport information. According to the Commission, only 1% of freight documents distributed between different EU-countries are fully digital, and this does not support the EU objective of becoming the world leader in innovation and digitalization. This regulation on electronic freight information would make digitalization and acceptance of digital freight transportation documents mandatory for all EU countries. The regulation would especially require the digitalization of legal information needed in freight information. If this new regulation comes into force, it will require some level of harmonization and interoperability of the IT systems used in the transportation industries operating in the EU. (European Commission 2018) This upcoming regulation creates a demand for a platform that enables better electronical documentation and sharing of freight transportation information.

This master's thesis addresses the case of DBE Core platform and its business model options. The DBE Core platform is a multisided digital platform that automates the exchange of supply chain and logistics data between companies from requests for product catalogs or quotations through ordering, logistics to invoice handling and payments. Nowadays, most of the documents used to execute supply chain and logistics processes are handled manually and the documents exchanged as emails, pdf, excel or paper documents, typically between two parties of supply chain and logistics processes. There are only some exceptions, like payment document handling and, to some extent, invoice document handling. This means that the same data processed internally inside of enterprises' ERP or other IS are exchanged manually and re-entered by the receiving party. (DBE Core Ltd., 2020)

DBE Core offers a platform called Core, and their user interface (UI) is Core Portal. The Core platform deploys UBL data model and UBL messages in the automated exchange of data between enterprises. The platform applies Hyperledger Fabric blockchain, REST API and other technologies to execute data exchange transactions in a cloud (SaaS

and PaaS) environment between the nodes of the DBE Core network. DBE Core also calls themselves to be the first network-as-a-service (NaaS) platform and mostly hopes to operate as platform connecting other platforms. PEPPOL (Pan European Public Procurement On-Line) messages are also based on the UBL data model and the DBE Core platform is able to process also PEPPOL messages. UBL and hence also the DBE Core platform view logistics from a multi-modal perspective, that is to address air, rail, and sea cargo. REST API enables loose integration and synchronization with ERP systems. The interface can be downloaded from a cloud free of charge. DBE Core then sends a confirmation certificate and two user IDs to the client. Another option is, that DBE Core provides the UI's source code and makes a licensing agreement with the client. (DBE Core Ltd., 2020)

This thesis will focus on the business models offered for B2B information sharing platforms, especially in the case of digital information exchange. To fill the gap for the demand in electronic freight information exchange, the case company wants to create a platform to "solve the complexity in business transaction formats" (DBE Core Ltd. 2020). The core business idea of the case company is a blockchain-based data model, which enables secure data sharing and thus being a sustainable solution for freight transportation information sharing. Sharing freight information is complex due to the different standards and properties for product data, inconsistent legal requirements for the data, and diverse internal processes and requirements for the freight information between different freight companies and their clients (DBE Core Ltd 2020; European Commission 2018). To overcome this problem of data complexity and different data requirements, the case company wishes to form a uniform metadata model to help to share the freight information.

The case company is still a startup in early stages of its business with little actual operations. The motivation for this thesis is to research the business models other similar platform may have and to offer a proposal for business model for the case company. To make the proposed business model more significant, it should also be tested with different business model tools, like the business model stress test.

1.2 DBE Core's current business models

During 2020, DBE Core Ltd. had drafted four different business models. Deciding between these different models and comparing the business model proposals for other platforms' business models is one of the main reasons why the company commissioned this thesis. (DBE Core Ltd, 2020)

The four different models are as follows:

1. *Transactional model.*

Current operation is mostly based on this business model. In this model, DBE Core operates as an independent platform and sets its prices per transaction. The UI is downloaded from a cloud environment for free, and the platform charges per each exchanged document.

2. *Partnership model.*
   DBE Core has a business relationship with a large Finnish telecommunication company, Telia. DBE Core purchases their programming largely from Telia and the platform operates in Telia's service center and cloud. In partnership model, DBE Core partners with for example Telia or with other operators in order to gain larger user base and technological advances. DBE Core and the partner agree how the revenue is divided and DBE Core is shown to customers as a separate entity.

3. *Subcontracting model.*
   This model is much like the partnership model, except that DBE Core operates as a subcontractor to another party, and the business partner offers the Core platform to the clients as their own platform. This might be relevant model especially when expansion to overseas is considered. The subcontracting model is currently used with one Australian supplier who participates in competitive tendering of PEPPOL.

4. *Research project model.*
   DBE Core has a strong background in research projects. The DBE Lab is a non-profit organization that seeks to generate new ideas and innovations in platform business that may lead into transaction business. In this model, the Core platform becomes more a general sandbox environment for different officials, companies, and research centers. DBE Lab has been part of projects in the digitalization of construction documentation and municipalities' purchasing operations.
   (DBE Core Ltd, 2020)

1.3 Research questions

To solve the problem discussed above about DBE Core choosing the right business model, this thesis will give answers to the following questions:

(1) What kind of business models do platform companies whose business is information sharing have?

(2) What are the business model components and their contents that need to be considered when business model is designed for DBE Core?
(3) What are suitable business model designs for DBE Core Ltd and which of them appears to be the most viable option?

1.4 Research design

This qualitative study uses mainly textual data, like websites of similar companies, news articles and previous research, as data gathering methods. Information, such as articles and other documents, about the current competitive environment and information sharing systems in transportation with the focus on maritime industry is gathered and analyzed. Also, conversations with DBE Core's chairman of the board are used as data. The data gathering method includes diverse qualitative data, like news articles, company announcements, and videos in order to gain clear insight about the current business environment, previous and current business models used in the field, and to offer the best possible business model options for DBE Core Ltd. Based on academic literature and information gathered about similar businesses working in the field, a business model proposal is made and tested.

For this thesis, a design science methodology is selected. As this study is more pragmatic than theoretical, with the emphasis on the offered business model, design science is the best suited methodology. Design science is a methodology to support the applicability of an "IT artifact" – here, a business model. It combines behavioral sciences to IS methodologies and tries to support innovation creation and evaluation. The design science methodology wishes to fulfill both business and academic needs by offering solutions for both sides: application to the business side and theory justification for the academic side. (Hevner et al. 2004, 76-77, 80)

1.5 Key concepts

To properly understand the topics in this thesis, it is fitting to define the most important concepts. The concepts briefly discussed are business model (BM), two-sided platform, ecosystem, UBL, PEPPOL, Hyperledger Fabric, and Rest API.

The BM research has many definitions based on the discipline of the study. In information systems studies, the BM is usually described to be the way a business captures value for its stakeholders and what is the logic behind the business to do so. (Heikkilä et al. 2015, 339) The BM can be viewed to be a component between the business strategy

and business operations, the short-term goals of the business in order to realize the business strategy (DaSilva & Trkman 2014, 383).

Two-sided platform, sometimes referred as dual sided or multi-sided platform in the literature, is an intermediary service between two or more groups of users. Two-sided platform is used to connect two or more parties with each other in a value-creating process. Usually the users are viewed to be either buyers or sellers, like in Amazon. The competition may happen inside a platform between participants, or between two platforms trying to attract participants (see Li & Liu 2010, 245). In this study, a platform is defined to operate in an online setting.

Another term closely linked to platforms is a business ecosystem. Moore (1993, 76) defines the business ecosystem to be about creating and sustaining a new innovation in a competitive and cooperative business environment, meaning that actors in the ecosystem are both in competition and cooperation with each other in order to create profit. A digital business ecosystem (DBE) is a business ecosystem that uses digital and IT solutions to support the ecosystem (see Nachira et al. 2007, 5-6). Next chapter discusses more in depth of the definitions of the BM, two-sided platforms, and ecosystems.

Some technical terms concerning the DBE Core platform should also be clarified. Universal Business Language (UBL) is a standardized, royalty-free XML language and data format used specifically in transportation and logistics documents and procurement. OASIS, the creator of UBL, wishes that it will help create and support ecosystems throughout the supply chain. (more about UBL, see OASIS)

Pan European Public eProcurement On-Line (PEPPOL) is both a network and technical specifications (PEPPOL BIS) for digital procurement, created by the EU. Through PEPPOL network, a business can send transportation documents cross-borders and the PEPPOL BIS standards help with the compatibility of the documents. PEPPOL supports interoperability between business participants in the supply chain. (see PEPPOL website)

Hyperledger Fabric is a distributed ledger, or a blockchain, software by Hyperledger, an open source collaborative for blockchain technologies. Hyperledger Fabric is used for blockchain development. (see Hyperledger website)

REpresentational State Transfer Application Programming Interface (REST API) is an architectural style based on HTTP for sharing data between two or more systems.

2 THEORETICAL BACKGROUND

2.1 Business model definitions and tools

2.1.1 Theory behind the business model

Business models (BM's) are a widely researched topic in the fields of information systems and strategic management. The term itself was first introduced late 1950s, but business model research did not receive much attention before the 1990s. This trend is thought to be because in the 90s, more technology and IT-based companies emerged than ever before, and strategic management researchers as well as practitioners tried to find out what made these companies so successful. As internet and ICT grew in importance throughout the 2000s, the literature and academic research for business models grew as well. The BM research has been since closely tied to the research of technology-based companies and their strategy. (DaSilva & Trkman 2014, 380-381)

Although the popularity of BM research has soared in the last decade, researchers have failed to give one definitive definition for the term "business model". According to Zott et al. (2011, 1023) the definitions for business models can be divided into three different categories: 1) e-business and information technology, 2) strategic value creation, and 3) innovation and technology management. The first category views BM's to be a way the technology-based companies organize their business and how these businesses work in their own ecosystems. The e-business and information technology emphasis is not much interested in the empirics of applying BM research, but rather how organizations combine value proposition, revenue model and networks together into a successful business. (Zott et al. 2011, 1025, 1028)

The second category, strategic value creation, is more about the value creation, performance, and the competitive advantage the right BM can give to a company. The key to successful BM's is a complicated network that supports this value creation, and that business model differs from product and corporate strategy in being the" reflection of a firm's realized strategy". (Zott et al. 2011, 1029-1031) DaSilva & Trkman (2013, 383-385) argue that BM differs from business strategy in being the more short-term realization of the firm's current dynamic capabilities in creating value, in other words, how the firm actually runs the business and creates profit opposed to its strategical long-term goals. This second definition is more from a strategic management point of view as it does not require technology to be in the center of the BM.

The third category, innovation and strategy management, differs from the second category, as it highlights the role that a good BM has also innovation and technology management. The BM demonstrates how innovation can be made profitable, and this innovation management view has very functionalist attitude towards business models. The BM is simply a tool to support the technological innovation and how it brings value to stakeholders. Another point of view in innovation management definitions is that the BM itself can be the innovation that creates value, like open business models for technology licensing. (Zott et al. 2011, 1031-1034) Researchers agree that the most important aspect of a BM is the value creation and the value capture and the uniqueness of this process (see Xu & Koivumäki 2019, 308; Bouwman et al. 2018, 149; Zott & Amit 2007, 181; Heikkilä et al. 2017, 108). The BM then is mostly about the process of creating value and profiting from this value creation in a way that makes the organization special. It is not a pure strategy, but a model of how the business realizes its goals and values.

The agility of a BM is one aspect in the business model theory. In the context of platforms and digital business, agility means an innovative way of bringing value to stakeholders in shorter development cycles than in the traditional field (Xu & Koivumäki 2019, 307) and creating an outcome that can easily adapt to sudden changes (Bouwman et al. 2018, 150). Agility is then about how well a business can tailor its business model to react accordingly when changes in the market happen, without losing its unique way of creating and capturing value. With this agility in mind, Xu & Koivumäki (2019, 310) suggest three different approaches to the creation of business models: causation approach, effectuation approach, and lean startup approach. The first, causation approach, sees BMs as an opportunity recognition process, where a company simply creates a business model as they see an opportunity for business. The effectuation approach claims that a BM is more a non-predictive and a practical plan, meaning that a business model can only exist in practice. The latter approach, the lean startup approach, highlights that a startup needs short technology development cycles to quickly disregard failed innovations, making this agility a big part of a business model. Business model is in this view never ready and final, but a continuous process. (Xu & Koivumäki 2019, 310) Bouwman et al. (2018, 152) also argue that agile approaches to BMs are more about short development cycles and dynamic change. For this study, agility of a business model is an important concept as it offers perspective on how developing an innovation might affect the company's business model and the agility of this business model.

The definitions and theory behind the BM seem complex and loosely defined. There is no apparent definition for a business model, but it can be agreed that BM always involves value creation and more practical processes needed to realize the company strategy. For a platform business, agility of the BM may be crucial as more agile business model supports better adjustment to sudden changes, which are common in the field of technology.

2.1.2 Business model canvas

When it comes to business modeling tools, BM canvas and BM stress testing are two most commonly used tools for SME's business model testing. The BM canvas, created by Osterwalder et al. (2010), analyzes the firm's business model through nine different building blocks that are essential for value creation, for example customer segmentation, key resources, and revenue streams. Heikkilä et al. (2018, 109) support the usage of this canvas as it is easily understood and less technical than other business modeling tools.

The BM canvas is a straightforward framework of describing the business model. There are other frameworks as well to outline a BM, like STOF model and Visor, but the canvas framework is more comprehensive than these, more technical, frameworks. As it can be better adapted to many different BMs rather than just to technology-based businesses, the BM canvas is widely used framework. (Heikkilä et al. 2018, 109) In the BM canvas, the different business model components are placed in the blocks to illustrate the BM. The components are key partners, key activities, key resources, value proposition, customer relationships, channels, customer segments, cost structure, and revenue streams. The BM canvas is shown in Figure 1.

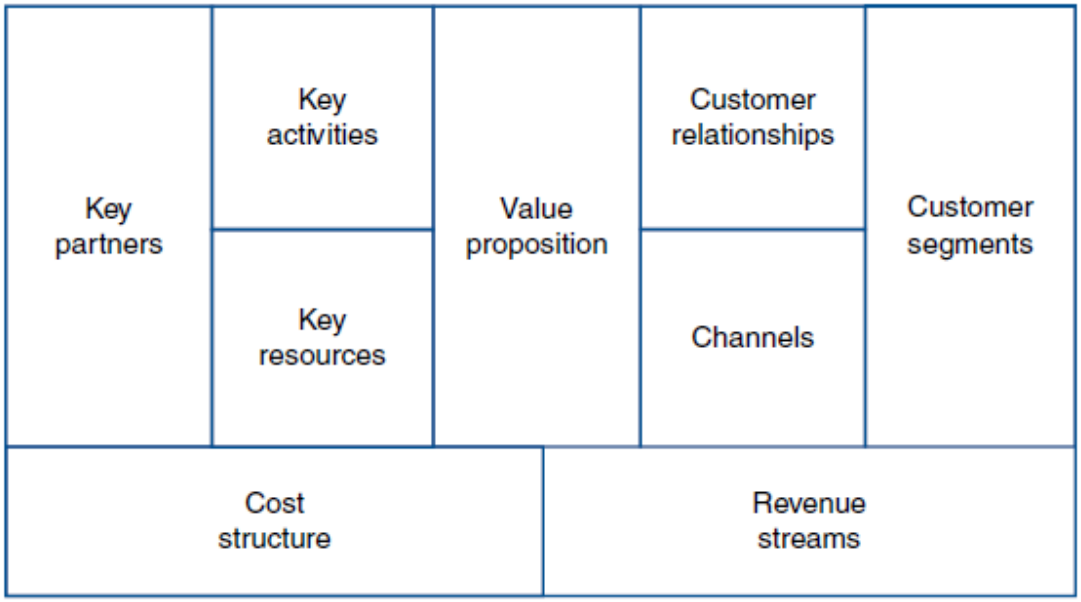

Figure 1 The BM canvas by Osterwalder et al. 2010

2.1.3 Business model stress test

Business model stress testing is a method to analyze the robustness of a BM by comparing certain business components' reaction to changes in the business environment (Bouwman et al. 2018, 152). After modeling the business model components with BM canvas, stress testing is a beneficial way of analyzing how different risks affect the business model components.

The BM stress test is based on scenario planning, a research field belonging to future studies, where different scenarios are created in order to analyze and predict future strategic challenges (Haaker et al. 2017, 16). The BM stress testing was developed to provide a more pragmatic method for practitioners to test their business model and to give robustness to business model theory (Bouwman et al. 2018, 152). Haaker et al. (2017, 17) describe the BM stress test to be "a systematic analysis of the robustness of BM components in different future environments". The BM stress test is then a method to test the components described in the business model canvas. The stress test was especially created to test business model components under different uncertainties in future scenarios, for example changes in the competitive environment or in a case of a disruptive innovation (Bouwman et al. 2018, 152). Haaker et al. (2017, 17) outline a six-step approach for conducting a stress test to be the following:

1. Describe business model
2. Identify and select stress factors
3. Map business model to stress factors
4. Create heat map
5. Analyze results
6. Formulate improvements and actions.

After describing the BM, preferably using a BM canvas, the next step is identifying and selecting stress factors. For this phase, up to five trends and uncertainties are selected to be the stress factors that may influence the company's future. The stress factors can be selected using for example SWOT or PESTLE analysis. The third phase consists of mapping the business model to the selected stress factors so the causality between them can be compared. (Haaker et al 2017, 17-18)

The creation of a heat map is the fourth phase of the BM stress test. The selected stress factors in phase 2 are compared to the selected BM components in phase 1. Exact calculations do not determine the causality between these factors, as it is more based on the subjective view of the analyzer. The heat map itself is constructed as a matrix, where the BM components are at the vertical level, and the stress factors are at the horizontal level.

The coloring is usually as follows: red for the outcome that makes the component no longer feasible, orange for the outcome that makes the component no longer viable, green for the outcome that enhances the component in a positive way, and grey signifies that the outcome is indifferent for the component. (Haaker et al. 2017, 18, 21, also shown in Table 1)

the outcome of the stress factor makes the component no longer feasible	red
the outcome of the stress factor makes the component no longer viable	orange
components feasibility or viability is influenced by the stress factor, but not negatively	green
the stress factor has no effect	gray

Table 1 The stress test coloring after Haaker et al. 2017

The fifth phase, analyzing the results, is done after creating the heat map. This phase has two sub analysis steps, sub-view analysis and pattern analysis. The sub-view analysis shows where the BM is more robust and it helps to analyze the overall structure of the model. In the pattern analysis, the coloring of the heat map is checked as it may form patterns, that need to be examined further. The analysis phase can result in positive outcome where the BM is shown to be viable, or it may reveal inconsistencies, even exposing that the BM is not feasible in any of the future scenarios. In the last phase, the formulate improvements and actions -part, the BM is enhanced after a discussion with an expert group to help to improve the uncertainties that emerged during the heat map phase. (Haaker et al. 2017, 18-19, 21-22)

The two tools introduced here, the BM canvas and the BM stress testing, are both simple but powerful tools to help analyzing the proposed business model. In this study, these tools are used to map the strengths and challenges that the case company's BM may have.

2.2 Ecosystem platforms

2.2.1 What is a platform and an ecosystem?

The case company is a B2B platform, which means that they operate with suppliers and business customers, not with regular consumers as B2C (business to consumer) platforms, like Amazon. They operate in a B2B marketplace, which can be, according to Li & Penard (2014, 1), classified into categories based on whether they are horizontal (has buyers/suppliers in many operational fields) or vertical (has buyers/suppliers in only one operational field), and whether they are neutral (not owned by a company operating in the field) or non-neutral (owned by a company operating in the field). This case company's B2B marketplace can be defined to be horizontal as it wishes to serve all transportation companies (instead of just serving maritime or aviation industry) and it is a neutral operator, as it is not currently owned by a company that already operates in the field.

In business ecosystems studies, most researchers refer to Moore's (1993) article as one of the first pieces to bring out the concept of business ecosystems and competition. According to Moore (1993, 76) business ecosystems have four stages (very similar to Schumpeter's creative destruction): birth, expansion, leadership, and self-renewal or death. In all these stages, companies compete and cooperate in an ecosystem of businesses, facing different managerial challenges. For actors in an ecosystem to flourish, the companies must both compete and cooperate with each other in right balance. (Moore 1993, 76-77)

A business ecosystem is the "economic community" that consists of different partners in a dynamic market, but when the ecosystem involves a platform and operates mostly digitally, digital business ecosystem (DBE) is the most proper term to be used. The term digital comes from the peer-to-peer network infrastructure used to connect the partners in the network. The digital business ecosystem, according to Nachira et al. (2007,5) is "an isomorphic model between biological behavior and the behavior of the software". (Nachira et al. 2007, 5-6) The digital business ecosystem is then a concept that has the characteristics of a biological ecosystem, but in a digital business setting, where different companies act in both competition and cooperation with each other, thus being connected (see also Karhu 2016, 15). This competition and cooperation in a platform ecosystem is mostly referred as coopetition, when companies have both elements in their relationship with their competitor (Karhu 2016, 15-16).

The digital business ecosystem's network, Nachira et al. (2007, 6) argue, is possible due to technological (IT), social, and knowledge networks being intertwined together. The network in the ecosystem then is possible as a result of technological advancements, such as the internet, and the already existing social networks and knowledge networks

improve the digital business network (Nachira et al. 2007, 6). The ecosystem network, then, could be said to have the basis on the social networks and knowledge networks that technology enables.

2.2.2 Two-sided markets in platform economy

In the field of economics, platform economies, and especially the network effects they hold, are much discussed subject. A B2B platform is usually a two-sided market (Li & Penard 2014, 1), which means that the amount of suppliers and buyers using the platform influence: (1) the attractiveness of the platform on both sides (more suppliers attract more buyers and vice versa) and (2) the price the platform charges per side (network externalities may result in one side using the platform for free whereas the other side must pay of the usage). (Li et al. 2010, 245; Parker & Van Alstyne 2005, 1503)

The most known theory of multi-sided markets (or two-sided markets, depending on the author) is the one by Parker & Van Alstyne (2005). They argue that two-sided network externalities have a great effect on the platform's pricing principles, even resulting in negative prices being favorable. The network externalities in two-sided markets refer to a situation where the number of users improve the attractiveness of the platform, as more users (or buyers) attract more sellers, and vice versa (Li et al. 2010, 245). The platform works as an intermediary between users and sellers, and how the platform sets its prices depends on both network externalities and cross-price elasticities of the market. This can then result in a situation where, for example, game developers are offered tools for free to create a game for a platform, but the players need to pay in order to access the game. (Parker & Van Alstyne 2005, 1494-1496) Besides network externalities, cross-group externalities affect platform pricing. Having weak cross-group externalities means that it does not matter much for one user group if another user group joins the platform. This impacts how platforms charge fees from users, for example if the cross-group externalities are weak, then transaction-based fees are more relevant than fixed fees. (Armstrong 2006, 668-669)

According to de Reuver et al. (2018, 125-126) platform research can be divided into non-digital and digital platforms. They argue that the theories by Parker & Van Alstyne and other economists are assuming that platforms are non-digital, as they consider platforms to be stable and modular system with similar design hierarchies. Non-digital platforms operate as internal platforms, supply chain platforms, and industry platforms and their main purpose is to "provide a stable core but also mediate between different groups of users". A digital platform, on the other hand, highlights dynamicity and flexibility. Digital platform relies on software and applications built around that software, and the

concept is more sociotechnical as it includes both technology and organizational processes. In digital platform, the core technology is still stable, but it should be flexible too to spur growth. Both types of platforms emphasize openness, but for non-digital platforms this refers to only organizational openness, whereas for digital platforms, the technology's openness is also considered. (de Reuver et al. 2018, 125-127) The concept of digital platform then does not exclude the theory of network externalities, but rather brings the technological applications into research discussion.

The competition in two-sided markets is not only between users and sellers in a platform, but between platforms as well. In the case of DBE Core Ltd, the distinction between buyers and sellers is not as clear as in the case of some other platforms (like Amazon or eBay), so detailed calculations about user pricings may not be applicable. But as the company operates in a field where competition is inevitable, the model for competing platforms may be of use. The model suggests that although two platforms may offer similar services, the user's preference still directs them to use one platform over the other. Users, as in both sellers and buyers, have different utility and they face transportation cost if they need to change platforms. In the equilibrium, for the user, the utility received from platform 1 is equal to the utility received from platform 2. If the platforms are close substitutes, the utility received and the transportation cost to switch to competitor becomes lower for the user, thus reducing the platform's profit. On the other hand, if the platforms are differentiated enough in the eyes of the users, the platform may try to attract the network externalities of a defined user group. (Li et al. 2010, 246-247) This model explains the need for differentiation in platform economy and highlights how close substitute platforms can still create profit and grow.

3 METHODOLOGY

This study aims at giving an example of a practical implementation of the business model research conducted in the field of information systems science. It attempts to solve a real-life business problem through existing academic literature and other textual data and through analyzing the business models of current information sharing platforms operating in the field. The conversations together with one DBE Core representative are also used as data about the company itself. The conversations were unstructured interviews about basic features the company offers and about the core idea of DBE Core Ltd. This data was mainly used as additional information and thus is not the main data collection method. The notes of the conversations are in author's possession.

The design science method is then suited for a study that attempts to solve real-life business problems, like forming a business model. Hevner et al. (2004, 83) give guidelines about what makes a research design science. In this thesis, the first and second guidelines are fulfilled as the first guideline, designing an artifact, includes the design of a business model. The second guideline, problem relevance, is fulfilled as the objective is to give an answer to a current business problem. The third guideline, design evaluation, demands "well-executed evaluation methods". According to Hevner et al. (2004, 85-86) the design science needs to have proper metrics to support the justification of the designed artifact, and these evaluation methods can be 1. observational, 2. analytical, 3. experimental, 4. testing, and 5. descriptive. Observational evaluation methods include for example case study, and analytical evaluation methods include different methods to evaluate the artifact itself. Experimental evaluation methods use artificial simulations, testing evaluation methods have black and white box testing as a metric, and descriptive evaluation methods include informed argument and scenarios. This study uses the descriptive evaluation methods, as they consist of both using current research for building an argument and constructing usability scenarios around the artifact to support the argument (Hevner et al. 2004, 86).

In design science methodology research, Peffers et al. (2007, 52) have constructed a process model for design science studies. They identify six activities that are included in the process:

1. *Problem identification and motivation*, where the research problem is defined.
2. *Defining objectives of a solution*, where the intentions to solve the problem are identified.
3. *Design and development*, where the IT artifact is created.
4. *Demonstration*, where the artifact is used to solve a problem.
5. *Evaluation*, where the artifact's offered solutions are analyzed.

6. *Communication*, where the results are justified to other researchers.
(Peffers et al. 2007, 52-56)

The process for this study is described in Figure 2. First, the identification and motivation for this study came from the research questions and background of the study. The objectives of the solution, the business model, were to demonstrate what added value can the case company's ecosystem platform offer to information sharing compared to other platforms or information sharing methods. Other information sharing platforms were sampled according to following specifications: 1. the operational field (transportation industry), 2. is it a digital platform or not, 3. does it have information sharing or networking properties. The platforms chosen all operated in transportation, mostly maritime industry, they are all digital platforms, and they have networking and information sharing properties. Also, as DBE Core Ltd operates in the EU, mostly European or platforms operating in Europe were chosen.

Then, the business model proposition was designed, and the business model stress test was used to demonstrate the power of the model. Finally, the results were analyzed and communicated. The design science process usually may need many iterations and Peffers et al. (2007, 56) note that many researches that use design science methodology do redesign or define the objectives again depending on the process. This thesis included one iteration due to time restrictions and challenges brought by the COVID-19 pandemic. This iteration was done during the evaluation-phase, when the company evaluated the first business model draft and objectives of the study were re-defined and some facts and updates were included to create a more robust BM proposal.

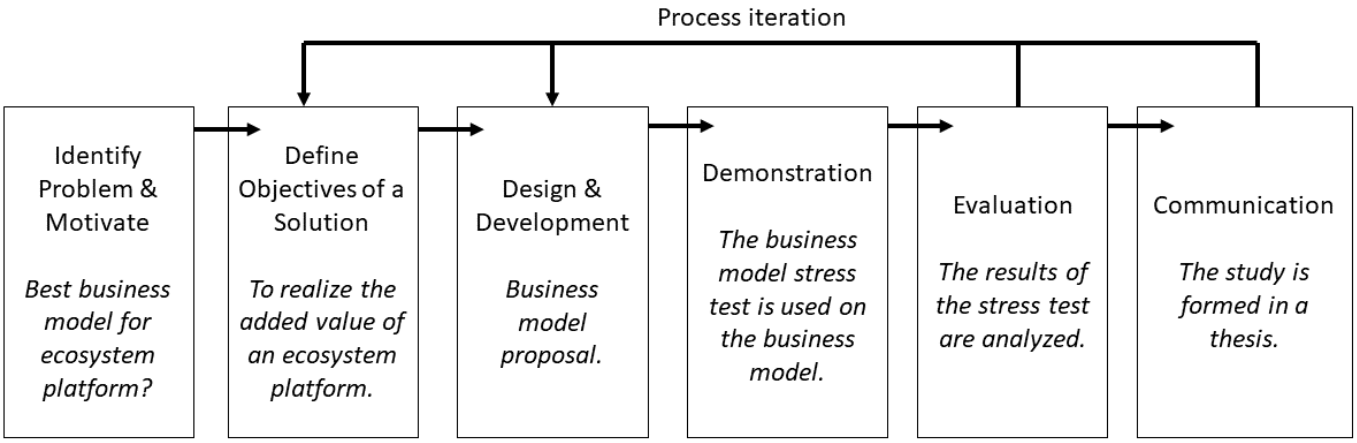

Figure 2 The process of the study

4 THE COMPETITIVE LANDSCAPE OF INFORMATION SHARING PLATFORMS

4.1 Networking platforms for logistics and transportation

To study what other platforms in the same or similar field have chosen as their business models, the competitive landscape should be mapped. Many different organizations offer platforms or platform visions for digitalizing services around the supply chain. For most cases, the platform supports an ecosystem of different stakeholders in the supply chain, providing different services for them, from communication with current partners to shipment tracking.

For this chapter, few so called ecosystem provider platforms, that were not information-sharing platforms per se, were chosen as an example based on their business model: BluJay from the UK, Awake.AI from Finland, Maritime Connectivity Platform by EfficienSea2 from Denmark, and Digital Skipper Assistant (DSA) by BearingPoint Belgium. None of these platforms are direct competitors of DBE Core platform, but they operate in the same field and have similar ideas about networking through a platform, thus should be considered. As mentioned in the Methodology chapter, the companies were chosen based on four categories: 1. the operational field (transportation industry), 2. is it a digital platform or not, 3. does it have information sharing or networking properties, 4. does it operate in the EU. The platforms were found through internet search and the companies, that had similar business idea than DBE Core and had the most promise, were chosen. Each of their BM's are estimated and the BM canvas is used to have a clear perception of the models.

All these platforms show the many projects that have emerged around information sharing and ecosystems in the transportation industry. From these four examples, only BluJay is a large software company with large customer base. This does not mean that the others should not be considered. The projects and platforms surfacing around the issue of information sharing in transportation industry shows that the same concern that DBE Core has about the lack of digitalization in transportation is shared in the industry.

Besides transportation ecosystem providers mentioned above, many other platforms are offered for organizations, such as German Saloodo! for road freight providers and Canadian Microdea for back-office automation for trucking companies. These platforms are excluded from this analysis, as they were more about connecting partners together (like Saloodo!) or to be used in internal processes (like Microdea) rather than to be used for information sharing and ecosystem creation. Although these are important functions, they are not essential for the case company.

To simply model the business models of the platform companies previously mentioned, this chapter will use the BM canvas by Osterwalder et al. The BM canvas is an easily communicable tool to visualize a business model and that makes it a popular way to describe a company's business model (Heikkilä et al. 2018, 109). Here, the BM canvas framework is used to illustrate the (possible) BM's of competitive platforms. The BM canvas describes nine business components: key partners, key activities, key resources, value proposition, customer relationships, channels, customer segments, cost structure, and revenue streams (see Figure 1 in chapter 2.1).

4.1.1 BluJay Solutions

The UK company BluJay Solutions offers supply chain optimization and networking services for businesses. The company is a large software house with around 1200 employees and 7500 customers. In September 2019, BluJay announced being PEPPOL certified. Data management and analytics seems to be a large part of their value proposition and the way they help their clients with the supply chain optimization. BluJay's Transportation Management software and LSP (logistic service provider) platform makes it possible for users to connect with other partners worldwide. BluJay calls this network for supply chain operators the Global Trade Network. (BluJay Solutions Ltd. website, 2020)

Looking at the possible BM components that BluJay Solutions might have, a following BM canvas was formed based on information found about the company:

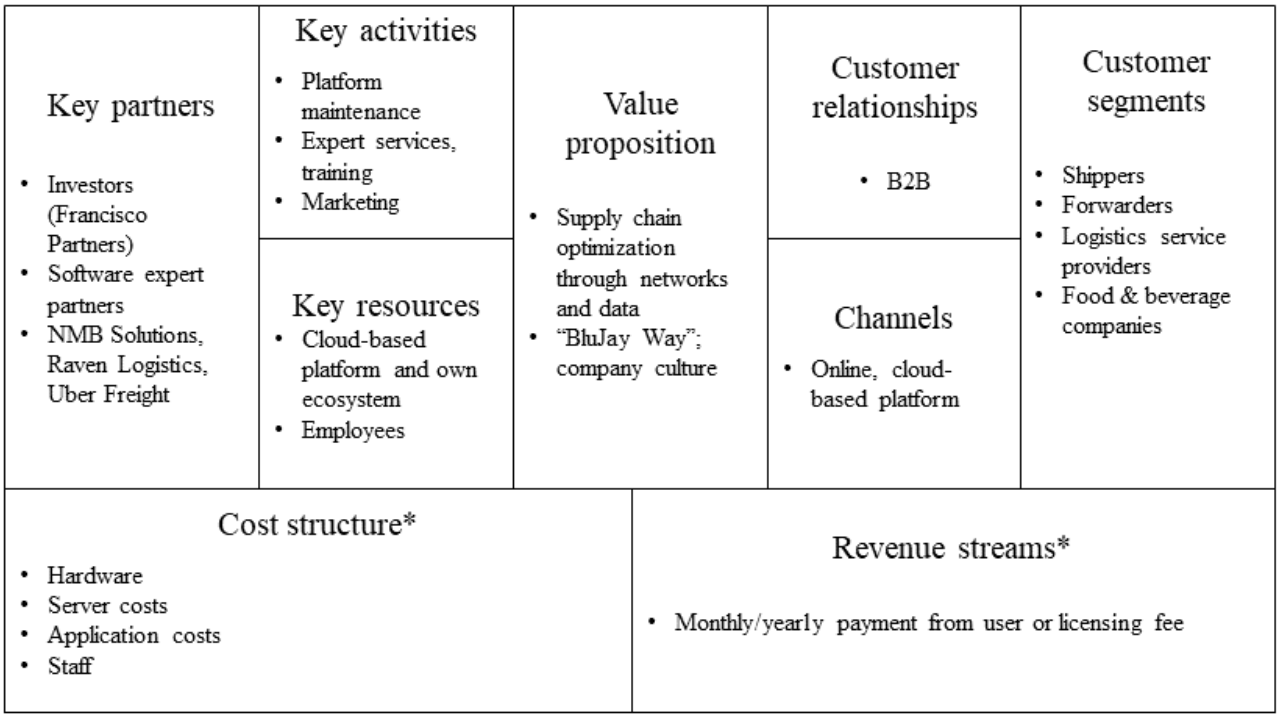

Figure 3 BluJay BM canvas

BluJay informs that they are owned by Francisco Partners, and that they have partnerships with relevant businesses such as Raven Logistics (a railroad logistics company with a railroad SaaS) and NMB Solutions (a partner offering Microsoft D365 integration). BluJay offers training besides their software and platform, and their platform is cloud-based and it has its own ecosystem (Global Trade Network). Their value proposition seems to be supply chain optimization through networking, data sharing and data analytics. Their customers include shippers, forwarders, logistics service providers, and food and beverage companies. (BluJay website 2020, BluJay press releases 2020)

Some components of the BM are not public knowledge, such as revenue streams and cost structure. BluJay does not share in their website what the platform costs for the user – it is probable, that they charge monthly/yearly payments or licensing fees from users. The website heavily suggests that the BM for BluJay is a traditional transactional model, similar to what DBE Core has now. BluJay has many partners, such as Uber Freight and Raven Logistics, but these partnerships are mostly about integrating the other party's technology and knowledge to BluJay's network (BluJay press releases, 2020). BluJay then has some similarities with DBE Core's partnership business model, but it could be argued that the transactional model is more relevant to BluJay.

4.1.2 Awake.AI

Turku-based Awake.AI is a shipping platform startup that hopes to introduce AI and digital ecosystems for maritime industry. The platform aims at promoting smart shipping and digital data sharing primarily for ports and ships, but also for all other maritime operators. Operational support and ecosystems are also part of their vocabulary. (Awake.AI website, 2020) Their platform, Smart Port as a Service, is described as a "real-time collaboration and situational awareness tool that uses artificial intelligence (AI)-based predictions to unlock smarter operational optimization for all maritime actors". Through AI, Awake hopes to increase the operational efficiency of ports and enable autonomous shipping in the future. (Awake.AI press releases, 2020)

The following BM canvas was formed based on information found about Awake:

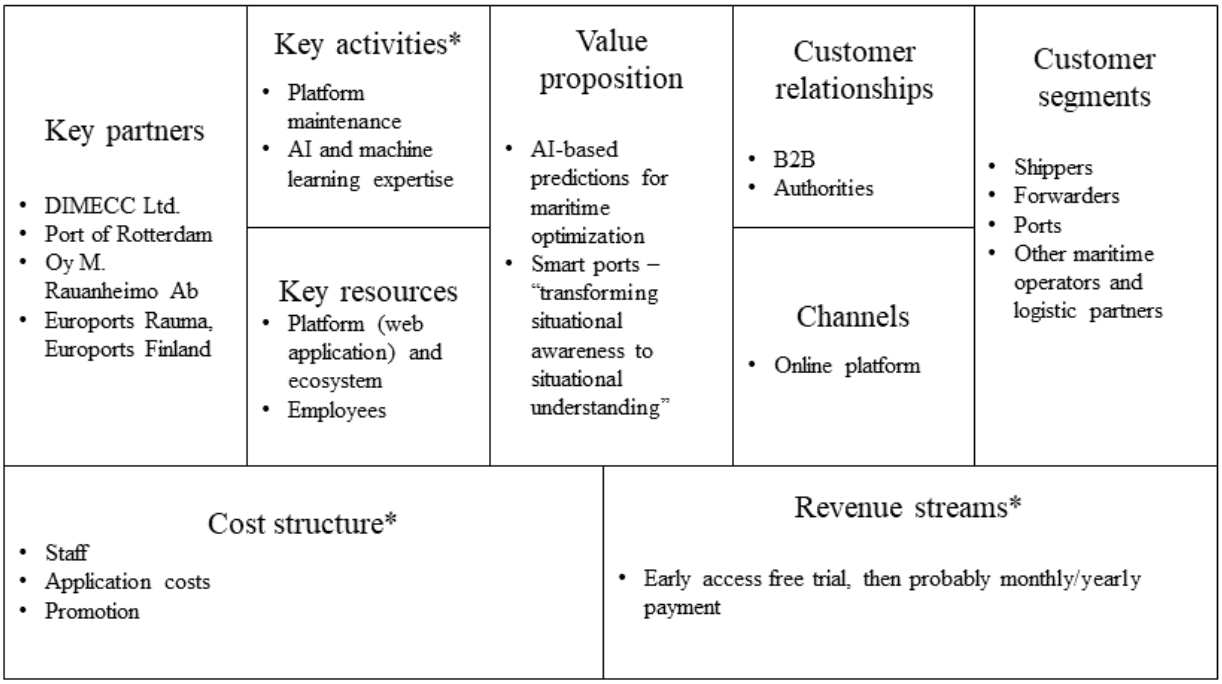

Figure 4 Awake.AI BM canvas

Port of Rotterdam is an important key partner for Awake, as the port is the largest in Europe. DIMECC, a Finnish innovation platform that brings together many R&D professionals and organizations, is a research-based project organization as DBE Core's DBE Lab (DIMECC website, 2020). Awake's value proposition seems to be based on AI predictions used for maritime optimization ("situational understanding") for the whole logistic chain of maritime operators. Their customers include not only shippers and ports, but also all other parties in the logistic chain. (Awake.AI website, 2020)

Currently, Awake.AI is offering an early access free trial for interested users (Awake.AI website, 2020). This may imply that Awake is planning to charge its users in the future, most likely with monthly/yearly payments. All the components suggest that Awake uses more a transactional based business model with a hint of research project model. As for all platforms, their partnerships are important, but in case of Awake, Port of Rotterdam is very likely to be both a user and a partner, making it less like what Telia is to DBE Core. Awake's partners do not supply the platform with technology like Telia does for DBE Core with their programming and cloud environment.

4.1.3 EfficienSea2

EfficienSea2 is a navigation platform project led by Danish Maritime Authority, making it a non-profit entity. They have a cloud-based open source platform called Maritime Connectivity Platform for information sharing and communication between ships and its stakeholders, mostly to be used in the Arctic Sea and the Baltic Sea. Helping maritime actors sharing their data is one of the main objectives of the project and the platform is available for all. The project lasted from May 2015 until April 2018. (EfficienSea2 project website, 2020)

EfficienSea2, then, is not a platform business venture, but rather a research project that aimed to improve navigational safety and efficiency. Enabling better communication between different maritime operators was also one of the aims of the platform. The project had 32 partners developing it, from academia, organizations, and authorities. (EfficienSea2 EU website, 2020) It is unclear how successful the project was, but it could be argued that having a research-based project that included 32 different partners, this platform might lead to more innovations in digitalizing maritime navigation. If the platform itself does not have a strong success, it may help grow other innovations.

The BM canvas of the project might look like this:

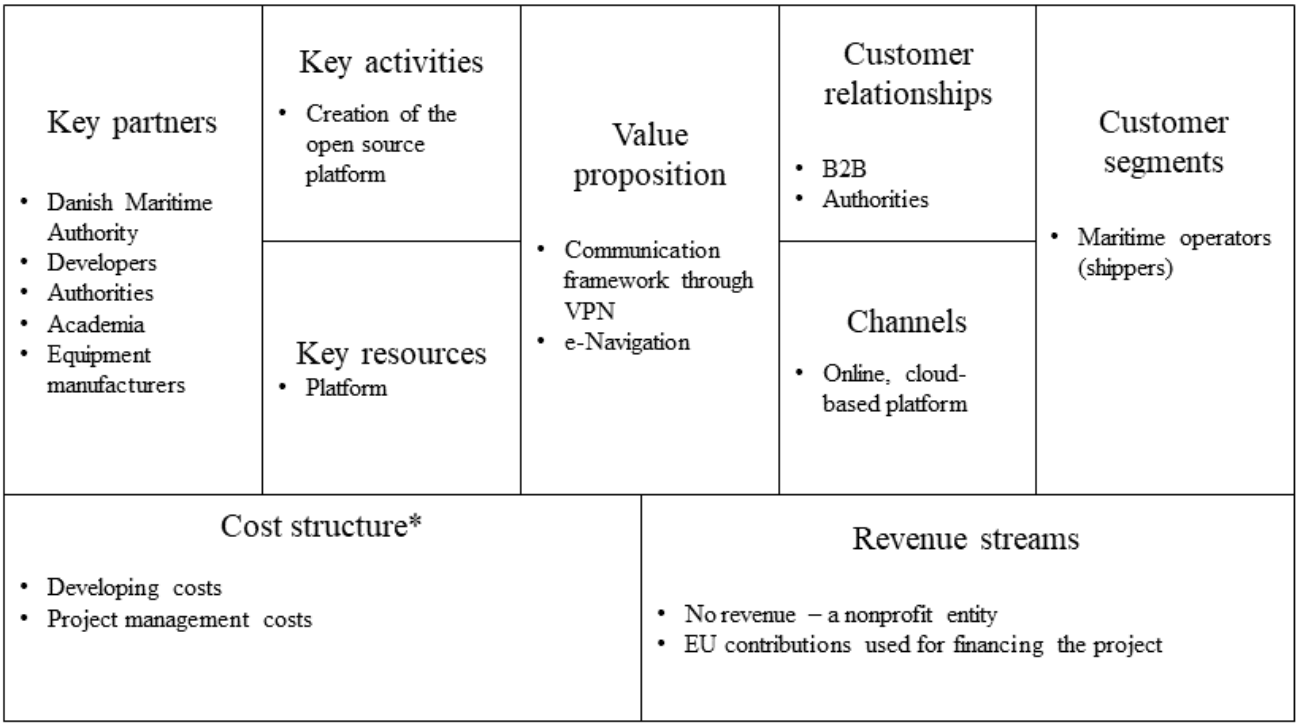

Figure 5 EfficienSea2 BM canvas

EfficienSea2 mentioned to have 32 partners, including authorities, academia, and equipment manufacturers. Creating the platform itself seemed to be the main task for the project, and offering better e-Navigation and communication between maritime operators is the value that this project brings. Customers are all maritime operators, but mostly shippers. A large part of project financing was received from the EU, but as a nonprofit project it could be argued that all of the possible revenue were directed to different project costs. (EfficienSea2 website, 2020; EfficienSea2 EU website, 2020)

Compared to business models discussed in DBE Core, this model is most likely to be a research project model. As the project was coordinated by a government official (Danish Maritime Authority) EfficienSea2 platform was not created to be a profitable business thus making it slightly different to previous BM's. For DBE Core, it might be interesting to find out what partners took part in this project to see if they are open to participate in other innovational projects.

4.1.4 Digital Skipper Assistant

Another project is BearingPoint's Digital Skipper Assistant (DSA) -platform. The idea of the platform is similar to previous examples: to create an ecosystem by connecting stakeholders together, but instead of operating in the maritime industry, the platform is aimed at inland shipping transportation. (BearingPoint website, 2020) The project contains no information about how much the platform has been developed, although it was set to be ready early 2019.

The DSA platform is currently a research project with mostly German partners. The platform seems to be aimed at Central European users, where inland shipping is very common way of transporting goods. Connecting stakeholders and better planning of routes and timetables are the aims of the platform. (BearingPoint website, 2020) Although the project includes a consulting company (BearingPoint), many governmental partners such as German ministry of transport suggest, that this is mostly a research project for now.

A BM canvas estimation of DSA can be found here:

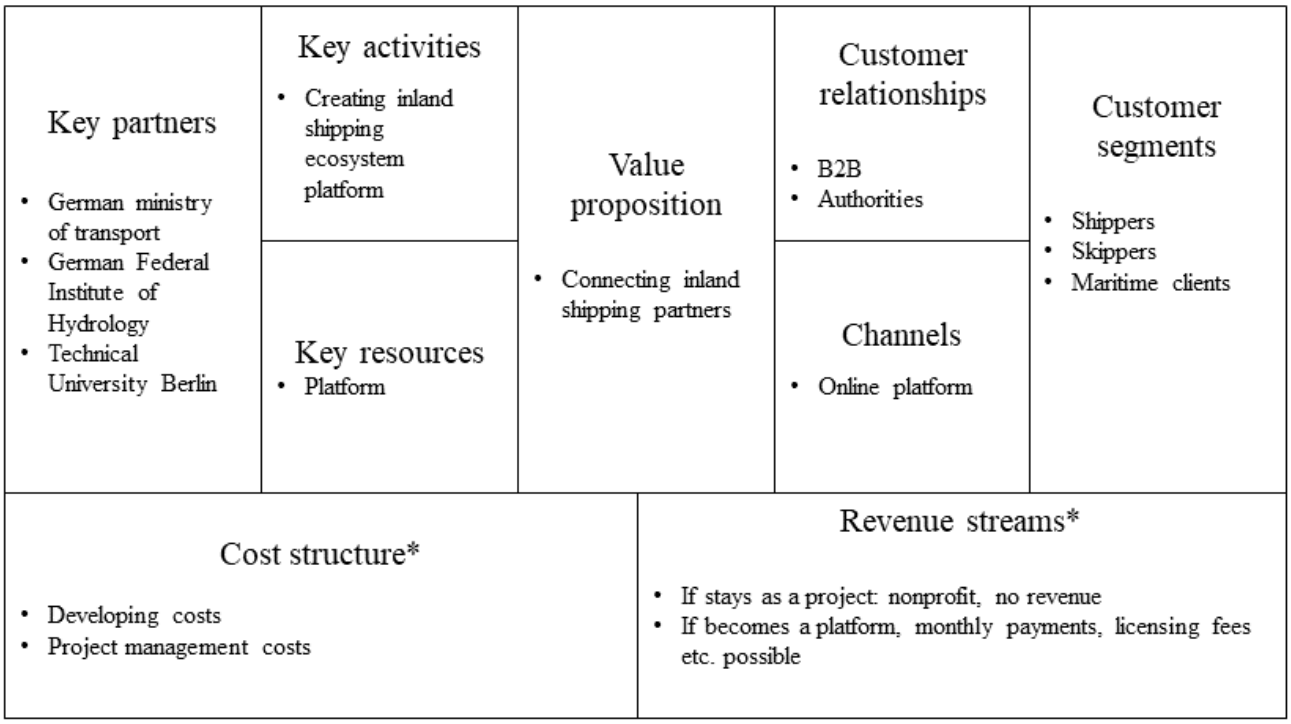

Figure 6 DSA BM canvas

Key partners include German officials and Technical University of Berlin, and as no companies or other organizations were mentioned, the project seems to be much government and academy led. Developing a platform that enables better connection between inland shipping stakeholders is the value proposition of the platform, and users are mostly shippers, skippers and other maritime clients. There was no information found whether

or not the DSA project hopes to gain revenue or is it a purely nonprofit organization. (BearingPoint website, 2020) If it is much like EfficienSea2, which is also a project led by officials, it is likely to be a nonprofit innovation project. The BM behind this platform is then most likely to be a research project based one, if thinking about the BM's considered by DBE Core.

4.2 Information sharing platforms – TradeLens

TradeLens, an information-sharing platform by Maersk and IBM, could be claimed to be the closest competitor to DBE Core. Like DBE Core, TradeLens' main business idea is to offer a platform for digital data and documentation sharing for transportation operators, and it uses blockchain for data security. TradeLens is an open API in order for it to be easily accessible for different organizations in transportation business. (TradeLens website 2020; TradeLens and Blockchain Technology Supply Chain Demo 2019)

The platform bases its data model on UN/CEFACT Supply Chain Reference Data Model (SCRDM), which is a data model formed under UN. The main purpose of the data model is to support information exchange processes in transportation and to offer a framework for both businesses and public organizations to build their information requirements while supporting overall data structures. The base for the standard is UN/CEFACT Core Component Library (CCL) where the business data exchange structures are derived. (UN/CEFACT 2017, 3)

TradeLens does not share how many users it has or how much revenue it has made. They have though, revealed some users that they have gained. Ocean carriers Hapag-Lloyd, ONE, CMA CGM and MSC, as well as terminal operator GCT, have joined TradeLens platform. Besides these big ocean carrier companies, some customs officials in different countries, such as in Jordan and Thailand, have shown interest to the platform. TradeLens has operated since the end of 2018. (TradeLens website 2020, TradeLens Press releases, 2019)

According to August Braakman, a Dutch lawyer specialized in maritime law, over 100 members have joined TradeLens, and having large lines like Hapag-Lloyd and ONE, the TradeLens members make up more than 70% of the market. Braakman (2019) claims this to be problematic as non-profit organization Digital Container Shipping Association (DCSA), founded by MSC, has created exclusive digital standards that are managed by the large shipping lines, and as TradeLens has most of these shipping lines as customers, the DCSA standards define the whole industry. He accuses the DCSA standards of strengthening the monopoly position of these large shipping lines as other developers

cannot develop the standards. Using the DCSA without giving others access for development, the situation forces other operators to join TradeLens. (Braakman 2019) Braakman (2019) underlines the role of EU in this: “It is essential that the EU Commission take action soon by creating tools that are sufficiently adequate and effective for measuring, evaluating and neutralising the ensuing effects on freedom of competition.”. On the other hand, there is no confirmation by TradeLens that they will use DCSA. But in May 2019 IBM stated that they plan to support the standards in the future (Wieck, 2019), making it very probable that TradeLens will do so too, as TradeLens is developed by IBM.

The TradeLens BM canvas might be argued to look like this:

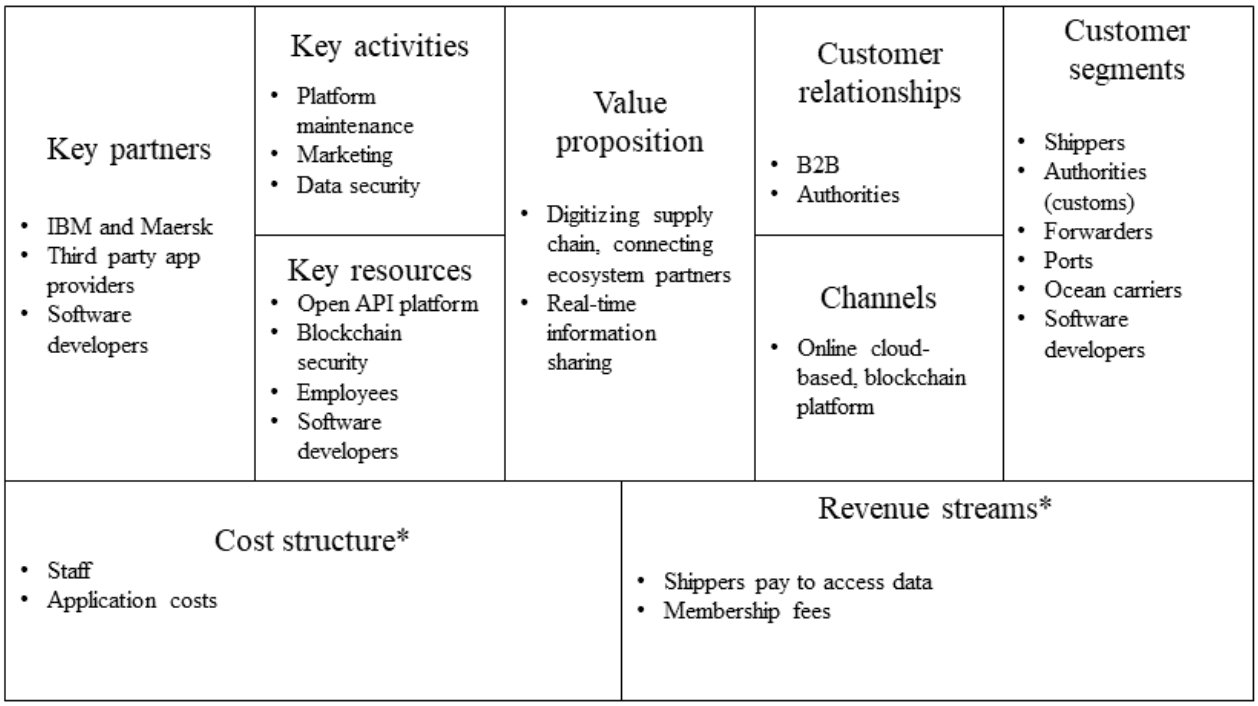

Figure 7 TradeLens BM canvas

Key partners include IBM and Maersk, whose networks might be crucial for TradeLens. The platform is open API and cloud-based platform, which uses blockchain for data security. TradeLens offers real-time information sharing and digitizing the whole supply chain information sharing as their value proposition, and they aim to involve all possible stakeholders in maritime logistics chain. (TradeLens website, 2020) They do not share what are the costs for the users for using the platform, but it can be argued that it is not a nonprofit organization, meaning it charges some fees.

Although TradeLens is a large project with big customers and has a big potential for gaining a monopoly position, the platform still seems to be in its early stages. It may be that the EU and its antitrust law becomes a big obstacle for TradeLens to gain monopoly-like position. Looking at the BM of TradeLens, it could be argued that comparing it with

the BM possibilities considered by DBE Core, this BM is most likely a partnership model. TradeLens seems to operate on its own, but it has strong support from IBM and Maersk. IBM and Maersk are great resources, both technologically and knowledge-wise, for TradeLens. It is then very likely that TradeLens' BM is more about partnership with IBM and Maersk than just a transactional model.

4.3 Business models of competitive platforms

Once all the other platform's business models have been analyzed, this chapter focuses on comparing these BM's to each other. To have a better comparative view of the different BM canvases of platformed discussed above, all of the BM's were formed as a one table (Table 3). It should be noted though, that some information concerning the BM components is not publicly announced by companies, making some of them to be estimations or educated guesses.

The platforms or projects are analyzed in the following order: BluJay, Awake.AI, EfficenSea 2, DSA, and TradeLens. Information on each block was found on the company website or in case of TradeLens, in press releases, unless stated otherwise. Key partners include for many platforms investors besides other partners. The value proposition of each platform could be concluded from what the platform informed to be their key advantage and offering. Customer relationships and channels were very similar to all, as their operations are in a similar field, which could also be interpreted from their websites. They all offer their platform for B2B clients and aim mostly for the same customer segments: shippers, forwarders, and other maritime clients. Most of the platforms are SaaS models with EfficienSea2 being the only PaaS model. Usage of cloud technology is also visible in almost all business models, but only for TradeLens, blockchain technology is essential part of the platform. Some parts, like key activities, key resources, cost structure and revenue streams were not public information, so educated guesses based on the platform's operational field, technology used and value proposition were made to fill in these gaps.

Revenue streams of the competitors were not publicly announced in most cases, but so-called membership-based fees model, where the users pay monthly or yearly fee for using the platform, is the most logical choice. The other revenue model would be transaction-based fees, where the platform charges fees for every interaction made (for example Amazon collects fees from the supplier side for each transaction made between the supplier and the buyer), but for ecosystem platforms like TradeLens this may not be sustainable. Armstrong (2006, 669) argues that platforms charge a fixed membership fee,

because gathering a fee from one user does not affect the platform's performance on another user. He states that this is due to the fact that cross-group externalities are stronger when charging fixed prices. This means that if one user group's attendance in the platform has a strong impact on another group's attendance, the benefit of having an extra user is more important in membership fee -based revenue models compared to transaction-based fee models. In transaction fees, charging a fee for each interaction between users lowers the importance of the benefit of having another user involved. (Armstrong 2006, 669)

For platforms who strive to create an ecosystem and to connect users with each other, it is then important to have specific users in the platform to attract more users. Charging a transaction-based fee lowers the benefit of having a certain user-group on the other side, meaning that for a user, it does not matter with whom they interact with, as long as the platform works. For an information-sharing platform, this does not support their value proposition. In transportation document sharing, it is crucial that certain actors are using the platform and that they are not anonymous. It means that one user group is dependent on having another user group involved, making cross-group externalities strong, thus making it more profitable for a platform to use membership-based fee revenue model.

The competition for transportation platforms and successful ecosystems is considerable and this should be taken account when creating a business model suggestion for DBE Core. None of these platforms have yet made a big transformation towards a more digital information sharing in the field of transportation, which has its benefits and downsides for new platform entrants.

The reason why none of these platforms have gained a strong market share may be explained with two-sided network externalities. Network externalities can result in one platform having a monopoly-like position, when more users attract even more users. In a competitive setting, this means that a dominant firm must set its prices so that an entrant cannot gain positive profit. For the newcomer to participate in market successfully, it would need a divide-and-conquer -strategy. The logic behind this strategy is as follows: if users are offered a possibility to multi-home, meaning that they can use multiple platforms to eventually connect with the desired partner, the newcomer can try to reduce membership fee and charge higher transaction fees on the same time. But in the case of information-sharing platforms, where transaction fees may not be an option, the divide-and-conquer strategy is not efficient for newcomers. This reduces the changes for successful market-entry and results in having one dominant firm that gets all the users. (Caillaud & Jullien 2003, 314-315, 322-324) This might be the setting that TradeLens aims towards. But still, none of the platforms mentioned previously hold a strong market share. According to Caillaud & Jullien (2003, 322), the quality of the platform is essential for a dominant firm to capture all users. So, the reason behind why there are many platforms in transportation information sharing but not one of them is strong enough to capture all

users, might be as simple as that the quality of the platform is not sufficient enough for users.

The BM canvases show that the platforms have some major differences, especially concerning revenue. EfficienSea2 and DSA could be said to be the most different ones, as they are a projects and most likely nonprofit entities. The other platforms had a clear connection to businesses as they had organizations working behind them, making profiting from the platform one of the purposes for its creation. EfficienSea2 and DSA are then project based business models, with much academic and government cooperation and with the purpose of creating a platform as the end-product of the project. BluJay and Awake.AI could be categorized as transactional business models as they hope to use the platform as the base of their business and gain growth and revenue offering it. TradeLens with its big partners IBM and Maersk, seems to have a partnership model besides the transactional model, where the partnership model is stronger than transactional one. Interestingly, all of the platforms had also features that DBE Core thought to be part of either partnership model or research project model. It could be argued, then, that platforms should not use just one business model, but adjust it according to the market environment where they operate in. This thought is much inline with the lean approach suggested by Xu&Koivumäki (2019, 310), where the business model is constantly renewed and reconsidered dynamically.

Platform	Key partners	Key activities*	Key resources*	Value proposition	Customer relationships	Channels	Customer segments	Cost structure*	Revenue streams*
BluJay (SaaS)	• Investors (Francisco Partners) • Software expert partners • NMB Solutions, Raven Logistics, Uber Freight	• Platform maintenance • Expert services • Marketing	• Cloud-based platform and own ecosystem • Employees	• Supply chain optimization through networks and data • "BluJay Way"; company culture	• B2B	• Online, cloud-based platform	• Shippers • Forwarders • Logistics service providers • Food & beverage companies	• Hardware • Server costs • Application costs • Staff	• Monthly/yearly payment from user or licensing fee
Awake.AI (SaaS)	• DIMECC Ltd. • Port of Rotterdam • Oy M. Rauanheimo Ab • Euroports Rauma, Euroports Finland	• Platform maintenance • AI and machine learning expertise	• Platform (web application) and ecosystem • Employees	• AI-based predictions for maritime optimization • Smart ports – "transforming situational awareness to situational understanding"	• B2B • Authorities	• Online platform	• Shippers • Forwarders • Ports • Other maritime operators and logistic partners	• Staff • Application costs • Promotion	• Early access free trial, then probably monthly/yearly payment
EfficienSea 2 (PaaS, open source)	• Danish Maritime Authority • Developers • Authorities • Academia • Equipment manufacturers	• Creation of the open source platform	• Platform	• Communication framework through VPN • e-Navigation	• B2B • Authorities	• Online, cloud-based platform	• Maritime operators (shippers)	• Developing costs • Project management costs	• No revenue – a nonprofit entity • EU contributions used for financing the project
Digital Skipper Assistant (SaaS, in testing)	• German ministry of transport • German Federal Institute of Hydrology • Technical University Berlin	• Creating inland shipping ecosystem platform	• Platform	• Connecting inland shipping partners	• B2B	• Online platform	• Shippers • Skippers • Maritime clients	• Developing costs • Project management costs	• If stays as a project: nonprofit, no revenue • If becomes a platform, monthly payments, licensing fees etc. possible
TradeLens (SaaS, open API)	• IBM and Maersk • Third party app providers • Software developers	• Platform maintenance • Marketing • Data security	• Open API platform • Blockchain security • Employees • Software developers	• Digitizing supply chain, connecting ecosystem partners • Real-time information sharing	• B2B • Authorities	• Online cloud-based, blockchain platform	• Shippers • Authorities (customs) • Forwarders • Ports • Ocean carriers • Software developers	• Hardware • Staff • Application costs	• Shippers pay to access data • Membership fees

*these compenents are fully or partly estimated by the author, they are not public knowledge

Table 2 Competitive platforms' BM Canvases

5 BUILDING THE BUSINESS MODEL

5.1 Choosing BM components

In previous chapter, the business models of competitive information sharing platforms were mapped. Through different BM components, the competitive business models were examined, and the conclusions considered especially similarities between the business models, possible revenue streams, and network effects. To build a competent business model recommendation for DBE Core Ltd, a more profound examination of the different BM components of different BM options should be made.

DBE Core Ltd is currently considering between various BM's, so innovating a business model is still at early stages. In research, the business model innovation (BMI) usually refers to either composing a totally new business model or modifying existing business model components. The BMI process should start from considering what is the value that the product or service brings to the customer, or in other words, how the company hopes to solve customer's problems. Then the processes and methods for capturing this value should be designed and implemented. Some researchers have suggested first evaluating the market segments, but most agree that defining the value for the customer is essential for building a sustainable BM. (Heikkilä et al. 2018, 109-110)

For business model creation, Xu & Koivumäki (2019, 311) suggest three different "tracks" according to the agility of the business model: the causation/prediction track, the effectuation track, and the lean startup -track. In causation/prediction track, the key process starts with identifying the opportunity areas and then creating a business model. In effectuation track, the process starts with by answering the questions "Who are we? What do we know? Whom do we know?" or in other words, realizing the opportunity and the possible network, and then creating the business model. For lean startup track, the process is turned: first, one proposal is created as a business model, then it is tested, measured, and improved in iterative cycles. Both causation/prediction and effectuation tracks highlight the firm's control over its own business model, whereas the lean startup track emphasizes customer needs as the base of the business model. (Xu & Koivumäki 2019, 311-313)

When choosing the right BM and the right components for the business model proposal, it should also be considered as part of the business model creation process of DBE Core. The lean startup track may be the most suitable process for the case company, as the market is still young and lacks strong competitors, so there is room for constant business model renewal based on customer needs. This business model proposal is only one

view of creating a business model, and the business model components and the whole business model logic should be reconsidered and tested constantly making the business model more agile.

The next sections consider the features recommended for a successful information sharing platform BM. As suggested by research, first the value to the customer, or value proposition, is examined. Then key partners, key activities and key resources are evaluated specifically according to networking possibilities that platforms may offer. Deeper customer segmentation is then done by comparing to other platform's solutions in the same field. Last, the different revenue models and costs are considered based on platform research and what existing platforms have concluded to be the best for them.

5.1.1 Value proposition

The value proposition defines what value a firm desires to create for its customers and stakeholders (Heikkilä et al. 2018, 109). For a business to be successful, it is essential to understand what factors are part of the firm's value proposition to fully answer customer's needs. Osterwalder et al. (2010, 23) suggest eleven different perspectives, both qualitative and quantitative, to examine when determining the value proposition. These suggested perspectives are: newness, performance, customization, "getting the job done", design, brand/status, price, cost reduction, risk reduction, accessibility, and convenience (Osterwalder et al. 2010, 23-25).

Newness refers to offering a completely new product or service to the market, whereas performance is about creating better performing products or services. Customization considers the needs of customized and more individualized products or services. "Getting the job done" is about helping the customer for certain jobs, for example being the trusted subcontractor. By having a strong design and/or brand of the product or service may also be the main value proposition. Offering the product for a lower price than competitor is much used strategy and value proposition especially in the field of consumer goods. Reducing costs or risks is something that a firm may offer to its clients, like many service companies do, for example offering IT services or accounting services. Accessibility as value proposition creates access to products or services previously unavailable to consumers, and convenience enables offering products or services more easily to customers, for example many streaming services like Netflix do. (Osterwalder et al. 2010, 23-25)

For an information sharing platform business like DBE Core, not all value proposition components offered by Osterwalder et al. (2010) are relevant. In their mission statement, DBE Core brings out their wish of "to a better, faster, smarter, and thus more predictable supply chain that will benefit all industries, finance, logistics, and new value-adding service partners. We develop solutions that industry needs most to facilitate fast ROI. We

want business and IT people to orchestrate, connect and operate optimally." (DBE Core Ltd, 2020). The most prominent value proposition components might be then the following: performance, reducing costs and risks, accessibility, and convenience (see Figure 3). As the company states their wish to better the supply chain for all participants, convenience, accessibility, and performance are important components. The platform makes information sharing easier than before, thus convenience is one aspect. Also, researchers argue that having a single platform for information sharing reduces the complexity and fragmentation of the information (Wang et al. 2011, 620). This supports the convenience aspect. Previously unavailable or otherwise difficult to receive information is more accessible than before, thus making accessibility second aspect. In order to fulfill these promises, the platform has to have better performance than the competitors. The promise of facilitating fast ROI and the platform's ability to reduce document sharing costs is one value proposition component. Using blockchain also solves the need for risk reducing as secure information sharing is important for the supply chain participants.

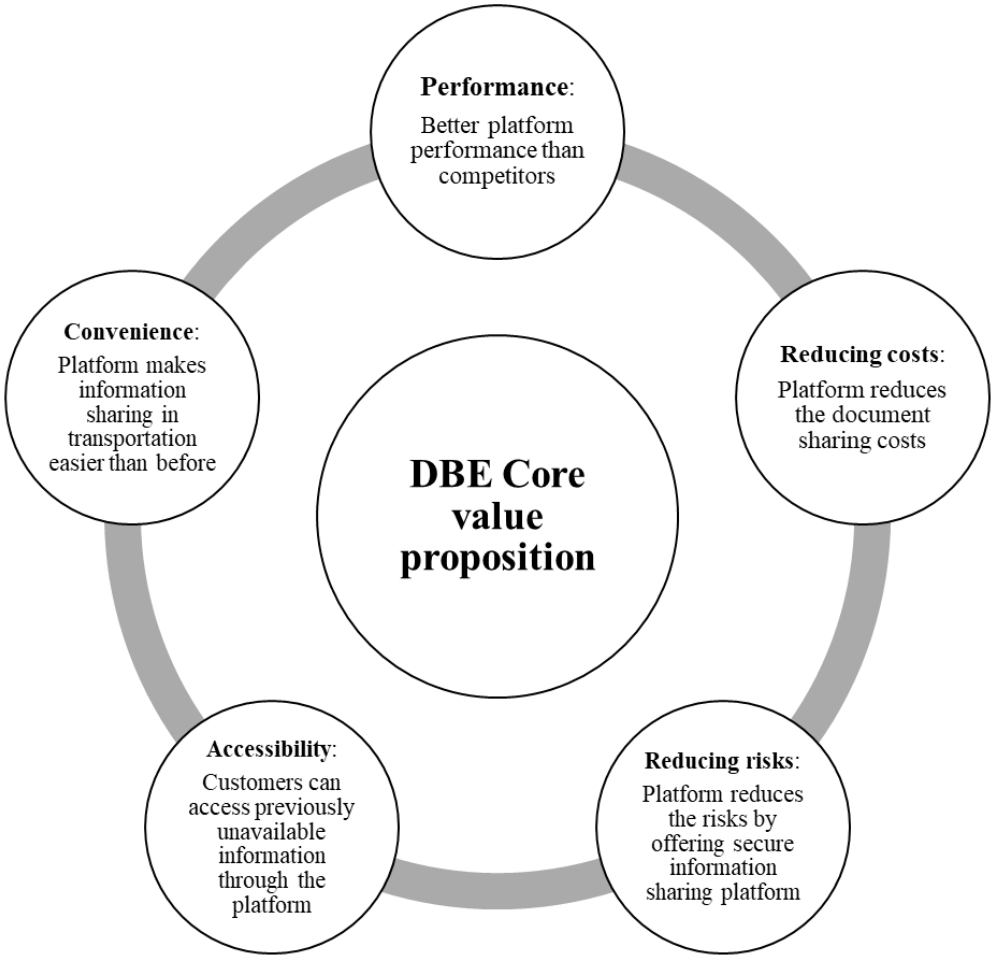

Figure 8 DBE Core value proposition components

5.1.2 Key partners, key activities, and key resources

In most business models, key partners consist of the network of suppliers and partners, which are usually strategic alliances between non-competitors and competitors (in coopetition, as mentioned in chapter 2.2.1), joint ventures and buyer-supplier relationships (Osterwalder et al. 2010, 38). For digital platforms, the ecosystem network itself and all actors in it could be argued to be a key partner itself, especially when thinking about the definitions by Karhu (2016) and Nachira et al. (2007) presented in chapter 2.2.1. This thought of digital ecosystems and value creation makes the role of key partners slightly different than in traditional business.

Fehrer et al. (2018, 554) suggests a new business model logic for platform ecosystems that is based on service-dominant logic. This logic emphasizes sharing and value cocreation through networking. In a platform, the openness that encourages sharing reduces market entry barriers for all sides as it makes resources available for all sides. It is argued that the collaboration between parties in an ecosystem network creates the value of the platform. (Fehrer et al. 2018, 554-555) This supports the coopetition-view of digital ecosystems, so the key partners in an ecosystem may then be competitors, too. Networking view is especially important in the partnership model that DBE Core is considering. In partnership model, DBE Core might cooperate with businesses, that traditionally could be considered competitors.

DBE already has some instances that are considered key partners. These key partners include the company's investors, Finnish teleoperator Telia, and as the company has strong ties and history with the academia, Finnish universities like University of Turku and Lappeenranta University of Technology. DBE Core also has cooperation with an independent program called DBE Lab Fi, which can help with R&D problems. Hyperledger, a network that created Hyperledger Fabric open source blockchain, could also be considered as a partner, as the network provides a key technology for DBE Core. DBE Core is also a member of Linux foundation, which supports with their platform programming. (DBE Core Ltd, 2020)

Networking with users, partners, and competitors is crucial for a platform. The openness that comes with cocreation includes system participation of the users and other actors, is called institutionalization. This institutionalization results in needs of high adaptivity and system governance of the platform, where the actors in the ecosystem govern the system. When the growth of the network is not fully on the hands of the platform, the platform may need complementarities to capture the full value. These complementarities may be between services, between technologies, or between activities. Offering complementary services may be one way to increase value capture and having good technology behind the platform that supports the networking needs of the actors, which could be one

complementarity. Activities, like supporting the networking and collaboration between parties, may also be a value capturing complementarity. (Fehrer et al. 2018, 555-556)

The role of the key partners differs in different BM considerations that DBE Core has. The value capturing complementarities and networking support of the platform discussed above seem to be much more important for transactional business model and partnership business model. In these models, DBE Core has to have an active role in creating a network of actors, that are part of the ecosystem. In these models, key partners are important actors and DBE Core should have a strong relationship with them. In subcontracting model and research project model, DBE Core is less active member of the ecosystem. In these models, DBE Core's role is mostly about offering and maintaining a technology that creates the network. The relationship that DBE Core has with its key partners then differ according to the business model – in transactional and partnership models, the company is more active member of the ecosystem and cooperation is more highlighted, but in subcontracting and research project models, the networking itself is mostly left for the contractor or it depends on the research project participant.

Osterwalder et al. (2010, 37) categorizes key activities into three groups: production, problem solving, and platform/network. DBE Core then naturally falls into the latter group. The platform as a key activity, according to Osterwalder et al. (2010, 37), is about "[…] platform management, service provisioning, and platform promotion". For DBE Core, platform development and management are key activities now, and later service provisioning and marketing may come into question, especially in transactional and partnership models. Managing REST API architecture and Hyperledger Fabric blockchain are key activities for the case company, as they are core technologies that are used to run the ecosystem and to provide data security for the users. The technological side of key activities are more important in subcontracting model and research project models, where the services of DBE Core are mostly valued for the technology.

Key resources are the physical, financial, and intellectual means that the company uses to fulfill its value proposition (Osterwalder et al. 2010, 34). Previously mentioned REST API and Hyperledger Fabric could be considered as key resources, as well as the UBL data model. These technologies provide the actual platform and therefore are the most important physical resources that DBE Core has. Comparing these components with what TradeLens uses, the UN/CEFACT data model and the DCSA standards, DBE Core uses UBL and PEPPOL. OASIS made a report in 2016 concerning the UBL and UN/CEFACT compatibility, where it was concluded that despite the efforts for collaboration, UN/CEFACT still remains somewhat technically incompatible with UBL XML documents and remain ununified (McGrath 2016, 9-10). So, compared to TradeLens, DBE Core uses data models and standards compatible with the invoicing procedures used in the European Union, as PEPPOL supports UBL and the European Commission promotes

the usage of PEPPOL in the EU (see PEPPOL website). This should be noted when researching prospects for the ecosystem, when the differences in standards may become a technical issue.

Intellectual resources are also important, like personnel, software developers, and students. Offering university students project work could be one key resource, as DBE Core works closely with Finnish universities. All the resources mentioned would be in use despite the business model DBE Core decides to use.

5.1.3 Channels, customer segments, and customer relationships

Customer relationships, channels, and customer segments tell how a company does its customer management and marketing communication. Channels are the ways that business uses to communicate with its customers, from raising awareness, sales touchpoints to post-sale customer services (Osterwalder et al. 2010, 26). The channels that DBE Core uses are much based on the technology it is created on. DBE Core is a cloud-based SaaS platform (or NaaS in their own terms), which operates fully online for B2B and authority customers. It uses blockchain technology to offer secure data handling. (DBE Core Ltd, 2020)

If we consider channels from transactional model and partnership model point of views, the most important channels then are DBE Core's own platform and online-webpages, where customer communication happens. These are essential channels where DBE Core is more visible to the users and partners. One channel to raise awareness might be releasing the platform to an app store, where the platform may be better accessible and easily downloaded. It might be a good solution to make DBE Core platform mobile-friendly, if many users find using tablets or mobile phones for document sharing to be more efficient than using desktops. Many users in transportation might prefer mobile devices over desktops, which then makes having the platform in an app store a practical option. For subcontracting model, DBE Core's own channels are less important, as they are managed by the contractor. The channels would then be the ones that DBE Core has with the contractor. In research project model, the main channel might be project websites and networking events, but the emphasis of the channels is to find new research project participants, not necessarily platform users. The research project participants can be also platform users, but the participants might also have their own network of users.

DBE Core wishes to offer a platform for all users in transportation, who need secure information and document sharing capabilities. Especially in transactional and in partnership models, the customer segments then would be very similar to TradeLens: shippers, forwarders, authorities (such as customs), ports, ocean carriers, inland transportation companies, manufacturers, banks, and all other members in the supply chain, who need

to trade information. Other platforms operating in this field are also important customers as DBE Core strives mostly on becoming a platform connecting other platforms. (DBE Core Ltd, 2020) All these customer groups may have different needs and reasons for information sharing, from sharing just the official documents to all other types of information sharing. This should be considered in customer relationships. In subcontracting model on the other hand, the contractor and possible contractors become the main customers of DBE Core. The platform users are still the ones mentioned before, but the actual customer of DBE Core would be the contractor. The research project model challenges the traditional view of customers: in this model, it is more about cooperation and innovation with other project members than having them as customers.

The customer relationships also depend on which business model is in question. In transactional model and partnership model, the customer relationships consist mostly B2B relationships and connections to the authorities. To create and maintain good customer relationships and to attract customers, it is beneficial to have a better understanding of the motives for joining the B2B platform network and the factors may limit parties to participate in it. Wang et al. (2011, 617) examined collaborative electronic logistic marketplaces in fast-moving consumer goods and found out that motives between shippers and carriers using the platform were slightly different. The shippers valued economic and service motives in a platform, such as cost reductions and time delivery performance, and carriers highlighted relational and service motives, like having good relationships with the shippers and improving delivery performance (Wang et al. 2011, 617). To manage customer relationships in transactional model or in partnership model, DBE Core should then identify the different needs of different parties joining the platform. If shippers aim mostly at cost reductions and carriers motive is to offer better service to the shippers, the services offered to them should create value for both. In information sharing, this may mean different marketing communication to different user groups.

Wallbach et al. (2019, 693-634) analyzed multi-sided platform diffusion in competitive B2B platforms in air cargo transportation sector and identified key factors that prevent users from joining a platform. They examined both same-side and cross-side network externalities and most of the inhibiting factors were impacting cross-side network effects, meaning that the factors influence different user groups. The overarching themes were technological and regulatory requirements, mindset, characteristics of the system provider, competition, and process. In technical and regulatory requirements, IT infrastructure and functionalities factors had most impact, which means that the network lacks technical infrastructure and has missing features. In mindset theme, the factors considering recognizing the potential of the system and blaming other actors e.g. for missing data were identified to influence user participation on platform. Communication of functionalities, where the system provider does not clearly communicate to the users about the

purpose of the platform, had the biggest influence in cross-side effects in the theme characteristics of the system provider. In competition theme, contractual relationships and conflict of interest had most impact on user participation, and in process theme, external processes (like difficulties in process streamlining and lack of knowledge) and process dynamics (like high dynamics and ad-hoc business) were the reasons for not joining a platform. (Wallbach et al. 2019, 701-707)

The research by Wallbach et al. (2019) may help DBE Core in their customer relationships if they consider transactional model or partnership model. In these models, DBE Core's role towards its customers and users is more active than in subcontracting model and research project model. DBE Core needs to make sure that their IT infrastructure and customer's IT infrastructure support one another, which they have attempted already, when the platform supports multiple ERP systems (DBE Core Ltd, 2020). The technical functionalities should also be carefully designed. The marketing communication should support the network's potential and benefits for the users, which may create positive mindset. This also includes the communication about the functionalities of the platform. Researching the possible contractual relationships and conflicts of interests between clients helps DBE Core to understand its customers and their needs, thus supporting the value-creation of the platform.

Customer relationships in subcontracting model, on the other hand, rely much more on the relationship between the contractor and the subcontractor rather than between the users and platform supplier. Manu et al. (2015, 1496) studied trust influencing factors that the contractor and the subcontractor may have. According to them, some key factors that may results in distrust if they are not managed right are change management process, payment practices, economic climate, and job performance. Change management process can create distrust if there are disagreements in the scope of work. The contractor holds more power over subcontractors when it comes to payment practices, such as deciding about payment terms and demanding discounts. Economic climate comes into question, when the contractor might change the subcontractor solely based on the price. Job performance monitoring is also a tool how contractors can influence the sense of trust in subcontractors. (Manu et al. 2015, 1500-1503) Although Manu et al. (2015) considered building constructing projects in their article, these key trust factors can also tell something about platform business. If DBE Core leans more towards a subcontracting model, then trust issues between them and the contractor may influence the customer relationship that they have. Agreeing on the scope of work, payment practices, and performance monitoring from the start may help when considering subcontracting. Economic climate changes are always are risk in this model, and DBE Core then has to keep up with its competitors in order to maintain their positions as a potential subcontractor.

5.1.4 Cost structure and revenue streams

Cost structure and revenue streams of platform business models are topics that have raised many questions in research and in practice. As explained in chapter 2.2.2, two-sided markets constitute unique conditions for platforms to generate profits due to network externalities. DBE Core imposes a challenge for this theory as the current model is mostly based on minimizing costs while not generating revenue, but they have other options in mind as well (DBE Core Ltd, 2020).

The current costs concerning technology behind the application are minimal. Using Hyperledger Fabric software is license-free (see Hyperledger Fabric website), so most costs come from platform and ecosystem development and maintenance. Other variable costs may come from cloud server providers, website hosting, customer acquisition, and marketing. Fixed costs mostly consist of human capital, such as wages and other fees, and tax liabilities. It could be assumed that TradeLens has very similar cost structure, but with much larger share of costs going to human capital.

While cost structure of a platform remains somewhat ignored in the literature, revenue streams and pricing are much more discussed. Kim (2016, 2125) summarizes how cross-side network effects influence the revenue structures of platform businesses. As the user's willingness to pay affects the platform's prices radically, the business needs to determine "money side" and "subsidy side". Money side has low price elasticity and the subsidy side has high price elasticity, and the firm needs to analyze which side does the demand side and the supply side fall into. Sometimes the divide between these groups is not straightforward, and the demand and the supply side can both have high price elasticity putting them into subsidy side. In this case, the money side is a third-party operator, like sponsors. (Kim 2016, 2124-2126)

If we consider transactional model and partnership model, where DBE Core also takes care of customer acquisition and charging the customers, the platform revenue stream models considered in literature are valid topics. DBE Core being an ecosystem provider and a platform for information sharing, it could be argued that its users cannot be clearly divided into "money side" and "subsidy side" and that they all have high price elasticity. Typical for this platform pricing theory setting is that the platform is thought to be a provider for two groups to meet, buyers and sellers, in an auction-like setup, and the other side is much more willing to pay for the usage of the platform than the other. But in an information-sharing setting, it could be argued that neither side is willing to pay considerably more for the possibility to share documentation information, as they are both the supply and the demand side of transportation information.

Gao (2018, 1104) refers to this setting as mixed two-sided markets, where the user can be both "a seller" and "a buyer". According to him, the answer for this kind of situation is price bundling – collecting a fixed fee from the user and then additional fees or tariffs

based on the usage of the platform. When the user operates in both sides, they gain a discount equal to the fixed price as they do not have to pay for using both sides. This means that offering a discount for joining both sides usually attracts customers to do so instead of joining just one side. Even when the customer operates mostly on the other side, the discount of using a bundle attracts the customer to join both sides. This holds when the demand elasticity for the bundle is greater or less than the demand for one product. (Gao 2018, 1105-1106, 1115)

The current model for DBE Core relies on the usage of external funding, but if it wishes to use either transactional model or partnership model, membership fees or licensing fees with price bundling may come into question. For example, TradeLens collects data access fees from the shippers (Johnson 2019), and DBE Core could use this revenue model as well. But if what Johnson (2019) have concluded in his article about TradeLens prices perceived relatively high by the customers in the industry, then DBE Core should consider whether or not to charge users at all. Gao (2018, 1115-1116) suggests that with price bundling, one option is offering the access to the platform for free but charging for any additional services. This would mean that DBE Core could offer the platform for free as it has done so far, but if the user wishes to do more than just view the received documents, sending them and modifying them would be chargeable.

If the price sensitivity is high and the competition is hard, then also using external funding may come into question. Kim (2016, 2125) refers this external funding based option as sponsor-based business model, where the revenue of the platform comes mostly from advertisers, as it is in such cases like YouTube and Facebook. This strategy is, according to him, the best strategy in a situation where neither sides are ready to be "the money side". (Kim 2015, 2125) If DBE Core decides to offer the platform for free, this would mean including advertisements in its platform. Other platforms analyzed in this thesis did not use advertisers as the main revenue stream, so it might be concluded that using advertisers would be risky move from DBE Core. Users tend to dislike advertisements and B2B users usually have the capital to invest in platform usage fees. If DBE Core considers transactional model or partnership model, membership fees or licensing fees with price bundling would then be the most viable option. The platform just needs to set its prices so that the competitor cannot steal all the users with better pricing.

It is argued that the strategic goals of SMEs are growth and profitability. By growing the business demonstrates viability and this growth is usually possible due to differentiation and responding to new market needs. Cost reduction and internal efficiency are said to be the main strategic mindsets behind SMEs profitability. (Heikkilä et al. 2017, 114-115) DBE Core's strategic goals when it comes to profitability through cost reduction and internal efficiency are equivalent to those proposed by Heikkilä et al. (2017). The current strategy aims at reducing costs and the main motivation behind this is the fact that the platform does not generate any revenue at the moment (DBE Core Ltd, 2020). If DBE

Core hopes to continue in this path, external funding without collecting any access fees from the users is then the natural way to start. But this revenue model mostly fits with the research project business model option when in the long run, not generating any revenue may result in key stakeholders losing interest to grow the platform or even participating at all. In research project model, this interest is irrelevant, as then DBE Core serves mostly other businesses and academia's interests. It is very unlikely then, that the research project model would support the platform's growth and profitability.

Growth and profitability are not the only strategic paths for SMEs. Heikkilä et al. (2017, 122) found in their studies that SMEs have three different business model innovation paths: besides profitability and growth, the new business model iteration path was considered to those operating in new business markets. For new businesses, the constant iteration of the business model and its components is the best way to keep the business viable (Heikkilä et al. 2017, 122). DBE Core's platform can be considered a new business, so this strategic path might be the preferred option. Making the BM more agile through frequent iterations of the BM components, DBE Core can keep up with the changes in the market while satisfying the stakeholders interests. One option to do this is to first favor external funding to gain first users, and when the user-base grows and the platform with it, add additional services for charge to gain revenue. Access to the platform would stay free-of-charge, but if the user wants to have more value-adding services like better data security or larger network, then monthly payments could come into question. This would perhaps be the best way if DBE Core uses transactional model.

In partnership model, on the other hand, it might be best to consider the revenue models of BluJay, Awake and Tradelens, where they charge for access to the platform. A partner or partners may add pressure on having a stable and profitable business, as partners also take a risk when partnering with someone. Of course, it depends on the partner, but it is hard to image a business partner staying for long if the company has unstable or nonexistent revenue streams.

Subcontracting model has then its own logic. The revenue streams would mostly come in the form of licensing fees from the contractor, who pays for the right to use the platform as their own. Then, the supply and demand sides of a platform discussed previously are not relevant for DBE Core, but to the contractor. In this case, DBE Core should focus on having a competitive price that attracts contractors.

The cost structure and revenue streams of platforms are BM components that much shape the business strategy. In conclusion, it could be argued that depending on the business model, DBE Core should use different revenue streams. The transactional model and the partnership model are both models which in the end include charging the users for accessing the platform. The research project model would mostly be externally funded, as growth and profitability then are not major concerns for the platform. In subcontracting

model, the traditional platform revenue models are not relevant, as it is an agreement between two parties and DBE Core would then charge the contractor, not the user.

6 RESULTS

6.1 DBE Core BM canvases and the most likely option

Previous chapter described the possible BM components that DBE Core could use and how these components differ depending on the chosen BM. The BM canvas consist of nine different components (key partners, key activities, key resources, value proposition, customer relationships, channels, customer segments, cost structure, and revenue streams) and together, these components form a business model that can be easily interpreted. Figure 10 shows the BM canvas propositions in one table for DBE Core with the components explained in chapter 5 to show the differences between the models.

Some components are the same despite the BM. These are value proposition, key resources, and cost structure. The value proposition is to make digital document sharing more convenient, reduce the costs of document sharing, and enabling secure document sharing. Key resources include technological resources like REST API, Hyperledger Fabric, UBL and PEPPOL, as well as intellectual (human) resources. The costs come mostly from personnel and platform development and maintenance, which are true in all BM cases.

The transaction model and partnership model have essentially same components from key partners to revenue streams. Key partners are investors, Telia or other partner, Hyperledger Fabric (blockchain operator), Linux foundation and academia. Key activities include platform development and management, and in later stages, service provisioning and marketing. The most important channels are the platform itself and the company's webpages, and customer segments include the users, like shippers, forwarders, authorities, inland transportation companies, manufacturers, banks, and other platforms. The customer relationships are usually B2B with also relationships to the authorities. The revenue comes from either membership fees or licensing fees and adding a price bundling option should also be considered. It is interesting to notice how the BM canvas components are exactly the same in both transactional model and partnership model. This shows how the simplicity of the BM canvas may leave important information out of the picture. In partnership model, the operations are done together with a partner, but DBE Core still holds much independence and does the same operations it would do on its own, too. The partnership model could enable better cooperation with the partner and access to the partner's networks, but these factors are not visible in the BM canvas.

	Transactional model	Partnership model	Subcontracting model	Research project model
Value proposition	• Digital document sharing is easier (convenience) • Reduces costs • Enables secure document sharing			
Key partners	• Investors • Telia • Hyperledger Fabric, Linux Foundation • Academia		• Contractor(s) • Hyperledger, Linux Foundation	• Academia
Key activities	• Platform development and management • Service provisioning, marketing		• Platform development and management	
Key resources	• REST API, Hyperledger Fabric, UBL, PEPPOL • Intellectual resources			
Channels	• Own cloud-based NaaS platform • Own webpages		• Communication channels with the contractor(s)	• Project websites • Networking events
Customer segments	• Shippers • Forwarders • Authorities • Inland transportation companies • Manufacturers • Banks • Other platforms		• Contractor(s)	• Project members
Customer relationships	• B2B, authorities		• Contractor(s)	• Project members
Cost structure	• Human capital • Platform development and maintenance			
Revenue streams	• Membership / licensing fees with price bundling		• Licensing fees from the contractor(s)	• External funding

Table 3 DBE Core BM canvases

The subcontracting model and research project model are very different from the other two models. Together they have in common the key activities, which mostly include platform development and maintenance, so rather technical attributes. In the subcontracting model, much is based on the relationship between DBE Core and the contractor(s). Here, key partners are the contractors and the technology providers, such as Hyperledger Fabric and Linux Foundation. Channels are those that the subcontractor has with the contractor, as the contractor takes care of customer communication. The main customer segment is not the users of the platform, but the contractors, and customer relationships are with them as well. The revenue comes from licensing the platform to the contractor.

The research project model is distinct from the other models. Academia is the most important partner and channels are about reaching out to possible project participation partners, like their own webpage and networking events. Customer segments and customer relationships are with the project members, although they are not customers in a sense, but rather partners. This is explained with revenue streams which come mostly from external funds, such as research founds. The research project model relies much on DBE Lab and would basically mean that the business venture side of the company will cease to exist.

Looking at all the possible BM canvases and components that the business model options have, it is difficult to see only one option being much better than others. It could be argued that using just one "pure" model is not sustainable. From other platforms BM's it was visible that none of them had a pure transaction model, but many had strong partners with them as well. DBE Core has one partnership with Telia already, and in September 2020, DBE Core left an application to Business Finland Growth Engine found, which would enable the build of an ecosystem based on platform connecting platforms -idea. The market size for this ecosystem operating in document sharing would be too large for DBE Core to handle alone, as approximately 2100 billion documents are shared annually in transportation and if half of the operators are able to digitize their system, the number of shared documents is still 1050 billion. (DBE Core Ltd, 2020; Billentis 2019) Using the partnership model then would support DBE Core better in growth when it could gain fast access to the partner's network and benefit from the technological and knowledge advantages that a larger partner may have. DBE Core also has plans for other markets outside transportation documentation, such as technical product information and planning documentation (DBE Core Ltd, 2020), which makes the need for a partner at this stage even more urgent. If the market size becomes too vast to handle, DBE Core then should consider to have a hybrid model like many other platforms, for example a BM with both partnership model and subcontractor model features. Using the subcontracting model could help DBE Core to reach those markets, that are otherwise harder to reach and are not part of the main scope that DBE Core has, like technical product information sharing.

Despite the BM model that DBE Core chooses, every single one of these components should be reconsidered and further developed, so the BM stays agile. One way of maintaining the agility is the lean startup way suggested by Xu & Koivumäki (2019, 312) where the initial BM is tested and improved in cycles depending on customer needs. These BM components are just suggestions, that should be tested, iterated, and improved empirically based on customer experiences and customer needs. The next chapter will demonstrate how a BM canvas stress test may help with assessing risks and opportunities.

6.2 BM canvas option stress test

The BM stress test is a method to assess the different business model components under different market scenarios and uncertainties. It shows how the component reacts to this changing market environment and evaluates the agility of it. (Bouwman et al. 2018, 152) The case study by Bouwman et al. (2018, 159), which was done with three companies from different industries, find stress testing to be a pragmatic way for companies to test their business model to real-life scenarios. The stress testing has six steps, and the first one, describing the BM components, was done in previous chapter. Then, the stress factors for these components should be identified and selected before mapping them and creating a heat map. (Haaker et al. 2017, 17)

Out of the four considered BM's, the business model proposed to be the most suitable for DBE Core was evaluated to be the partnership model with subcontracting model extensions. The stress test leans heavily on the BM canvas components, and if DBE Core hopes to mostly focus on partnership model, the partnership model is then tested.

6.2.1 Identifying and choosing stress factors

To identify and select stress test factors, up to five different trends or uncertainties are selected. This selection can be done, for example, by using PESTLE (political, economical, social, technological, legal, environmental) framework or by brainstorming the trends and uncertainties that might have a great impact on the business model. (Haaker et al. 2017, 17-18) In this thesis, PESTLE is used to ensure a clear and simple approach to the stress factors. Three different uncertainties, that may have the most impact on the business model, were selected. The selection was done based on the most pressing shifts in market and user concerns that may have an impact on DBE Core's business model. After selecting the uncertainties, two possible outcomes were considered. The possible outcomes are

one positive outcome and one negative outcome. All the uncertainties and their outcomes are summarized in Table 3.

Perspective	*Uncertainty*	*Outcome 1*	*Outcome 2*
Political	PEPPOL is not a mandatory standard in the EU	Only few countries implement PEPPOL	No country implements PEPPOL
Social	Interest in the usage of e-procurement platform	Resisting change	Growing interest
Technological	System and data compatibility	Adopting e-procurement platform becomes more difficult	Adopting e-procurement platform becomes easier

Table 4 Selected BM uncertainties and outcomes

The first uncertainty is the political perspective. As DBE Core relies on PEPPOL, one uncertainty might be how successful the EU is in making PEPPOL a mandatory standard inside the EU. Currently using PEPPOL is not regulated by the EU so the political environment for having just one standard might change. Not having a regulated standard inside the EU might have two outcomes: either only few countries implement PEPPOL, or none of the members wish to implement it.

The second perspective, the social perspective, may be about the interest in using e-procurement. One outcome could be that companies are resistant to change and do not see the benefits of e-procurement. The other outcome can be that companies have a growing interest in the matter and hope to have a platform to ensure it.

The third and the last perspective, the technological perspective considers the system and data compatibility. DBE Core platform is built based on the assumption that it will be easy for transportation companies to implement and use. If technical incompatibilities become an issue for potential users, it may lead to an outcome where adopting the platform becomes too difficult and thus prevents them from utilizing the platform. But on the other hand, if the technical specifications are compatible and simpler to adopt, then the outcome could be that the whole e-procurement and information sharing platform adoption is effortless.

6.2.2 Mapping the stress factors and creating a heat map

The next step in BM stress testing is mapping the stress factors. The selected stress factors in Table 3 are compared to BM components described in Figure 5. According to Haaker et al. (2017, 18), the stress factors should be compared to those components which are causally related to each other. In their study, Bouwman et al. (2018, 153) did this based on "factual relationships" of the stress factor and the component, meaning that if the stress factor clearly describes an issue that concerns the BM component, the relationship should be noted.

The first uncertainty, "PEPPOL is not a mandatory standard in the EU", is factually related to key partners, key resources, value proposition and customer relationships. Not using PEPPOL as mandatory standard in the EU has an impact on who are the key partners, as competing standard might change this. It is also a key resource for DBE Core, and easy information sharing as a value proposition is much based on the usage of PEPPOL. Customer relationships also depend on it or might change, when it is assumed that users use PEPPOL standards.

The second uncertainty, "interest in the usage of e-procurement platform" is related to all BM components, too. If users do not see any positive in using an information sharing platform and thus refuse to digitalize their procurement and other information sharing systems, it makes almost all components non-feasible as the whole point of the platform disappears. But if users agree on using and needing the platform thus growing the interest in having one, it affects positively on all DBE Core BM components.

Finally, the third uncertainty, "system and data compatibility", relates to all BM components in a much similar logic than the second uncertainty did. When technological compatibility is easy, it has a positive effect on the usage of the platform, and the usability increases other positive spinoffs. But if the technological compatibility is perceived difficult by the users reducing the usability of the platform, it has a considerable negative effect on the BM components.

After mapping the factors, a heat map is created. Table 4 shows the possible heatmap in more detail. As mentioned in chapter 2.1.3, the red color indicates that the BM component is no longer feasible, compromising the whole business model. Orange color implies that the BM component is no longer viable, forcing the company to re-evaluate the component itself. Green color, on the other hand, indicates that the stress factor has on effect on the BM component, but it is positive, rather than negative. Grey color denotes that the stress factor does not influence the BM component in any way. (Haaker et al. 2017, 18)

	PEPPOL mandatory standard; countries implement		*Interest*		*Technological compatibility and adoption*	
	Few	None	Resist	Grow	Difficult	Easy
Key partners						
Key activities						
Key resources						
Value proposition						
Customer relationships						
Channels						
Customer segments						
Cost structure						
Revenue streams						

Table 5 The stress test heat map

6.2.3 Analyzing the stress test results

When the heat map is formed, next steps are sub-view analysis and pattern analysis. In sub-view analysis, one section of the heatmap is chosen for closer analysis to determine what is behind specific components and stress factors to give robustness to the analysis. In pattern analysis, the colorings of the heat map that form a clear pattern are analyzed. This analysis can happen based on 1. the preferred outcomes on the BM (either positive or negative), 2. inconsistencies between the BM component choices (a stress factor may have positive influence on one component but negative influence on another), or 3. the component choices seem not feasible in any scenarios, meaning that the stress factor creates an outcome that threatens the whole BM. (Haaker et al. 2017, 18-19, 21; Bouwman et al. 2018, 154)

The pattern analysis shows that especially interest and technological compatibility have either strong positive or negative effects. If the user's interest in using the platform

is low and they even resist using it, then it makes almost all BM components no longer feasible. Many key partners rely on the fact that the platform will gain users and that they have an interest in the platform. For partnership model, this is even more crucial. Value proposition cannot be fulfilled if users are not interested in it and customer relationships become difficult to manage. The revenue streams may run out when external funding ceases and users will not buy additional services. Key activities, key resources, cost structure, and channels do not necessarily become inadequate, but they would have to be reconsidered. If the interest is low, then key activities may need tasks that are related to increasing the interest. Key resources might have to be developed further, if the user's interest is dependent on those. More channels may be needed to better raise awareness, and marketing costs may have to be included in the cost structure.

On the other hand, if the users have a great interest in the platform, it has a positive effect on all BM components. With more interest and possibly more users, come more key partners, and the value proposition may be realized even better. Customer segments may become more diverse as more actors become interested in the platform and new revenue streams are possible. Other components, like key activities and key resources, stay mostly unaffected by the growth.

The technological compatibility and adoption uncertainty has very similar effects on the BM components. If the platform is technologically compatible and the adoption is easy, then it has a positive effect on almost all components. The number of key partners may increase as users find the platform easy to adopt, thus making it more interesting for them too. Value proposition is fulfilled and customer relationships may be easier to maintain and strengthen if the adoption is easy. More customer segments might be added as more users join the platform, and revenue streams have a stronger foundation to improve when the technological compatibility and adoption is easier.

But if the compatibility and adoption is difficult, then many BM components become no longer feasible or no longer viable. Difficulties in technological compatibility and adoption suggest that key partners, key activities, key resources, and cost structure may have to be reconsidered. They do not become no longer viable, but for example some the platform may need further development in key activities and many key resources may need to change for it to be usable. If the technological compatibility and adoption is difficult, then the value proposition is not fulfilled, and the customer relationships become challenging when the platform is not usable. The channels and the platform itself may become no longer viable if the adoption is difficult. When the compatibility and the adoption are hard to manage, then the chosen revenue streams are no longer suitable as external funding may end when the technology cannot be applied.

The analysis of the stress test results shows that DBE Core may need to consider two uncertainties when developing the platform further: the interest of the users and the tech-

nological applicability. If either of them fails, many of the BM components that the platform has are compromised. Further market analysis may be required for DBE Core to properly map whether these uncertainties might become true or not. Also, as mentioned before in the research by Xu & Koivumäki (2019), the BM agility is crucial for the business to stay viable. For DBE Core, it might be beneficial to do BM stress tests regularly to ensure the agility.

6.3 Evaluation

This research was made in cooperation with DBE Core Ltd during an 8-month period. During the data gathering and analyzing process, parts of the study was constantly evaluated by DBE Core representative for fact checking and additional information purposes. The representative also informed any possible changes that might have happened during the time the thesis process was ongoing. This method is mentioned in the Methodology-chapter, and one iteration was done during the study. This iteration included adding the possible business model proposals that DBE Core were considering, like partnership model and research project model, which had changed from the original scope of study. The original scope considered only transactional business model and adding the other business model possibilities made the analysis more robust and better suited for DBE Core's needs.

When the iteration was done, the final version was sent to DBE Core representative and final evaluation of the business model proposal was done. The proposal was thought to include enough components to give a good view of how the business model compares to other similar companies in the field. The stress test was thought to be a valuable tool to test the possible and current business model components. It was concluded though, that the business model proposal here is a good insight about the company's business in one point of time but as the market and the field of business is in constant change, the business model components for DBE Core are also changing quickly. (DBE Core Ltd, 2020) This feedback also supports the fact that business models especially for technology startups need agility to constantly change according to market needs and fluctuations. During this 8-month period of study DBE Core faced many challenges and changes, like the COVID-19 pandemic, and they also applied for Business Finland funds, which may influence their scope and growth possibilities. This highlights the agility requirement of the process for developing a business model.

7 DISCUSSION & CONCLUSIONS

7.1 Discussion of key findings

Motivation behind this study was to examine the business models of information sharing platforms, particularly those operating in transportation, and see what reference they could give to DBE Core's business model options. The EU commission wishes to change the legislation about electronical freight transportation information and this may offer a new market for different platform companies. The purpose of this study was to map what kind of business models information sharing platforms already have, what business model components they may need and how their contents need to be considered when a business model is designed for DBE Core Ltd, and which one of the business model designs appears to be the most viable option for the company.

First, the theoretical background of business model research and platform research was determined. Many disciplines besides information systems science have made their effort in determining and researching business models, such as organizational studies, but in ISS, the technological innovation is often at the core of the business model. Other keywords for business model would be value creation and strategic innovation. For modeling the business model, the business model canvas by Osterwalder et al. (2010) is one of the most used and the most easily interpreted approaches. The business model canvas is also utilized in business model stress testing, where different key components are tested for, for example, varied positive and negative changes in the market (see Bouwman et al. 2018).

To determine and test the best business model option for DBE Core Ltd, similar information sharing platform companies and operators were mapped and examined. Overall, five companies or projects were chosen, and their business models were analyzed based on written material, such as web sites and press releases. When comparing their business models with the potential business models proposed by DBE Core, it was concluded that few of them had so called pure business models. The one's that had properties from only one business model prospect, were research projects like EfficienSea 2 and Digital Skipper Assistant. The others were more or less hybrid models with properties from both partnership model and traditional transactional model. This shows the many ways of how platform businesses hope to create value and gain competitive advantage in the market. It also supports the views of previous studies that platform business models that rely on new innovations should be agile and not rely on one model only.

When analyzing different business model components for DBE Core, it is evident that the chosen business model proposition affects some of the components. In value proposition, the most important topics for DBE Core are performance, reducing costs and risks, accessibility, and convenience, but the value proposition stays the same regardless of the business model. The key resources, such as technological and intellectual resources, are also the same despite the business model. As platforms are made for networking, the key partner's role depend on the business model. In transactional model and partnership models, the company has to have an active role towards their key partners, but in subcontracting and research project models, it is a more passive one. The key activities are very similar in all business model propositions, but the technology expertise of the platform is highlighted in subcontracting and research project models, as in these models mostly focus on providing the platform itself.

Channels, too, have a slightly different emphasis depending on the business model – the subcontracting and research project models rely much less on DBE Core's own channels than transactional and partnership models. The same divide between transactional – partnership model and subcontracting – research project models can be seen in other business model components as well. Customer segments in transactional and partnership models are the actual users of the platform, like forwarders, authorities, and ports, but in subcontracting and research project models, the actual users are not in key roles. The customer relationships are also active towards the users of the platform in transactional and partnership models, but for subcontracting model, the main relationship is then with the contractor rather than with the users.

Cost structure is the same for all business model propositions, but the revenue streams vary from model to model. Transactional and partnership models have similar revenue streams, they can charge membership fees or licensing fees with the opportunity for price bundling. For subcontracting model, the contractor is charged a licensing fee for using the platform and for research project model, the revenue comes mostly from external funding as the platform is thought to be free-of-charge.

It is interesting to see how similar transactional model and partnership models are when analyzing the business model components. In this level, they show almost no difference, although they do have differences in logic – the transactional model lacks a clear partner, but the partnership model is based on creating partnerships and benefiting from them. It could be then questioned if they are clearly separate business models, but rather the same model with a slight difference in emphasis to partner's role in the business. It could be argued that in all platforms, networking and partnerships are the essence of their business models, so differentiating them to transactional and partnership business models may not be favorable. But on the other hand, the differentiation may give the company a better strategic compass on their focus areas. In the end, it could be concluded that the

best business model proposition for DBE Core is a so called hybrid model, where the company should consider using features from both partnership and subcontracting model.

The business model stress test focuses on the business model components, and as the transactional and partnership models have the same components, the stress test describes both. The stress test is a tool for companies to define their business model components and to test them to different trends in the market. In this study, three trends were chosen and tested. The chosen business model proposition here was the transactional and partnership model, and it was clear that user's interest and technical compatibility of the platform had great impact on the success of the business model. The stress test is a good tool to be used in the future as well, especially when considering new business model components or facing new trends in the market.

This study shows that the business model in information sharing platform's have many different paths. The five other companies analyzed all had their own unique ways of forming a business model, whether it was more of a traditional transactional business model or a research project -based model. The business model components that DBE Core considers are slightly different depending on the business model proposition they wish to choose. If we consider similar companies to DBE Core, like TradeLens, a more hybrid model is more likely as that model may be more agile to market changes than a so called pure model. The business model stress test is a way to continuously test the agility of the model and to consider proper reactions to changes in the market. This study also shows that there is no clear way to define which business model proposition is the best in platform business, but it rather proves that when a new innovation and a platform is considering to enter the market and grow, ongoing improvement and consideration of the business model is necessary.

7.2 Limitations and future research

The limitations of this study are related to the data and researcher's involvement inside the company. Including interviews from the studied platform companies would have made the analysis deeper and given more insight about the business models they currently have. The interviews could have answered better the questions regarding companies costs and revenues, and their overall earning logic. On the other hand, some components in the business model could have been viewed as trade secrets, but this probability is then considered in methodology and methods.

The researcher's involvement inside DBE Core could have offered a way for better implementation of the chosen method of study, design science. Now the work was done outside the company and this resulted in communication delays between the company

and the researcher. From the inside, such communication issues could have been dealt more swiftly. Having a researcher inside the company could have also supported the designing of the business model in a more agile way. Business model may change quickly in a start-up, so working closely with the company could have brought more agility to the process.

For future research, a more comprehensive study of ecosystem platform's earning logic and network externalities could be done. The current research mainly focuses on platforms as a mediator between two or more users who are either selling or buying goods or services, but how this logic might be applied to ecosystem platforms like DBE Core is an interesting question. Business model research could also benefit from considering the business model components in platform business and how the ecosystem may affect the relationships between the components and ecosystem partners.

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