Master Thesis - Stijn Jacobus Pieper

Invoice Financing for Small and Medium-sized Enterprises on an Online Platform

An Action Design Research using a Transaction Cost Perspective on Platform Theories applied in a Start-up

TUDelft

Advanon

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Invoice Financing for Small and Medium-sized Enterprises on an Online Platform

An Action Design Research using a Transaction Cost Perspective on Platform Theories applied in a Start-up

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Summary

Advanon is an early stage start-up operating in the area of financial technology (Fintech) with the mission to create a better opportunity for SMEs to get short term financing to grow their business. The initial idea that Advanon has, is to create an online financing platform on which financial investors can invest in liquidity for SMEs, as it is thought the risks stays low and the speed of financing can go up. However, to be able to test this within a limited amount of time this research is being conducted.

Traditional financial institutions provide two ways of SME financing, being either transactional based lending or relational lending (Berger & Udell, 2006). Factoring is one of the transactional lending technologies that are used for alternative financing. Factoring means that a business sells its accounts receivable –or invoices- to a third party exchange for a charge or fee. However traditional factoring transactions entail a relatively high risk and are information intensive transactions. Commonly it is argued that multi-sided platforms are able to reducing search costs and reducing shared transaction costs among its multiple sides. Using this premise, this research aims at *lowering the transaction costs of invoice financing by introducing it on an online multi-sided platform*.

However, to this day there is limited knowledge on what the implication of this premise should be on the design of MSPs. In order to understand this, transaction cost economy is used as a design kernel theory to design the platform. It should be investigated which parts of a multi-sided platform model can be used to enhance the factoring availability of SMEs. Furthermore, it is not well known what aspects should be taken into account in the design process during the early phase of such platform development.

In pursuit of solving the SME financing problem, it is important to know whether the design will actually be used. Also, due to the fact that this research is conducted at a start-up the relevance of the solution will be of critical importance for the success of it. On the other hand, this research can contribute to the design knowledge base specifically on multi-sided platforms and factoring. In order to achieve both, the design challenge will be solved by creating a *specific solution* for the Swiss market from which learnings for both practice and academia can be taken. For this the Action Design Research methodology has been used.

The goal of this research is to design and prototype an online factoring platform to enable small and medium enterprises to get liquidity financing by private Investors more directly. This design should aim at allowing small and medium enterprises to gain easier access to cash which can be used to grow their businesses. In order to have a scalable platform, the design should be open and reusable for comparable problems. The research focuses on answering the following question and its answer is presented in the three phases.

How can an online multi-sided platform be designed as such that it enables financial investors to provide invoice financing to small and medium enterprises aimed to lower the overall transaction costs?

Phase I. Phase I is about the domain analysis. It uses design guidelines emanating from transaction cost economics and multi sided platforms as its kernel theories. The phase includes the evaluation methods user interviews and a domain survey. In this phase the functional requirements: The goal, context requirements: stakeholder roles and their interest and the user requirements: The financing problem and their assumptions have been presented.

Phase II. Phase II is where the structure of the platform is created and is about the platform modelling and design. It uses -   Multi-sided platforms as its kernel theory and is evaluated by stakeholder interviews and user interviews.

Phase III. Phase III is about the development and evaluation of the prototype. Agile software development is used for the development of the artefact. It provides insights in platform development, adoption and evolution. This is evaluated by experiment and prototype survey and log data analysis

The main findings of the process are that an online multi-sided factoring platform can be designed by using and combining the learning from transaction costs economics and platform literature. Both provided basic knowledge for the design of an online multi-sided invoice factoring platform. This research concludes that lower the transaction costs of invoice financing could not directly be evaluated in the early stage development of the platform. However, the formative evaluation of the design showed that using design criteria and guidelines were contributed to the design and evaluation of a prototype with sufficient *trust* and *momentum*. As the design guidelines of the platform were based on solid theories, this can be seen as an indication that the platform is on the right track of lowering transaction costs of invoice financing.

Preface

This report consist of a half a year research that I performed at the start-up *Advanon*, which I founded with two of my ex-colleagues that I met while working at Google. The thesis is written for the master Systems Engineering, Policy Analysis and Management at the Delft University of Technology. The writing of the thesis was very challenging, as it was constantly seeking a balance between the daily business of starting a business, seeking for guiding theoretical knowledge and trying write it all down. However, this report is the evidence that in it end it all worked out. During my project I have had many people helping me directly and indirectly for which I am very grateful. I will start with the people that helped me from close by. First of all I have to thank the five members of my commission.

First I would like to thank Mark de Reuver, who is my first supervisor. I am very thankful for the way he supported me throughout the thesis. Not only did he provide the necessary detailed feedback on the draft versions, also he has supported me in gaining motivation. By always providing clear improvement points, it was possible to concretely improve my thesis. He did this by providing good knowledge on design theory and platforms. Furthermore, it must be said that even though the process of writing my thesis was stressful it always was a real pleasure to have the weekly meetings with Mark.

Second, I would like to thank Marijn Jansen, the chair of the graduation committee, for the critical notions that he provided during the formal meetings. As Marijn also supervised me on my Bachelor thesis, I already knew that his critical view on things and his exceptional knowledge, would be very useful to guide the process of graduating into the right direction. This has been definitely the case for my master thesis and I like to thank him for that.

Third, Daniel Scholten, who is my second supervisor, who provided valuable feedback on the transaction cost perspective that could be taken. Even though his expertise did not lie in the financial or ICT domain, he was able to provide very nice guidelines on how the research could be using transaction cost economics to guide the design. This was very helpful and I would like to thank him for that.

Fourth, I would like to thank Philip Kornmann, one of my co-founders, who supervised and coached me within the company. Philips structured way of working was very meaningful for me, as it helped me to improve my way of working to both finish my thesis on time as well as adding value to the company. Both Philip as well as Phil Lojacono, my other co-founder, have been great partners in thinking through this idea as well as executing it.

Fifth, I would like to thank Wally Keijzer-Broers, the third supervisor who helped me understanding how Action Design Research could be better done by keeping a diary and keeping track of all the design decisions throughout the process, which was very useful.

Last, but not least, I would like to thank my girlfriend, friends and family for their support. Without them I would not have been able to persist. Especially I would like to thank my mother, who helped me during the last phase of my thesis tremendously. Also, my aunt Lotti, who allowed me to travel to Zürich so many times and have a place to stay.

I sincerely hope that everyone who reads this thesis will understand the ideas and thoughts I present.

Stijn Pieper

Delft, August 2015

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This research is carried out at the faculty of Technology Policy and Management of the Delft University of Technology in commission of Advanon GmbH registered in Zürich under trade register number CH-020.4.054.991-5.

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RESEARCH PREPARATION

"First Hunch"

1. Introduction

1.1. Research Background

1.1.1. Liquidity problems of small and medium enterprises

Liquidity, the ability to pay short-term obligations, is key for Small and Medium-sized Enterprises (SMEs) to keep their business running. Problems in liquidity emerge from a misalignment between the timing of incoming and outgoing cash flows. In particular, many firms find it difficult to finance their production cycle. As loans can contribute to a positive cash balance, access to loans is of major importance to generate growth and prevent bankruptcy of SMEs (Belt, 1979). Universal access to financial services therefore has always been a concern of policy makers (Beck & De La Torre, 2007). However, financial institutions all around the world decreased their share of loans provided for SMEs (Berger, Cerqueiro, & Penas, 2014).

There are multiple financial services available on the market that enable SMEs to gain access to external financing to improve their liquidity. One of them is factoring, in which a business sells its accounts receivable –or invoices- to a third party and receives it cash immediately in exchange for a charge or fee. Factoring is diversely used in EU and it is limited accessible for SMEs due to relatively high risk and information intensive transactions. However, since the financial crisis there have been some shifts in the financial possibilities of -particularly- SMEs all around the world (R. A. Cole, 2012; Cowling, Liu, & Ledger, 2012; Valadkhani, Chen, & Kotey, 2014). It is thought that the use of new internet business models and technologies can improve the accessibility to factoring. Designing a solution for this problem is the main topic of this research.

1.1.2. The start-up Advanon

Advanon is an early stage start-up operating in the area of financial technology with the mission to create a better opportunity for SMEs to get short term financing to grow their business. It's their goal to leverage the means of online technologies to create a solution for SME liquidity which cannot be delivered by the incumbent market. For this it sees an opportunity is to use web technologies to enable private financial investors (i.e. high net worth individuals) to directly to SMEs. The initial idea that Advanon has, is to create an online financing platform on which financial investors can invest in liquidity for SMEs, both the risks stays low and the speed of financing can go up. However, to be able to test this within a limited amount of time this research is being conducted.

Advanon sees opportunities to improve traditional factoring solutions, by introducing it in a platform setup. However, there are currently limited knowledge on how to designing such a multi-sided platform. Hence, *this research will focus on the design challenge of such a multi-sided platform for a financial technology case*. As Advanon is founded in Zurich and initially focussing on the Swiss market, large parts of this study is conducted in Switzerland. However, as liquidity problems are universal for start-ups all around the world, we do not see this research being limited applicable to Switzerland.

1.2. Problem Definition

1.2.1. Platform innovation

The internet already disrupted whole industries -such as the retail industry- by making parts of the value chain accessible to new actors and increasing transparency. In examples such as Ebay this happened by creating multi-sided platforms. Web-technologies enable these improvements to existing business models. A multisided platform creates value primarily by enabling direct interactions between two (or more) distinct types of customers. Within the domain of financial technology, a common denominator of the introduction of multi-sided platforms is to simplify what is complex, increase transparency, offer analytics, and reduce friction for already existing financial services (Charles Moldow, 2015).

Although financial platforms are rapidly being created, there is little notion yet in literature of the creation of liquidity solving platforms. Compared to, micro crediting and crowdfunding platforms, creating an online solution for short-term credit for SMEs will have its challenges in both intensifying the knowledge transfers in the decision making process of the credit transactions that are dependent on the liquidity needs and on the other hand standardizing the investment needs of potential investors. This is more difficult, because the risk within factoring is including a small risk of the seller of the invoice and the risk of the end-customer who receives it. This makes it more complex to transpose all the factors that need to be taken into account onto an online platform.

1.2.2. A multi-sided factoring platform

In this research we will focus on the possibilities to bring investors as close and involved to the investment in factoring as possible, by designing a prototype of an online platform. However, while doing this all potential improvements to the factoring process will need to be taken into account, as they will also influence the potential success of Advanon. The main focus will lie on bringing the decision to finance SMEs online and directly accessible for financial investors. Thus the first challenges lie also in the use of web-based information technologies. One step further, it should be investigated which parts of a multi-sided platform model can be used to enhance the factoring availability of SMEs. To this day there is limited knowledge on how web-based information technology and platform models can be used to enable financial investors to directly provide short term invoice financing to SMEs. To fill this gap, this research aims to design a factoring solution in a multi-sided platform setup.

However, even-though platforms are widely discussed in literature, there is little knowledge about the way multi-sided platforms can be designed for success. Often, it is mentioned that the one with the best ecosystem is the one who becomes successful: "Who wins and who loses these competitions is not simply a matter of who has the best technology or the first product. It is often who has the best platform strategy and the best ecosystem to back it up." (Cusumano, 2010 p. 34). However, to this day there is still little knowledge on what aspects should be taken into account in the design process during the early phase of such platform development.

1.3. Design challenge and knowledge contribution

1.3.1. Designing in an action setting

This research is performed in a start-up environment, which is highly dynamic and uncertain. In order to structure the design research process the Action Design Research (ADR) method proposed by Sein, Henfridsson, Purao, Rossi, and Lindgren (2011) is used. ADR is a research method that is specifically focuses at designing an artefact in an actual setting, while contributing to knowledge for practitioners and to make theoretical contributions (Sein et al., 2011). Although, theoretically ADR is a good methodology, it currently still lacks empirical evidence based on primary data (Cronholm & Göbel, 2014). That is, the empirical grounding in these methodologies is based on secondary data, not on primary ADR research. Thus, more specifically, by providing a specific case of ADR in an actual setting, this research aims to contribute to better prescriptive design knowledge.

1.3.1. Kernel theory knowledge contribution: Transaction cost economy and platform theories

Tiwana, Konsynski, and Bush (2010) introduce a framework to study platform evolution. It contains the platform architecture and the platform governance mechanisms that together form the platform design and governance. The platform architecture and the platform governance have an internal fit that can be researched. They also have an external with their environment. By taking a theoretical lens, these fits can be evaluated on their impact on the evolutionary dynamics of a platform ecosystem. They argue that there is still a possibility to perform research to how these internal and external fits influence these evolutionary outcomes. A simplified representation of this framework is presented in Figure 1.
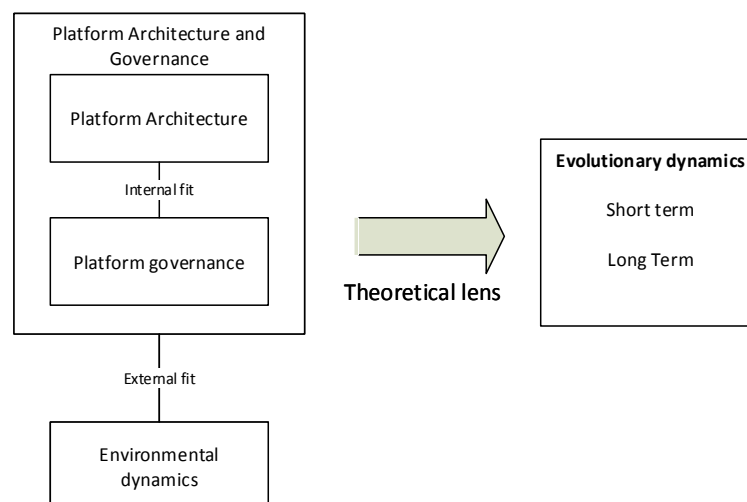
Figure 1 Simplified representation of the framework of Tiwana et al. (2010) for studying Platform Evolution

There are two main short-term dynamics that Tiwana describes: First, composability, which refers to the ease with which functionality-extending changes can be made to a module or platform without compromising its integration with or functionality of the ecosystem (Messerschmitt & Szyperski, 2005 p.63). Second, malleability that refers to the ease with which the platform or module can be reconfigured to refine or extend their behaviours to adapt to evolving user needs or to exploit technological advances. Both aspects provide a way to evaluate the ecosystem dynamics on the short term. On the long term the evolution rate, envelopment, derivative mutation. Survival, and durability of the platform are also dynamics that come into play (Tiwana et al., 2010). From this, we can learn that the following must be done. View the platform architecture and platform governance through a theoretical lens in order to evaluate it on its long-term and short-term success potential within the developing ecosystem. In order to apply this in the case study, the following the theoretical lens of transaction cost economy is taken to evaluate the design within its current ecosystem.

Currently certain SMEs might be better served by a factoring platform solution.
Improvements for factoring might involve a better financial structure by bringing both SME and creditor closer together, risk structure by better quantitative data collection for credit assessment, efficiency by reducing the friction while making the transactions and improve the way investors and SMEs experience the transactions by including analytics and implementing a user centric design.

To understand the potential improvements in the social relationships between investors and SMEs, these cost structures can be studied in the perspective of transaction cost economy (Williamson, 1979). By understanding the dynamics of factoring in terms of transaction cost economy, both the approach of sellers and the safeguards needed in order to make sure the system functions, can be better understood. However, before there are any hard conclusions to be made on the problem definition, it makes sense to test this in the environment the platform is being designed. Therefore empirical research will be needed, to fully understand the problem within the current factoring solutions that could be solved by introducing a multi-sided platform.

1.3.2. Design knowledge contribution: Exaptation of platforms in the financial domain

According to (March & Storey, 2008) a design science research contribution requires "(1) identification and clear description of a relevant IT problem, (2) demonstration that no adequate solutions exist in the existent IT knowledge-base, (3) development and presentation of a novel IT artifact (constructs, models, methods or instantiations) that addresses the problem, (4) rigorous evaluation of the IT artifact enabling the assessment of its utility, (5) articulation of the value added to the IT knowledge-base and to practice, and (6) explanation of the implications for IT management and practice." We aim at achieving all six prerequisites for a solid contribution for both science and practice. We use the six prerequisites, that have been described by (March & Storey, 2008), to structure the contribution of this research.

1. In phase 1, the **relevant problem** that can be solved by a factoring platform is identified, described and evaluated with a market survey and interviews with stakeholders;
2. In phase 1, the very few new and **similar factoring platforms** are identified and described;
3. In phase 2 and 3, thus both mock-ups and prototype, are developed to demonstrate the **functionality of the platform**;
4. In phase 3 the **utility** of the platform is being assessed by using both a survey and log data;
5. After all phases the value added to the interdisciplinary knowledge, such as institutional economics, business model generation theory and entrepreneurial practice in the context of platform design is documented and formalized into general principles;
6. After all phases the value added to the IT knowledge-base and practice is documented and formalized into general principles.

In order for this research to be of added value to the scientific community, the contributions described above are generalized into a general design principles for multi-sided platform design. It success depends on two main principles: relevance towards its environment and rigour to the state-of-the-art knowledge base, as defined by von Alan et al. (2004).

Gregor and Hevner (2013) proposes some considerations for presenting design science research. First the type of contribution can be better defined. They classify contributions on three levels: 1) Situated implementation of artefact, 2) Nascent design theory – knowledge as operational principles/architecture 3) well-developed design

theory about embedded phenomena. By demonstrating the artefact, this research aims at contributing on level 1 and 2, as the demonstration of a novel artefact can be a research contribution even though it embodies design ideas and theories yet to be articulated, formalized, and fully understood. Another consideration on the contribution is whether the *solution* or the *application domain* or *both* are low. Depending on that, the research can be of four types (Gregor & Hevner, 2013): 1) An improvement: develop new solutions to existing problems 2) An invention where a new solution is thought of on a new problem, 3) an exaptation, where a known solution is applied to new problems or 4) a routine design. It is useful to know that only 1, 2 and 3 are considered to have a valid research opportunity and possible knowledge contribution (Gregor & Hevner, 2013).

This research is using the concept of platforms to understand how this can be applied in an application for SME finance. It can therefore be classified as an *exaptation research.* According to the classification of Gregor and Hevner (2013), the fact that platforms are already well-known constructs does not mean that this research has no contribution. Especially for the case of platform design in an uncertain environment it is a very interesting research opportunity to see how this can be applied in the field of SME financing. The knowledge contribution of this research to existing design knowledge will be there because of the fact that it provides insights in the process and design decisions that are to be made. By reflecting on the process and by providing design principles it also tries to transpose these learnings for other potential design projects. By doing so, this research hopes to provide new insights for Design Theory in an entrepreneurial environment. Furthermore, the usefulness of kernel theories for the specific design challenge are discussed in Chapter 4.42

1.4. Research objective & questions

1.4.1. Research objective

Fundamentally, I believe that the theory and analysis of this study can contribute to the discussions on how multi-sided platforms can make liquidity financing for SMEs more accessible. Currently invoice financing is for many SMEs too much of a barrier due to the transaction costs that occur. Therefore, I aim to analyse the potential role of an online multi-sided platform to enable financial investors to directly invest in small medium enterprises.

Hence, the goal of this research is to *lower the transaction costs of invoice financing by introducing it on an online multi-sided platform*. By design and prototype an online factoring platform this should enable small and medium-sized enterprises to get liquidity financing more easily and directly by private investors. This allow SMEs for easier access to cash which can be used to grow their businesses. In order to have a scalable platform, the design should be open and reusable for comparable problems.

1.4.2. Research question and sub-questions

In order to achieve the previously explained goal, this research focusses specifically on the design challenge of the online financing platform. In this line, the research question of is defined as follows.

RQ: How can an online multi-sided platform be designed as such that it enables financial investors to provide invoice financing to small and medium enterprises aimed to lower the overall transaction costs?

The research question has been divided into sub-questions. Firstly, the relevancy and novelty of the research is described more in detail. Due to the high complexity of the domain for readers that are not familiar in the financial technology domain, it is relevant to firstly explain this more in detail.

SQ1: Why is it relevant and novel to design an online factoring platform?

Secondly, theoretical notions and concepts are examined in order to answer the first sub-question. It is important that the different concepts and theories needed to understand the problem and needed during the design process are understood by both the designer and the reader of this thesis. Therefore, the first sub-question is defined as follows.

SQ2: What state-of-the-art theories and concepts provide justificatory knowledge to inform the design of an online multi-sided invoice factoring platform?

Thirdly, the in literature proposed design methodologies need to be assessed in order to construct a design methodology that fits the needs of this research. Both the application of the research in the appropriate

environment (i.e. relevance) and its additions to the existing knowledge base (i.e. rigour) are important for information system research (von Alan, March, Park, & Ram, 2004). It is important to understand how it is possible to perform research in the context of a start-up. As the research is focussed on designing a multi-sided platform in a real environment and by that better understand the way platforms can be designed, the research is probable to have a high relevance. However, it should be taken into account that the research also needs to keep its rigour. In order to achieve this, the following sub-research question needs to be answered.

SQ3: What design methodology can be used in order to study the design challenges in a live environment, while keeping its rigour?

Fourthly, the main problem needs to be properly understood. As explained in section 1.2, there is an indication of a problem for SMEs to gain liquidity. Also, the initial idea is that a multi-sided platform can enhance the liquidity possibilities for SMEs in Switzerland. Moreover, the transaction cost economy also provide a few cornerstones to identify the problem and target group. Even though these will be well thought through, they remain assumptions. But for the design to have a successful adoption, the main problems and assumptions behind the problem should empirically tested. Furthermore, when the target group and short term financing problem has been identified, the design requirements in order to solve the problem need to be defined. Therefore, the following sub-question needs to be answered.

SQ4: What assumptions on the theoretical transaction cost problems of factoring in Switzerland are valid that could be solved by a multi-sided platform and what should the general platform <u>requirements</u> then be?

Fifthly, based on the requirements coming out of the previous sub-question, a conceptual design of the platform needs to be made in order to give guidance to the prototype development. In order to make sure the design will be relevant to its surrounding, is important that this conceptual design will be both made from a technical and a stakeholder's perspective. Therefore, both the architecture and organisational arrangements will be part of this design. In order to include all this, the following sub-question needs to be answered.

SQ5: Given the need for short term financing, what should the <u>conceptual design</u> (architecture and organisational arrangements) of a factoring platform look like, from both a technical and a stakeholder's perspective?

Sixthly, to complete and evaluate the design, a functioning prototype is made. It will follow the design requirements that were set up. It will be a concretisation of parts of the conceptual design. The main reason for creating a prototype, is to test whether the design has potential to be adopted by the users. It will need to be tested whether the transaction costs, introduced in section 1.2, will actually be lowered and if this will give better potential for the adoption of a platform. To do this, the following sub-question will need to be answered.

SQ6: Does an <u>online factoring platform prototype,</u> which follows the design requirements, enable financial investors to provide invoice financing to small and medium-sized enterprises?

When these research questions are answered, the reflection on the learnings from the theory and the design process will also need to be evaluated. Also, the learnings from the whole design study need to be described in order to add to the knowledge base and for other design studies to be able to improve their design. For this, the usefulness of the kernel theories that have been used to inform the design process have to be evaluated. In order to do this, the following sub-question will be answered.

SQ7: To which degree did the kernel theories inform the factoring platform design and was it useful?

When all these sub-questions have been answered, the main research questions is ought to be answerable as well. All sub-questions will be answered throughout the chapters, where specifically, is described in the next sub-section.

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1.5.Approach and structure

1.5.1. Literature review

The literature review is aimed at reviewing concepts and theories that are useful to use throughout the design cycle in order to make choices for the design of the platform. It contains explains the concept invoice financing, from a finance perspective. Also the platforms that are recently being developed in the financial technology domain are reviewed. From this review it should become clear why it is relevant and novel that this research is performed. **Chapter 2** describes this review.

More in detail are the mechanisms behind invoice factoring reviewed according to the perspective of transaction cost economy. After that the literature on multi-sided platforms is reviewed in order to structure the way elements from other multi-sided platforms can be used to design a factoring platform. After that, in order to make sure the design will be working in its competitive environment, a synthesis of both pure transaction cost economy and a platform perspective aims at creating design guidelines that can inform the design. **Chapter 3** describes this review.

1.5.2. Design research methodology and structure

For this research a design research methodology is used that is based on multiple works from the design research. The chosen methodology is based on design theory and uses a state-of-the-art design methodology aimed at doing research within a *practice context*. **Chapter 4** describes the research methodology in detail. It describes the three phases that have been used for the design research that are adapted from Verschuren and Hartog (2005). An overview hereof is given in Table 1.

Table 1 Phases of this graduation thesis where the three main phases are indicated and linked to the concepts mentioned in Verschuren and Hartog (2005)

Phase	Output		Concept from Verschuren and Hartog (2005)	Chapters
Setup		Goals	First hunch	1, 2, 3, 4
PHASE I		Domain analysis	Design requirement, assumptions	5
PHASE II	Ecosystem Architecture	Platform Architecture / Organisational arrangements	Structural specifications	6
PHASE III		Prototype	Prototype & Implementation & Evaluation	7
Finishing		Generalisation	Evaluation	8, 9

The design study itself is performed and described in **chapter 5, chapter 6 and chapter 7** and the generalisation is described in **chapter 8 and 9**. The methodology that is used for this design study is based on Verschuren and Hartog (2005) and Sein et al. (2011). Mainly the structure is based on Verschuren and Hartog (2005), who mention six phases that a design study should contain: (1) A First hunch, (2) Requirements and assumptions, (3) Structural specifications, (4) Prototype, (5) Implementation, (6) Evaluation. In order to perform this design study, mainly the second, third and fourth phase are described in detail. The other phases are less emphasized and are referred to as the *preparation* and *finishing* phase. However, it needs to be noted that despite the fact that the phase structure is used to present the design study, the phases in reality have been much more unstructured. Therefore, as an example, elements from the evaluation will not be seen not only in the finishing phase, but will also be mentioned in the three main phases. The three phases that are described in detail are referred to as the (I) *domain analysis*, (II) *structural specifications* and (III) *the platform*. Each phase is generically introduced.

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Preparation. "First Hunch"
 The text that you are currently reading is part of the preparation. The first three chapters (1,2 and 4) are really all about the initial research opportunity. The initial research opportunity is the creation and specification of the 'first hunch' of a solution. Verschuren and Hartog (2005) refer to the first hunch as "the very first stage of a designing process is the appearance of a first hunch and initiative for constructing a new material or immaterial artefact". In this study the first hunch can be seen as the idea to create a multi-sided factoring platform.

Phase I. Domain analysis – The problem and assumptions
Phase I is about the domain analysis. Verschuren and Hartog (2005) mention the design requirements and testing of the assumptions as the second step in the design cycle. In this thesis, the domain analysis refers to this process, which is the first phase where this thesis really puts its focus. Chapter 5 is all about the domain analysis, in which the design requirements follow from the domain analysis. Also, the assumptions are tested in this chapter.

Phase II. Structural specifications – Platform Modelling and Design.
Phase II is where the structure of the platform is created. In Verschuren and Hartog (2005) this is the structural specifications phase. In this this thesis, this is the second phase where real emphasis is laid on. The phase will be described in Chapter 6 and entails the ecosystem architecture, which focusses more on the interactions that the platform has with other actors; the platform architecture, which lays down the internal and technical components of the platform; and the organisational arrangements, which will entail the governance of the different interactions on the platform.

Phase III The platform – Prototyping and evaluation.
Phase III is about the development and evaluation of the prototype. In Verschuren and Hartog (2005) this is the prototype and implementation phase. Chapter 7 is describing the development and the eventual artefact of the prototype. Also, it describes the evaluation of the prototype according to design requirements and the way it actually is adopted by the users. The user feedback is discussed to evaluate the prototype.

Finishing. In chapter 8 the discussion and formalized learnings from the design research are consolidated into a generalized recommendations that are aimed to help researchers to grow the knowledge base on designing multi-sided platforms. The recommendations are also aimed help starting companies to design a multi-sided platform from scratch. This report finishes with the conclusions in Chapter 9.

1.5.1.   Use of the kernel theories

The theories that are discussed in Chapter 2 are being used in specific parts of the research phases. Table 2 summarizes the approach including the timing, design cycles, technical and stakeholder focus points and the empirical research that has been performed. In order to structure the report the three phases of the domain analysis, structural specification and the platform prototyping. For all these phases empirical evaluation steps have been performed.

A distinction between two system levels is added to the table in order to show that the different viewpoints that this thesis takes. On the one hand it is really technical focussed, but in order to design the right technical platform a lot of the organisational perspective needs to be understood. Also, some empirical methods and theories are more applicable to one perspective. Please note that throughout the thesis both perspectives are less clearly distinguished.

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Table 2 Overview of the design approach

Timing (Chapter)	Design Phase	Technical Perspective		Organisational Perspective		Empirical Research
		Method	Kernel	Method	Kernel	
PHASE I Jan-May 2015 Chapter 5	**Domain analysis** – The problem and assumptions	-Interview with users	- Platform transaction costs	-Survey	-Transaction cost economics	-User Interviews -Domain Survey
PHASE II Mar-May 2015 Chapter 6	**Structural specifications** - Platform Modelling and Design	-Mock-up testing -Semi-structured interviews	- Platform design theories	-Organisational arrangements	-Transaction cost economics - Platform transaction costs	- Stakeholder interviews - User interviews
PHASE III Mar-Jul 2015 Chapter 7	**Platform prototyping** and evaluation	-Pilot testing of process model & technical artefact	- Platform design theories (designing for platform acceptance)	-Agile software development	- Platform design theories	-Experiment and prototype survey -Log data analysis

It should be noticed in Table 1 that the phases within the design cycle are overlapping. This is due to the fact that the research is done in a relatively short time period of 6 months and therefore some things of the phases had to be done before the previous phase had been completely finished. In the discussion chapter 8 and this will be elaborated more upon. Furthermore, it should be noted that the real research method followed the ADR approach, which means that this structure is mainly used because it provides structure to the reader of this report.

Firstly, in the domain analysis the main problems and assumptions in the domain of invoice factoring have been investigated and described in Chapter 5. For this, the learnings from the multi-sided platform and transaction cost theory has been used on understanding the context and laying out the assumptions that helped creating the design requirements. In the two evaluation methods, in total 26 semi-structured interviews have been performed with potential users and a survey to approximately 100 SMEs (of which 30 filled in the survey usefully), the design requirements have been evaluated.

Secondly, in the structural specifications the platform architecture (and the ecosystem) and the organisational arrangements have been designed and described in Chapter 6. In order to create the platform architecture, platform design theory has been used to inform the design. A mock-up of the user interfaces was designed and evaluated by conducting semi-structured discussions with a group of approximately 10 early adopter sellers and 5 investors to create of new ideas that would benefit the fit of the platform to the needs of its users. The organisational arrangements have been created mainly by using the guidelines that followed from transaction cost economics and platform transaction cost theory. In order to better understand the roles and views of different stakeholders of the ecosystem that is being architected 11 unstructured interviews with the relevant stakeholders and experts in the field have been performed. It helped evaluating some context requirements of the artefact.

Thirdly, a platform prototype has been created and described in Chapter 7, by using the synthesis of the platform design theories. This phase has been evaluated by a prototype survey and a log data analysis. In this survey the user is also asked to perform the tasks on the platform and the most important features and constructs that are needed in a multi-sided financing platform have been evaluated. The log data was also analysed to evaluate whether the platform actually had user sign-ups and what the user's behaviour consisted of. It provided a way to formatively evaluate the functional, context and user requirements.

Summarizing, throughout the process of designing, two types of evaluation have been done: 1) a formative evaluation, which focuses on whether the prototype suffices the requirements that were developed in Chapter 5. These evaluation methods are described in the Chapters 5, 6 and 7. 2) a summative evaluation on whether the platform artefact sufficiently adheres to the design guidelines, which is elaborated upon in Chapter 8.

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2. Background on financial technology

2.1. Introduction

This chapter describes the main reasoning behind designing an online factoring platform. As the domain of this design research is quite complex for readers who are not familiar with the field, the main concepts of SME lending, invoice factoring and financial platforms are explained. By doing so, this chapter aims at answering the question:

SQ1: Why is it relevant and novel to design an online factoring platform?

In order to answer this question, this chapter will first elaborate on SME lending problems and financial lending technologies. Secondly, it will explain what invoice factoring is and why it can be useful to solve the liquidity problem of SMEs. Thirdly, it explains by describing other financial platforms why there is a need to investigate how a factoring platform can be designed. Fourthly, it concludes by giving an answer to the abovementioned question.

2.2. SME lending

2.2.1. SME Liquidity problems

As mentioned in the introduction, is liquidity a problem for many SMEs. Having liquidity is sometimes also refer as having working capital. But even profitable businesses can, at times, suffer liquidity problems that mean they are unable to invest in growth and development. In the past, many of the problems of small business cash flow and liquidity were addressed by the banks. Banks would simply be able to provide a loan to an SME to overbridge the gap. However, since the financial crisis there have been some shifts in the financial possibilities of -particularly- SMEs all around the world (R. A. Cole, 2012; Cowling et al., 2012; Valadkhani et al., 2014). Banks have become less willing to lend. In order to understand the different types of lending possibilities for SMEs, they are accordingly discussed.

2.2.2. Types of financial lending technologies

Traditional financial institutions provide two ways of SME financing, being either transactional based lending or relational lending (Berger & Udell, 2006). Transactions lending technologies are mainly based on "hard" quantitative data that may be observed and verified. In contrast, relational lending is based on more "soft" qualitative information, gathered through contact with the SME and the local community over time. The soft information cannot be easily observed, transferred or verified within or outside the financial institution.

In literature about SME lending has been a long debated problem, where there is a common finding that small banks have a competitive advantage over larger ones (Berger & Udell, 1995; Petersen & Rajan, 1994). This is due to the greater autonomy they have, they can better perform relational lending based on "soft information". It is often thought that lending to smaller enterprises performs better by relational lending, due to the fact that these companies are *less transparent*. However, this method is less scalable then the transactional based lending. As Berger and Udell (2006) argues, it is an oversimplification that only relation based lending would be suitable for smaller enterprise lending. The definitions of working capital, transactional-based and relational-based lending are given in Table 4.

Table 3 Definitions of working capital, transactional-based and relational-based lending

Concept	Definition	Guiding references
Working capital	is a financial metric which represents operating liquidity available to a business	(Juan García-Teruel & Martinez-Solano, 2007)
Transactional-based lending	are mainly based on "hard" quantitative data that may be observed and verified. Although is a more scalable lending solution, many transaction-based lending solutions are generally considered to be less suitable for SME lending.	(Berger & Udell, 2006)
Relational-based lending	is based on more "soft" qualitative information, gathered through contact with the SME and the local community over time	(Berger & Udell, 2006)

As explained in the previous chapter, is transactional-based lending is more scalable, and thus are the transactional-based lending solutions potentially can both serve SMEs and be scalable at the same time. According to Berger and

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Udell (2006) "4 transactions technologies may be well-suited to providing credit to informational opaque SMEs" Invoice factoring is one of these transactional lending technologies that is suited for SME lending. However, to this day, there has been limited success in standardizing, optimizing and scaling this type of lending onto a platform. Before explaining this more in detail, invoice factoring is first more elaborated upon.

2.3. Invoice factoring

In order to better understand the domain of this research, invoice financing, this section explores the state-of-the-art literature about invoice factoring. It provides insights in what factoring is and why it exists.

2.3.1. What is invoice factoring

As mentioned in the introduction, invoice factoring concerns the process to fund businesses using their account receivables (i.e. invoices) as a monetary deposit. Invoice factoring, or simply referred to as factoring, is defined as financial process where an external party (factor or investor) purchases the trade debts or accounts receivables arising from the sales of goods or the provision of services to trade customers (end-customers). Invoice factoring can be classified as a form of debtor financing. Debtor financing is an umbrella term for the process to fund businesses using their account receivables (i.e. invoices) as a monetary deposit. Within debtor finance one can also have invoice discounting. Both provide access to quick cash and thus provides a way for SMEs to improve their liquidity. Factoring is the more common used term when talking about debtor finance at smaller companies, but it is not exclusively used by companies that are smaller than those that use invoice discounting.

After having a factoring contract with a financial provider (factor) that gets his credit line from a credit issuer, the actual factoring of the invoice usually proceeds in four steps. The first step is that the SME delivers his goods or services to his customer. The second step is that the SME submits his invoice and other documents to the factor. In the third step the bank makes the payment to the SME. The fourth step entails the recovery of the payment that is being done by the factor when the invoice is due. Figure 2 shows an overview of these steps.
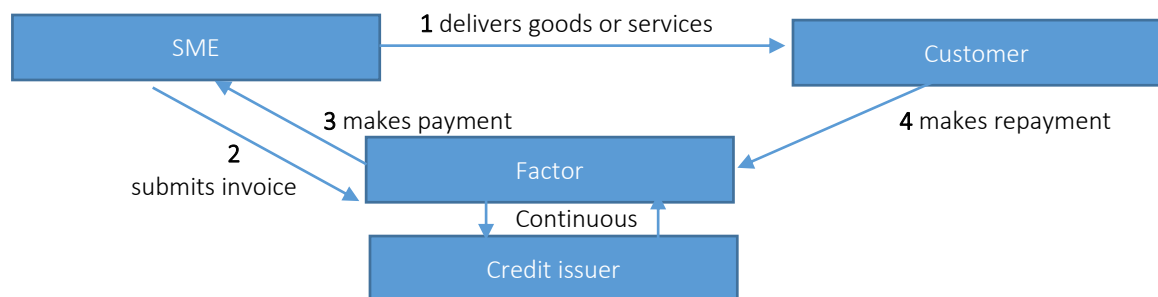
Figure 2 the traditional factoring schema explained in 4 steps.

Even though the steps of factoring are always the same, within factoring many variants can be found. These variations are discussed in the following subsections, preceding a review of the concepts trade credit and factoring.

2.3.2. Trade credit and factoring

When a suppliers deliver goods to their customer, they often allow the customer to pay later then the delivery of the goods. This concept is called trade credit. In fact it means that the supplier offers a credit to its customer and allows them to delay the payment. Thus, the trade credit transactions involve a short-term (for example thirty to sixty days) loan on the purchases of goods or services. Even-though it can be considered to be a loan, there are three main differences between trade credit and normal types of corporate debt (Cuñat & Garcia-Appendini, 2012). First, suppliers are lending money not 'in cash' but in 'in kind', meaning that only goods or services are advanced. Second, the credit is often not formally in contracts, as it is the case with loans. Third and finally, it is credit that is issued by non-financial institutions.

There are two ways how trade credit is being provided (Cuñat & Garcia-Appendini, 2012). The first type of agreement is the *Net Terms*, in which the supplier the full payment requires after a specific period after the delivery of the goods or services. After this payment date the supplier is allowed to charge a penalty. The second type of trade credit agreements is called *Two-part terms* in which the supplier provides a discount on the invoice when the invoice is payed early. This discount actually shows the price of the trade credit, as it implies an effective rate of interest if the invoice is payed at the end of the net credit period (Ferris, 1981). For example, if the supplier sets a discount of 2% if the invoice is payed within 10 days instead of the full 30 days of the invoice period, that would

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imply to have an interest of 37 percent annually. Roughly half of the inter-firm contracts use the discount (Ng, Smith, & Smith, 1999). Both types of trade credit are illustrated in Figure 3.
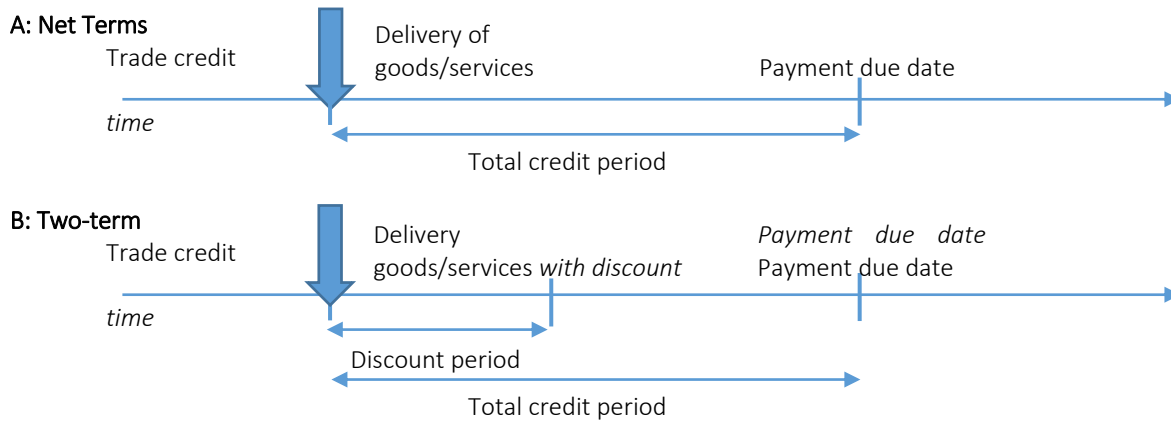
Figure 3 Two types of trade credit provided

Trade credit provides an important part of firm's financing in both developed and developing countries (Demirguc-Kunt & Maksimovic, 2001). There are some discussions on the reasons for SMEs to provide trade credit (Cuñat & Garcia-Appendini, 2012), but two main reasons can be distinguished: transactional and commercial (Burkart & Ellingsen, 2004; Ferris, 1981; Schwartz, 1974). The first reason implies that the trade credit supports a smooth transaction between the delivery of the good and payment. By looking at the landscape of competition, SMEs often have to provide trade credit, as not providing it will bring a competitive disadvantage as their larger competitors can grant trade credit to their customers (García-Teruel & Martínez-Solano, 2010). Secondly, providing trade credit is also known to boost company sales. As trade credit provides a way for the buyer of a product/service is able to receive and test the product before it actually needs to be paid. The latter mechanism has already been used for marketing since the middle ages (Soufani, 2002).

By providing trade credit, firms automatically generate accounts receivables. Account receivables pertains the availability of cash that needs to be unlocked in order for firms to improve its cash-flow situation. This "locked-up" cash is vital for companies to sustain their business operation (Soufani, 2002). Therefore, credit is needed for firms that are in need of cash, due to a lot of outstanding invoices. However, normal credit lines are difficult to obtain by companies, because of the fact that banks often require fixed assets or personal guarantees (Soufani, 2000).

Many firms, but especially small and medium enterprises, have difficulties to provide these assets or guarantees. Small and growing companies often need more credit than they can provide assets or guarantees as so-called *collateral* – the pledge that serves as a security of a repayment. Therefore, many SMEs seek alternative forms of finance for their operations. Thus, SMEs giving out trade credit are in need of a better cash flow management, as trade credit gives rise to accounts receivables. Factoring, selling accounts receivables to a third party (a factor) in exchange for cash, could be a way to provide this cash flow. By using factoring, firms are using the accounts receivables as their collateral and thus despite their lack of assets, still obtain cash to operate their business. The definitions of trade credit, factoring and factor are given in Table 4.

Table 4 Definitions of trade credit, factoring and factor

Concept	Definition	Guiding references
Trade credit	the practice of an input suppliers deliver goods to their customers offering credit terms that allow the buyers to delay the payment	(Cuñat & Garcia-Appendini, 2012; Ng et al., 1999)
Factoring	an economic decision to have an external party (factor) take over the account receivables of a company in exchange for immediate cash. It can be seen as short term capital, as the factor usually gets a discount over the invoice value.	(Hawkins, 1993; Klapper, 2006; Salinger, 2006; Sopranzetti, 1998; Soufani, 2002)
Factor	a (specialized) external party performing the credit risk management and invoice collection in exchange for a discount on the invoice value	(Hawkins, 1993; Salinger, 2006)

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2.3.3. Types of factoring

A study from the UK, Germany and France shows the impact of late payment of suppliers' invoices on the operating cash flow of especially small businesses is high and limits them to achieve their potential growth (Chittenden & Bragg, 1997). García-Teruel and Martínez-Solano (2010) argues that factoring is often done by smaller companies that provide trade credit. For larger companies, that have well-founded of access to funding, trade-credit is easier to provide without the need of a factor. Uniquely for young and small companies (start-ups), the access to funding is notoriously low (Cressy, 1996; Stiglitz & Weiss, 1981). Thus, factoring is more used by those types of companies.

There are two different types of factoring: *with or without recourse* (Mian & Smith, 1994). In a with-recourse set-up the lender is not only allowed to collect the accounts, but as he does not have recourse against the supplier he takes over the full risk of the invoice. If factoring is done under recourse the seller has a claim at the seller for any account payment deficiency. In developed countries it seems to be that factoring is mainly done on a non-recourse base (Klapper, 2006).

Another variable of invoice factoring is the way the end-customer is notified. Notification means that the customer of the seller is being contacted to notify him that his invoice has been sold. Selling on notification bases, allows the factor to better confirm the delivery of the goods and services. Moreover, many factoring arrangements provide that the selling firm must notify the factor on a continuous basis of all sales contracts into even before it has entered one (Smith & Schnucker, 1994). However, for the sellers of invoices this can mean that the customer relationship can become disturbed.

An important feature of factoring is that not 100% of the invoice value is transacted to the seller. By only providing 60-80% of the invoice value, the factor has a reserve in order to create an incentive to make sure the invoice will be repaid, in case it has been sold with recourse. In case of non-recourse factoring, the same reserve is used to cover potential non-payed invoices. Also, potential reductions in the invoice value due to a deficits in the product are captured in this way (Klapper, 2006).

2.3.4. Motives for Factoring

A factor, the provider of factoring services, provides seller of goods cash at the time of selling. By this, the accounts receivables are substituted by cash. The main difference between factoring and a regular bank loan, is that factoring is better able to assist cash flow needs as it is "sales-based" and not "asset-based". Therefore, they do not require a profitability, unlike bank loans. Thus, as soon as you have sales and send out invoices, factoring would become a possible way of getting financing. This is one of the reasons for firms to take a factoring loan and why factoring companies often claim that they are the ideal financing option for small sized, young, and fast growing firms operating in a specific business activity (Hawkins, 1993; Smith & Schnucker, 1994). An analysis of Soufani (2000) in the UK indicates that factoring is more focused on small firms with turnover between 250,000 and 3 million pounds, between 1–5 year old, and limited liability companies in manufacturing, distribution, and transportation.

The second reason for SMEs to choose for a factoring loan, is the fact that factoring loans are generally faster than bank loans <source needed>. In case a company is generating invoices and the factor knows the customer of the supplier, the process of taking over an invoice can be done even faster, as the credit risk assessment of the customer can be done in advance in that case. The application for bank loans are often a lengthy process, which can be unfavourable for SMEs in need of immediate cash.

A third reason to choose for factoring financing instead of bank loans, is the performance of the credit risk (Soufani, 2000, 2002). The factoring companies are more interested in the credit rating of the customer of the seller, as the invoice risk will usually become theirs. If, a supplier supply to companies that has a good credit rating and reputation of paying the bills, but your own company has a bad or no credit rating, it is likely that you would not receive a bank loan. This is due to the fact that banks deal directly with the company seeking the loan and are thus mainly interested in their credit rating. However, this supplier would still be eligible to for factoring loans, as a factor is more interested in the credit rating of the end-customer.

If the situation is the other way around where the seller has a good credit rating and the buyer not, would also provide reasons to use factoring. In this case the factoring company can being used to get a more efficient management of their trade credit (Smith & Schnucker, 1994). According to Smith & Schnucker, this also follows from the fact that factoring is used more when information and monitoring costs are high.

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2.4. The rise of financial platforms

2.4.1. The window of opportunity

Since the financial crisis financial institutions all around the world decreased the number of loans provided for SMEs (Berger et al., 2014). Despite initiatives to improve the position of SME in financing[1](European Commission, 2011), SMEs often receive very high interest rates on their credit. Contrary to the declining volume of SME loans, the willingness of European investors to finance *short-term loans* increased with 8% in 2014 (Doove, Gibcus, Kwaak, Smit, & Span, 2014). Furthermore, lending volumes have dropped significantly. Amongst others reasons the 2008 financial crisis and the regulation that ensued is commonly seen as one of the drivers of this decline (Ivashina & Scharfstein, 2010). One question that remains is why -even though these volumes dropped- did the profitability of the industry not at the same rate? As revenues dropped banks have mainly focused on lowering costs (Deloitte, 2015).

However, a recent review on global banking illustrated that just 30 percent of top global banks improved cost efficiency over four years. The remaining 70 percent stayed the same or became less efficient — all despite leaps forward in mobile technology, cloud computing, and web platforms (McKinsey, 2014). This is being resembled in the fact that though the banks borrowing costs are all-time low, the net yield or interest spread is at an all-time high (Charles Moldow, 2015). A high interest spread means that there is a bigger opportunity for new firms to bridge the gap between investors and lenders. Figure 4 shows this increase of interest spread.
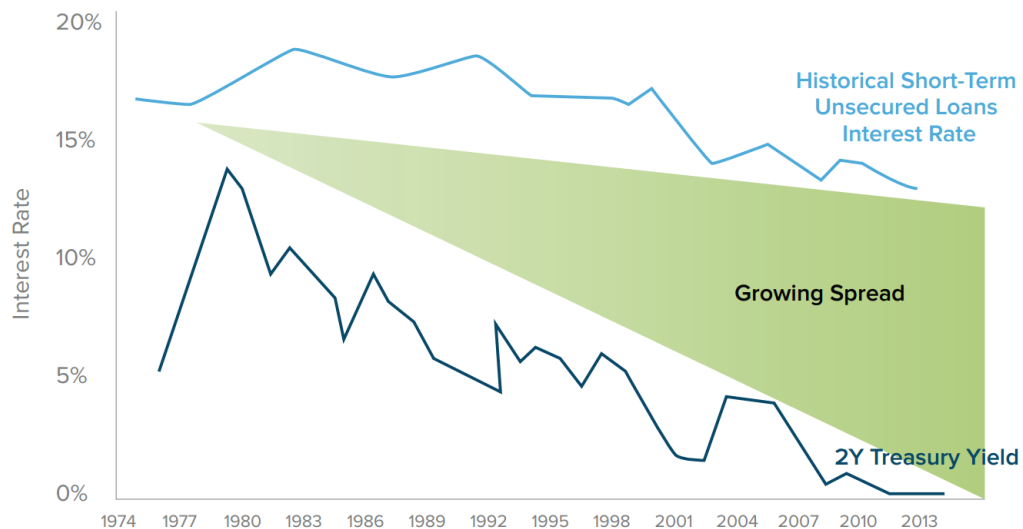
Figure 4 and Figure 5 Showing the growing interest spread between the interest rate and the net average net yeald over a two years period. Taken from (Charles Moldow, 2014).

Next to a high interest spread, banks reputations are thought to be very low. As an anecdote, a popular survey even identified that 70 percent of US residents actually prefer a trip to the dentist than go to their bank and nearly half expect that tech start-ups will reinvent banking (Scratch, 2014).

Furthermore, factoring is not yet very much used in some developed countries, such as Switzerland. In general there are big diversities across countries of the use of available funding technologies. As an example, SME factoring in 2004 factoring was done by 0,9% of the SMEs in Switzerland (in comparison to 11.9% in Italy) (Bakker, Klapper, & Udell, 2004). It is for three reasons that there is the believe that there are chances for today's technology and innovation to make it possible a new generation of financial services that are more affordable and more available.

2.4.1. The financial technology frontier

The internet already disrupted whole industries -such as the retail industry- by making parts of the value chain accessible to new actors and increasing transparency. In examples such as Ebay this happened by creating multi-

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[1] Policies focussed on increasing transparency, encouraging the use of qualitative factors in credit decisions, and providing legislation to require feedback to SMEs in respect of credit requests, and improving the supply of information through the agencies that provide banks with information about enterprises.

sided platforms. Now, also the financial industry seems to be influenced by internet technologies and related business models innovations. Numerous examples can be found that use these internet technologies to solve financial issues. Innovations are taking place ranging from *cryptocurrencies* (Bitcoin) to *peer-to-peer lending* (Funding Circle). But a lot of current innovations are based on bringing two users together on a multi-sided platform. A well-known example on which private investors are brought together with businesses in need of external financing would be the concept of *crowdfunding* (Kickstarter)*.*

The start of the financial crisis in 2008 kicked-off a strong growth of investments in the Fintech (Accenture, 2013). In 2014 these investment even grew by 201% globally (Accenture, 2014), perhaps indicating that a digital revolution in financial services is under way. Part of the Fintech is currently disrupting the banking industry by using techniques like algorithm-based banking and bringing transactional lending technologies online (Dapp, Slomka, AG, & Hoffmann, 2014; Walker, 2014).

Responding to the reasons mentioned in the previous section, many different web- and data companies are attempting to use internet technologies to replace certain services in financial industry. Primarily non-bank technology-driven providers are starting to compete with the incumbent banks (Dapp et al., 2014). At first, the less knowledge-intensive and easily standardisable financial services have been under pressure by these new Fintech companies. These include payment solutions, automated financial services, online banking and simple financing products such as consumer credit (e.g. peer-to-peer lending) or the allocation of venture capital to start-ups (e.g. crowd-funding). However, based on the premise that there is more and more trust in the digital channel, there are more complex financial products are being taken over by their digital counterpart.

After the introduction of the more simple financing products online, there is a trend in providing more knowledge intensive solutions, such as the provision of SME credit and liquidity management. The successes varying from payment to crowdfunding solutions has brought trust that there are more possibilities to disrupt the financial industry. Payment solutions are a good example of solutions that are very easily standardisable and are not knowledge intensive (as only little data is required to make the transactions work). More knowledge is required in providing for example venture capital. However, start-ups such as theventurecapitalplatform.co.uk and microventures.com are examples of attempts to also disrupt this part of the financial industry. In order to classify the challenges that Advanon is facing some of the financial solutions have been classified in Figure 6.

Knowledge requirement	**Intensive**	relation-based lending	SME credit, liquidity management
	Superficial	personal investment management	venture capital, consumer credit, automated financial services, payment solutions
		Difficult	**Easy**
		Ease of standardising	
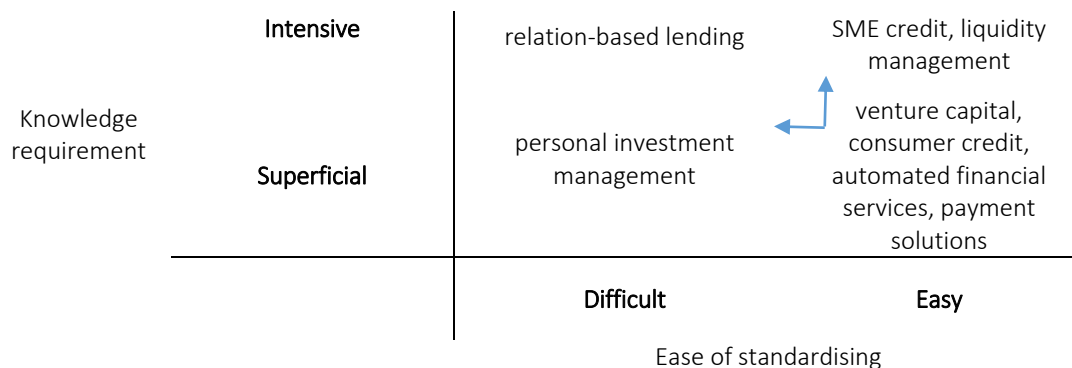
Figure 6 A classification of the fintech solutions on the ease of standardizing and the knowledge requirement (own classification and representation). The arrows indicate the hypothesised frontier and show the challenges for platforms such as Advanon: moving into a more knowledge intensive world of SME credit instead of consumer credit and on the other hand moving into a less standardisable world of personal investment management.

Figure 6 aims to represent the main solutions in the financial industry into four quadrants. In the first, the top-left quadrant, the financial solutions that probably will never be taken over by a technological counterpart. An example would be relation-based lending, as it is difficult to standardize and knowledge intensive to perform these types of lending. On the other hand, the bottom-right, the main solutions that currently already have been disrupted by Fintech companies, such as payment solutions. Currently Fintech is pushing the frontier and showing more cases of more difficult to standardize solutions, such as personal investment management. This is more difficult to standardize as a part of the investment decisions is about understanding the individual investment needs. Often this requires customized and tailored contact with investors. The other part of the frontier is the movement of

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Fintech into the more knowledge intensive areas, such as venture capital and even SME credit. Credits for SME's are often of a higher amount than consumer credits. Furthermore, SMEs often have a high opaqueness, which means that insights in the SMEs performance is cumbersome (Berger & Frame, 2007). Likewise, liquidity management entails a lot of complex transactions on the predictions of both internal and external demands, which makes it more knowledge intensive process.

2.4.2. Financial multi-sided platforms

There are numerous examples of multi-sided platforms. Also in the financial industry, new platform business models can be found. Three examples that include the elements discussed in the previous section are crowdfunding (Gerber, Hui, & Kuo, 2012); Peer-to-peer lending and Payment service providers. Within the lending space, multiple platforms have emerged that currently provide services that could not have been provided in the traditional way. Examples are numerous, but a few are mentioned:

Fundingcircle, offering generic loans to SMEs by connecting them to investors
Lendingclub, offering generic loans to persons and SMEs by connecting them to investors

Both of these lending platforms allow for SMEs to gain access to cash. Even though both of them give fairly easy and quick access to loans, they do not meet the needs of many businesses that have liquidity issues. This is due to the fact that the loans are often very expensive, due to the fact that the platforms make no difference in risk assessment (except from the network effects of high volumes) from traditional bank loans. However, the success they show, indicates a real benefit of providing these loans through an online platform setup.

All these platform technologies show a rapid growth in adoption. A good example of that can be seen in the way crowdfunding already exceeded traditional business angel investments and is steering towards becoming bigger than traditional venture capitalist funding (Crowdfunder.com, 2015). According to crowdfunder.com the absolute amount that has been collected through crowdfunding grew almost exponentially from 5 in 2013 to 22 billion in 2015, while angel capital has stayed relatively stable around 20 billion. This growth is illustrated in Figure 7.
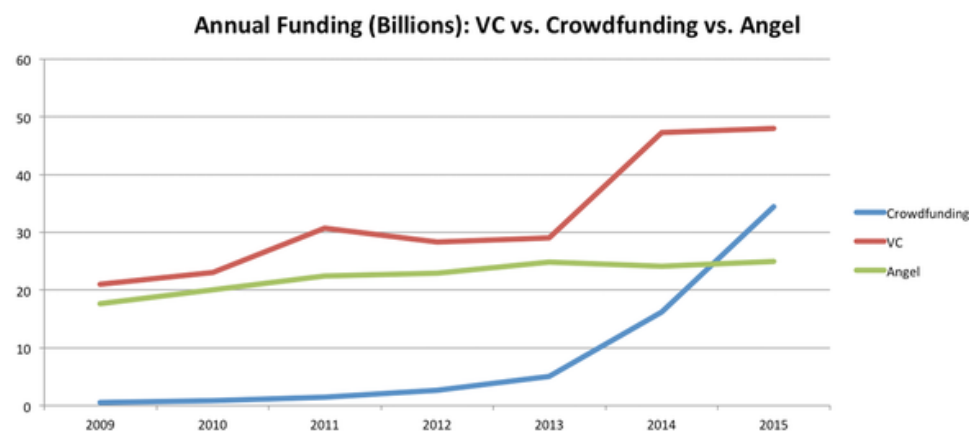
Figure 7 Graph showing the volume of different funding forms between 2009-2015 in billions from (Crowdfunder.com, 2015)

Although the challenges of the upcoming platforms will be higher, as they sometimes address less standardisable and more knowledge intense financial solutions, the growth of similar platforms make it seem plausible that Creating an online solution for short-term credit for SMEs will have its challenges in both intensifying the knowledge transfers in the decision making process of the credit transactions that are dependent on the liquidity needs and on the other hand make it more difficult as it becomes a little more difficult to standardize the investment needs of potential investors. These challenges make this design research relevant and different from other Fintech solutions that concern solutions that are easier to standardise and have less knowledge intensive transactions.

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2.4.3. Liquidity financing platforms

Within the solution space for short term liquidity, multiple platform solutions have already emerged (Dailyfintech.com, 2015). Due to the high complexity that is involved in short term finance aimed at managing liquidity, there are different perceptions on the solutions that are being offered. With slight changes in their offering, different solution providers all provide a solution to the same problem: liquidity. However, due to their field of application all solutions are usually referred to differently and have a slight different focus. Depending from what kind of a perspective you are looking at short term financing solutions, you will see four different things.

Medium and larger corporate perspective: **Supply chain finance**.

Supply chain finance (SCF) is something that banks offer their corporate clients. It rests on the same principle as factoring, however it is more of a specialized solution for larger corporates that want to optimize their supply chain management. Even though banks have been successful in providing good solutions for supply chain finance, they have not yet been able to serve the smaller suppliers that need their cash early. This has created a gap, as medium or larger corporates also have suppliers that are of this kind. In order to fill this gap SCF platforms have emerged that focus on approved payables finance, where medium sized vendors and suppliers get their invoices payed early. Examples of these types of platforms differ in the sources from which the financing comes (the credit issuer). Three known examples of these platforms are:

Prime Revenue, on which the financing comes from multiple banks;
Orbian, on which the financing comes from the capital markets;
Taulia, on which the financing comes from the corporate buyer itself.

Similar to the solution that Advanon is aiming for the main focus points of these platforms is the data exchange between the different parties. Advanon is different from this type of platform as it focusses more on regular B2B businesses instead of only the larger corporates. Furthermore, it aims at opening up this type of financing to regular private investors, thus not the three credit providers mentioned above.

Small and medium company perspective: **Factoring and Discounting**

Factoring is already explained before and is the alternatives small to medium businesses have used to get paid up-front. The costs of factoring are usually high and it usually it has a cumbersome process to get invoices financed. Further problems with these traditional sources, like factoring and invoice discounting, is that the factor and credit issuer (often banks) tend to dictate strict terms and conditions to the SMEs of which one is the fact that the customer is now in contact with the factor instead of the SME. As the invoice is not managed and controlled by the SME itself, this can lead to a worsened customer relationship management. Furthermore, as these types of short-term financing are not accessible for starting companies, as they require a trading history and often the SME would need a credit rating.

Factoring to this day is still a fragmented service business with a lot of niche suppliers. No successful attempts have been made to scale this service. Only due to the high need of B2B working capital, only two successful platforms have emerged in the US and the UK on which businesses can trade their invoices, which are:

Receivables Exchange (US)
MarketInvoice (UK)

On these platforms smaller businesses can sell their invoices to private investors. By having multiple investors compete on the factoring platform the costs of getting invoices factored can indeed go down. However, investors usually are more interested in risk adjusted returns. The risk on the above mentioned platforms is not significantly changed, as the risk is only changed to another SME.

There are still important things to improve on these types of factoring platforms. As for example the speed for which invoices are approved and the amount of automation implemented on the platforms. Many of the steps that are being done on these platforms are still being done manually instead of being algorithmic driven. The difference with these platforms and Advanon is as well the fact that Advanon operates in the German speaking part of Europe, where regulation is different and the user familiarity with factoring is far less than in the US and the UK (Bakker, Klapper, & Udell, 2004). It must be emphasized that not only this, but the whole culture difference, must

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be seen as a big challenge for the platform design, as user interaction will be completely different in the two countries.

Furthermore, Advanon aims at really lowering the transaction costs for SMEs to a minimum, by also allowing different credit data, payment service and accounting system providers as modules onto the platform. The aim of that by doing so, both investor and seller will experience a more flexible and optimal transaction of the cash. Also, if designed right, this should allow for an additional competition on more aspects of the transaction and thus lower the costs of lending for SMEs. Although MarketInvoice only allows different accounting systems, they have not yet created an open interface for it. The design challenge for Advanon would be to really focus on creating and using standards to allow for this type of modularization.

Consumers perspective: **Merchant Cash Advance**

When a B2C perspective is taken Merchant Cash Advance (MCA) can be an option to have your working capital financed. MCA is the same as factoring, but then for retailers who get payed by credit card. Credit cards usually pay the retailers late. The costs of this type of factoring is even higher as for factoring, as the risk is even more difficult to assess. This is a difficult type of factoring, as the risk is still with the retailer and thus this would only be feasible for an occasional loan. Furthermore, the type of lending relies on the customer information on the retailers, and is therefore often only concentrated around digital marketplaces such as eBay, Amazon and Sharing Economy services. An example of this type of marketplace is:

Iwoca, that provides MCA loans to small retail businesses

The difference that Advanon has with this type of platform, is that is actually holds invoices as securities, which allows it to be far better priced than the MCA alternatives. The difficulty on having invoices as a security however, is the fact that they are sometimes more time consuming to assess for risks, as the complexity is higher. Once this is solved, the factoring platform will be far cheaper than the MCA alternative.

Pure IT perspective: **Electronic Invoicing**

Looking at liquidity financing purely from an IT perspective, the main enabler is the fact that invoices can be send electronically and standardized. There are multiple players around that have created ways for electronic e-invoicing. However, new players have started entering the financial market and offer trade financing for this. Although there are new players here none of them can be really classified as a platform. However, in order to have the full spectrum of liquidity finance developments, it is relevant to mention here.

Besides being a platform, Advanon is different from these electronic invoicing companies as it focusses on the liquidity management of the SMEs. The core of Advanon's goal is to enable SMEs to gain cash by linking them to investors. Although fundamentally different from e-invoice companies, the standardisation of the invoices is one of the strategies Advanon could take to better optimize the lending transaction. This could be beneficial for the automation of the processes. Although an idea, the initial prototype is basic and will still allow non-standard 'pdf' or document-format invoices.

All above mentioned platforms solve in a way a liquidity or working capital problem. However, they all have a different focus. It should be noted that all are fairly new (+/- 5 years) and therefore can only be really used as an aspiration instead of them being already best practises. By combining the ideas from the other platforms Advanon with solid theory, Advanon can create a novel artefact that will have a good chance of becoming a highly scalable success. The motive of creating an online factoring platform was the success that other platforms have showed to have. All the main mechanisms that enabled that were not yet fully understood when starting the design process, but became clearer later from both theoretical insights as well as practical encounters.

2.5. Conclusion

Many things are going on in the world of Fintech. The main topic of this research is the design of a platform for liquidity finance. In order to better understand the domain of this study, the financial technology, this chapter gave an overview of the complexity of the problem and the types of financial platforms that are currently being developed. The chapter aims at answering the question *why it is relevant and novel to design an online factoring platform.*

A good definition of factoring is the financial process where an external party (factor or investor) purchases the trade debts or accounts receivables arising from the sales of goods or the provision of services to trade customers (end-customers). It should be understood that factoring is highly related to the provision of trade credit, which is the practice of an input suppliers deliver goods to their customers offering credit terms that allow the buyers to delay the payment. Understanding this, brings a better view on why factoring can be needed and provide an alternative way of financing for SMEs. The following notion should be taken from this review: factoring comes in many different forms and has the potential of offering alternative finance for SMEs.

Understanding the difference between relation-based and transaction-based lending explains why factoring is one of the more scalable solutions. This makes it more suitable to potentially create an online standardized and scalable platform. Furthermore, the concept of invoice financing (or factoring) is further explained. Factoring concerns the process to fund businesses using their account receivables (i.e. invoices) as a monetary deposit, which allows to fill the liquidity gap that some SMEs have. To understand the nature of this gap one also needs to understand the nature of trade credit, which follows from the fact that invoices are payed after the delivery of the goods or service. It is relevant to know that there are many different forms of factoring, as designing a factoring platform is formulated as the main goal of this thesis. The differences in offering all need to be tested in the design of the platform in order to see which combinations bring most success. To understand why factoring is a useful type of financing, the difference between asset-based and sales-based lending types is crucial. The problem of many SMEs that do not have many assets that they can use as a collateral. By creating a factoring platform Advanon could open the possibility for SMEs that do have sales from trustworthy customers but do not have many assets, to still obtain loans for a decent price, as the risk of such a setup is lower than providing a standard loan to this type of SME.

As factoring has been proven to work in some countries, there have been to this day no successful attempts to scale this solution. There are several reasons to investigate the possibilities of designing a factoring platform right now. First of all, there is a window of opportunity that has been growing over the last decades, due to the large and often unwieldy banks, the interest spread has grown. This creates more willingness for investors to invest and SMEs to find alternative ways of finance. Especially in a country as Switzerland, where the traditional way of banking is still valued high. Secondly, the financial technology is pushing and shows capable of disrupting more knowledge intense and less easily standardisable incumbent solutions with an online counterpart. Usually the new players fulfil a platform function between the lenders and borrowers. What can be observed is that some of these platforms are growing very big, as for example some crowdfunding platforms.

A similar trend can be observed within the liquidity platforms of which there are only a few. Advanon is aiming to fill the gap of an SME factoring platform in the German speaking countries, starting with Switzerland. As companies Switzerland are expected to not yet really familiar with factoring, there lies a challenge in educating them both in factoring and in online lending marketplaces. Advanon is different from Merchant Cash Advancement and Supply Chain Finance platforms, because it focuses on B2B businesses. Compared to the existing Factoring platforms in the UK and US, the Advanon design is aiming at being more automated and have a more open architecture in order for different module providers to connect their services to the platform. This means that platform theories need to inform the design on how this can be done and in what composition it will bring most benefits.

Another thing that should be concluded from this chapter is that all financial platforms are fairly new and there are still limited best-practises that come from practise. This thesis can therefore add value to the practise of platform sponsors to further develop their platforms, as it provides a theoretically ingrained case of platform design that even though a lot is still unclear about the success factors, still a working prototype can be designed from which valuable insights can be taken.

3. Relevant theory and concepts

3.1. Introduction

This chapter describes the selection of general theories that are used throughout the design cycle in order to make choices for the design of the platform. The theories are selected on their applicability and clarity to provide a basic starting point within the design research. This chapter focuses on the explanation of the used theories in order for the reader to be able to understand the choices within the design better. The chapter answers the following sub-question:

SQ2: What state-of-the-art theories and concepts *provide justificatory knowledge to inform the design of an online multi-sided invoice factoring platform?*

This chapter starts with the description of factoring from a transaction cost economy perspective. In this section, first the transaction cost economy is briefly introduced, whereupon the theoretical barriers and constructs of opportunistic behaviour are explained that currently exist within the factoring solutions. The barriers are used to understand better what the current theoretical problem with factoring is that can be solved by introducing factoring on an online platform. The can be viewed as **three main design evaluation criteria** on which the platform needs to be evaluated upon, to test whether it suffices to improve of factoring as much as that is theoretically expected. The constructs of opportunistic behaviour are also used to set up **five more** design evaluation criteria that can be used to evaluate how the platform mitigates theoretical opportunistic behaviour that exist within all the factoring transactions.

After this introduction to viewing factoring from a transaction cost perspective, platform theory is discussed from this same perspective. The section aims to explain the reasons why a platform solution would be possibly contributing to factoring to better serve up to its potential. In short, the definition and mechanisms behind multi-sided platforms is discussed following the state-of-the-art literature. These notions and concepts aim to contribute on understanding why a multi-sided platform could help improving factoring to be a solution for SMEs in need of liquidity.

From these notions, a synthesis of platform design theories is done. In order to be practically able to use the concepts from theory, design guidelines have been established from a synthesis of design theories and transaction cost theory. These guidelines can be seen as "prescriptive statements" are used to inform the design with the theoretical notions. This Chapter concludes by giving a brief answer to the abovementioned sub-question.

3.2. Transaction cost economics of traditional factoring

In order to better understand the concepts behind the factoring set-up and in order to be able to transpose this set-up to a multi-sided platform. By looking at factoring from a transaction costs perspective, the characteristics of the nature of the formal or informal relations between the different actors can be better understood. Understanding this better, will also create a better understanding of what aspects of a platform would come to benefit the traditional factoring set-up. Hence, the characteristics of the transactions can be used in the design process of the Advanon platform.

As platform design is not only about setting up a technical infrastructure, but is expected to also requires the design of social constructs and involving the stakeholders to actually grow the platform and its ecosystem, it is important that the characteristics of the formal or informal relations that already exists within factoring. It is expected that by taking a very fundamental economic view on the social interactions that take place in traditional factoring, the functioning of factoring can be more theoretically understood and thus the design can more fundamentally improve the current state-of-the-art offering of factoring. *Transaction cost economy is used to understand the logic behind why factoring works or why it does not work in certain situations and what types of opportunistic behavior needs to be taken into account when designing the platform.* In other words, they provide us with insights in some of the design evaluation criteria.

3.2.1. Definition of transaction costs

Transaction costs were conceptually introduced by Coase (1937) as "the cost of using the price mechanism" (Coase, 1937 p.38). Following the later development of property rights (Allen, 1999), the definition became 'the costs establishing and maintaining property rights' (Allen, 1999 p.898). The later neo-classical economists focus more on

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the transaction demand for money and treat transaction costs as the costs of trading. This resulted in the more on trading oriented definition of transaction costs, which formulated as 'the costs resulting from the transfer of property rights' (Allen, 1999 p. 901). In the context of a business trade, the latter seems to still hold as a definition.

Transaction costs are seen as the negotiation, monitoring and enforcement costs necessary to assure that contracted goods and services between and within firms are forthcoming (Alston & Gillespie, 1989). More concretely, transaction costs include: contracting costs, which refer to costs that are associated to negotiating and writing an agreement; search and information costs, which include the costs of gathering information to identify and evaluate potential partners; monitoring costs, refer to the cost associated with monitoring the agreement; enforcement costs, refer to the costs associated with the ex post bargaining and sanctioning between the partners when a partner does not act according to the agreement (Dyer, 2002).

Transaction costs can both occur ex ante and ex post. The standard reasoning of transaction costs is that if the asset specificity increases, the more complex governance structures are required to eliminate or lower bargaining costs (Riordan & Williamson, 1985). According to this paradigm and thus assuming that transaction costs go up if the asset specificity goes up, the choice to "make or buy" can be better made. Depending on the type of transaction costs that occur, either being production or pre- and post-production, firms are respectively encouraged to make or buy (Alston & Gillespie, 1989). Meaning that in the absence of transaction costs other than production, a market transaction would usually be preferred.

3.2.1. Transaction costs in traditional factoring

As factoring is all about providing early cash to a transaction, it might seem obvious that all sorts of transaction costs play a role in factoring. As mentioned, transaction costs exist out of contracting costs, search and information costs, monitoring costs and enforcement costs. Within factoring these costs occur more specifically out of the following:

1) Setting up the contract with the company that the ownership of all invoices is transferred to the factor
2) Searching the SMEs that actually need liquidity, and vice versa the searching for factoring companies. The information costs come also to it, as it might for example be the case that an SME does not even know about factoring or what it actually is.
3) The monitoring of the SMEs performance and the factor's handling procedure with the customer. The latter can become a problem for SMEs if the factor does not operate with a somewhere flexible payment term.
4) The enforcement costs might stem from the fact that an SME or end-customer need to be chased or brought legal charged against to regain the invested money.

Besides having an idea about the exact composition of the transaction, it is key to understand how the basic concepts of transaction cost economy applies to the factoring situation. A lot of these costs cannot be very specifically calculated, but will be more of an estimation that is done by the transacting parties. In order to establish a transaction, the estimation of making it, should in the end be worth the risk. This means that as the actors will make a 'calculation' of the transaction, trust is one of the main issues (Williamson, 1993). Williamson refers to this as calculative trust. This means that trust and transaction costs go hand in hand in a factoring situation. A main evaluator for the factoring platform could be that the factoring platform should lower the overall transaction costs occurring with traditional factoring. In section 3.3 it will be explained why transaction costs can be lower in a platform setup, from a theoretical point of view. From this pure transaction cost perspective, a design evaluation criterion could be set up as follows.

Design evaluation criterion 1: The factoring platform should lower the overall transaction costs compared with traditional factoring.

Besides understanding that it helps to lower the overall transaction costs, certain concepts need to be understood. Asset specificity, which can be defined as being high when the loss of value is big when you sell it to an unintended customer, has a strong relationship with the transaction costs. Transaction cost economy says that when this asset specificity is high, that then more governance structures need to be in place between the parties in order to make the transaction feasible. This mechanism has an impact on when factoring is feasible, which is discussed in the next subsection.

Another important aspect that involves the transaction costs is the information asymmetry, which is high when one party has significantly more or better information than the other. The amount of information that a seller

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has about its buyer is relevant for the feasibility of factoring, as this can determine the added effectiveness of a factor. The precise reasoning behind this will also be explained in the next subsection.

The frequency of the transactions is an important feature of a certain economic exchange (Doney & Cannon, 1997). The same is true for factoring. When a certain transaction has a high frequency, which is the case more for invoice factoring than for traditional loans. Thus, the fact that factoring is in place, as it is a high-frequency loan, can improve the trust. All definitions are summarized in Table 3.

Table 5 Definitions of working capital, transactional-based and relational-based lending

Concept	Definition	Guiding references
High specificity	is high when the loss of value is big when you sell it to an unintended customer.	(Williamson, 1979)
Information asymmetry	is high when one party has significantly more or better information than the other	(Williamson, 1979)
Transaction frequency	when high, trust is built faster between the exchanging parties	(Williamson, 1979)

3.2.2. Theoretical barriers for traditional factoring

When the transaction cost economics (TCE) is to be applied, its assumptions should also be agreed upon. There are some fundamental assumptions underlying transaction costs economy (Williamson & Masten, 1999). These assumptions include that firms are opportunistic and seek to minimize transaction costs. The latter assumption is thought to explain the rationale for *vertical integration*. Ever since Coase (1937) wrote his Nature of the Firm, in an attempt to explain vertical integration, economists theorized that there is an underlying desire to reduce or avoid transactions costs arising from using the price mechanism to guide resources (Smith & Schnucker, 1994). Building on these assumptions, multiple analysis can be done why factoring is done and what the underlying mechanisms are. The most important barriers of using factoring -that follow from this theory- are described here.

Theoretical barrier 1: Asset specificity of the seller needs to be low

Coase (1937) theorized that internalizing the functions within the firm would be dependent on the transaction costs that would occur with it. Williamson (1979); (Williamson & Masten, 1999) and Klein, Crawford, and Alchian (1978) discussed that this would dependent on the type of transaction costs between the seller and the buyer. "If the parties are required by competition to make highly specific, nonsalvageable investments in order to complete the transaction efficiently, then opportunism is more likely and hence vertical integration is more likely, ceteris paribus." (Smith & Schnucker, 1994).

Smith and Schnucker (1994) what this means for the decision for firms to provide trade credit in the first place. The presence of specialized investments has been modelled by Smith (1987) to be a primary determinant of sellers' decisions to offer trade credit. Smith hypothesized that if a seller has made a specialized investment in the provision of the good or service, he can provide the discount (that is described in section 2.3.2). Providing discount, usually adding up to a high interest-rate on a yearly basis, would be a way to check if the buyer is able to pay this invoice before the discount day. This would be a very good measure for credit risk, as it will show the seller if his customer has access to cheaper financial means. Whether he pays the first invoice with discount is valuable information and a potential indication to change the following invoices or contract a seller closes with his customer.

This type of seller, that has made specific investments, is less likely to want to use factoring to provide financing. According to Smith (1987) this is because a seller who relinquishes credit management to a factor also "limits the ability to preserve the value of its specialized investment by designing timely and flexible credit procedures for troubled buyers". In other words, the seller would not be able to get insights in this credit risk measure anymore which helps determining if the difficulties are permanent or not.

Furthermore, asset specificity creates incentives for opportunistic behaviour since once an asset is specifically committed to the buyer, the seller is vulnerable to the buyer's demands to renegotiate the terms of the original agreement, and vice versa. Thus, if the seller would sell invoices through a factoring solution with recourse (see 2.3.3), this means an increase of transaction costs.

Another reason of not using factoring in the case of asset specificity, is for example when there is a large human capital investment done in the relationship building between the seller and the buyer. In the case a sales-person has spent a significant amount of time with the buyer, the credit rating would already be a by-product. In this case, a factor would not have access to the same information about the buyer's business at the same cost as the seller. Therefore, it would never lower the transaction costs to factor these accounts, thus the costs of factoring

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would probably too high. Thus, if a seller provides asset specific goods or services, or the relationship between the seller and buyer is specific the likelihood of factoring being beneficial for the seller is low.

Theoretical barrier 2: Information asymmetry between seller and buyer needs to be high

(Demsetz, 1988) added to the Coase's theory of the firm, the fact that information costs (a specific type of transaction costs) were an additional factor to the asset specificity that play a role for the choice whether trade credit functions and thus also factoring should be done in-house or not. It is important to understand the role of information and monitor costs. As explained in section 3.2.1, information and monitoring costs are transaction costs. As the costs to identify the credit-worthiness of a company are also most relevant before the transaction has taken place and the choice for factoring has to be taken at that time as well, this will also be very relevant for the choice whether to go for the factoring option.

Diamond (1984) developed a general theory of financial intermediation based on minimizing the cost of generating and using information for monitoring. Credit rating monitoring information is as such very useful for resolving incentive problems between borrowers and lenders. A factor would in a sense be fulfilling the role of credit monitor, the factor would be fulfilling the role of "information intermediary" (Smith & Schnucker, 1994). Sellers would in this way benefit from the accumulated credit information that a factor (and thus a factoring platform as well) would have. The other way around, a buyer could also benefit from this, as it would be able to know information such as product quality and budgetary operations.

Diversification by the factor, from both the seller and the customer side, is therefore very beneficial for the added value that the factor can deliver. This could namely produce information whether certain financial problems are industry-wide or specifically for a certain customer. Whether a seller will elect his own credit rating assessment will depend on the costs of the transaction of doing so, at other alternatives. The more heterogeneous his customers are, the more costs this will bear. As a factor (or factoring platform) will possess better information on the credit worthiness of the sellers, this would be preferable in the case the seller has heterogeneous customers to which there is a large information asymmetry.

3.2.3. Applicability of the theoretical barriers for platform design

Understanding the barriers of traditional factoring can be used both in the design process of the Advanon platform in the evaluation phase. It should be investigated whether these barriers also hold in a *platform setup* of factoring, as other dynamics take place. For example, it could be questionable the asset specificity still need to be so low in order for the platform to be a success. However, by taking a pure transaction cost view on traditional factoring, the following should be guiding the design process.

- Traditional factoring is only feasible when the *asset specificity of seller is low*, as it would provide too much friction for a seller to outsource its accounts receivables because overall transaction costs would increase;
- Traditional factoring is only feasible when the *information asymmetry between seller and buyer is high*, as the factor takes over the role of information intermediary and factoring thus decreases transaction costs.

Interpreting the theoretical barriers for the platform design

Understanding the barriers as prerequisites for the design would help in defining the target groups, as they give guidance for which problems to look within the large potential user group of SMEs and investors. However, as mentioned, it should be challenged whether these barriers also hold in a platform setup. By introducing potential users to the specified idea, it could be evaluated whether the barriers still hold for a platform setup. Under the *condition that online platforms can actually reduce transaction costs* (will be elaborated upon in section 3.3), the following should be true:

- **Design evaluation criterion 2:** The factoring platform should be able to serve sellers that have a higher asset specificity than with traditional factoring
- **Design evaluation criterion 3:** The factoring platform should be able to serve sellers that have less information asymmetry between them and their buyer than with traditional factoring

3.2.4. Theoretical social constructs of opportunistic behaviour

If a seller determines to go for a factor, there are multiple incentives for opportunistic behaviour. In order to understand those for factoring, five structures of opportunistic behaviour caused by information asymmetry, are

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explained. Moral hazard and adverse selection are two examples of mechanisms that cause opportunistic behaviour and might be known from the principle-agent theory (Koppenjan & Groenewegen, 2005), where one party called an agent has more information than another party, called the principle. These and the three other social constructs that are in place for a factoring financing setup are described here.

Social construct 1: Moral hazard

Moral Hazard. Moral Hazard occurs when one person takes more risks because someone else bears the burden of those risks. We know that in finance this is caused by the fact that the information asymmetry between the borrower and the credit issuer could steer the borrower to appear in better shape than in reality is the case (Y.-S. Chan & Kanatas, 1985), as it will provide him with more funds for which he is only limited liable, for example in case of a bankruptcy.

In factoring moral hazard may arise as well, as the seller has incentives to withhold information or provide misleading information about the buyer's credit-worthiness in an effort to influence the factor's decision to accept an invoice. The seller (the factor's customer) also can behave opportunistically by seeking payment from the factor prior to the goods actually being shipped. The most prevalent form of fraud in this market is selling fictitious debt. See Crichton and Ferrier (1986).

Social construct 2: Adverse selection

Formally, adverse selection describes a situation where an individual's demand for a service is positively correlated with the individual's risk of loss and the issuer of the service cannot allow for this additional risk in the price of the service (Chandler, 2008). In the case of finance, adverse selection entails the fact that the borrower is more likely to provide the "bad" products or services as securitisation of the loan (Berger & Udell, 1995; Stiglitz & Weiss, 1981).

In factoring adverse selection is also in place, as information on the financial status (of the seller himself or the customer) is better known either to the seller or to the factor. The other way around, in the case a factor can decide whether or not to finance invoices, the factor will also only select the good invoices. Therefore, the chance on a stable cash-flow, the main reason for using factoring, is also disturbed by this construct. Not having governed this mechanism might lead to the fact that the price a seller is willing to pay to get a stable cash-flow and the price a factor can offer his services for do not meet each other, while without adverse selection in place it would (Stiglitz & Weiss, 1981).

Social construct 3: Distorting important business information

Another concrete construct of opportunistic behaviour, is the distortion of important business information. By doing so, the sellers will be able to obtain better loans for example. If the business and/or the invoice is presented better than its actuality, this could be of risk for the factor. This is due to the fact that the credit risk will be determined on the expected returns on a certain invoice. With distorted business information, this credit risk estimation will be inaccurate which could lead to a lower return than calculated for.

Social construct 4: Shirking

Shirking is involving some kind of negligence, failure to acquit oneself of a duty (or a responsibility) previous agreed or implied (Lyons, 1996). This can occur in factoring when a either the factor or the SME is not keeping its promises in as were specified in the contract or implied when the contract was closed. Usually certain 'back-up' plans are created for these types of situations. In a factoring settings, not having governed this mechanism might lead to the fact that a single invoice could cause the trust in the factor, as certain invoices might never be recovered back due to this behaviour. It is therefore important to have certain incentives in place for the seller to discourage shirking. This social construct is mainly important for when invoices are sold with recourse, as the seller might have some responsibility in getting the invoice payed, which he might not do if there is no incentive to do so.

Social construct 5: Reneging

Reneging is where a contractual agreement, promise, intention or understanding of a deal is not fully honoured by a party to the contract (Muris, 1980). When a factor signs a contract with a seller, this is still vulnerable for this type of behaviour. Mainly when asset specificity is low, the chances of reneging are high, as there is little dependency between the parties. Reneging is the contracts could end up in very long lawsuits or just losses on the loans provided. It should always be taken care of that not only the contracts are waterproof, but also other safeguards are in place to prevent reneging.

3.2.5. Applicability of the constructs in platform design

The theoretical constructs of opportunistic behaviour will be in place that can prevent factoring from being part of the optimal transaction cost outcome for SMEs. These notions should be taken into account during the design. Furthermore, like the applicability of the barriers, also the constructs must be critically solved within the platform setting. As previously explained, the dynamics on a platform setup might be different which means that some constructs can become more important and others less. Concluding however, they should be always taken into account, as not doing so the following is true.

- If no safeguards are in place, *moral hazard* can prevent factoring from being an optimal solution;
- If no safeguards are in place, *adverse selection* can prevent factoring from being an optimal solution.
- If no safeguards are in place, *distorting important business information* can prevent factoring from being an optimal solution.
- If no safeguards are in place, *shirking* can prevent factoring from being an optimal solution.
- If no safeguards are in place, *reneging* can prevent factoring from being an optimal solution.

Interpreting the social construct for the platform design

The social constructs are suggesting the need of certain safeguards. However, instead of just assuming these social constructs to be valid, this study tried to critically reflect on them by in the domain analysis of the design study. Although assuming that transaction costs go down, the social constructs are expected to still be in place. Thus, the following criteria should make sure that opportunistic behaviour is minimized on the platform, which will allow factoring to be still be a good alternative for SMEs to use as a means of getting liquidity.

- **Design evaluation criterion 4:** the platform setup should lower *moral hazard* compared to the traditional factoring setup
- **Design evaluation criterion 5:** the platform setup should lower *adverse selection* compared to the traditional factoring setup
- **Design evaluation criterion 6:** the platform setup should lower the chances of *distorting important business information* compared to the traditional factoring setup
- **Design evaluation criterion 7:** the platform setup should lower *minimize shirking* compared to the traditional factoring setup
- **Design evaluation criterion 8:** the platform setup should lower *reneging* compared to the traditional factoring setup

3.3. Transaction costs of multi-sided platforms

Multisided platforms (MSPs) have existed for centuries. Examples are the village markets that served as a central place for people to come and buy goods from different groups of people. Usually the size of these physical marketplaces are limited. Due to the information technology, mainly the internet, it became possible to build bigger, more valuable and powerful platforms. Due to the fact that different types of internet platforms have become very well-known and influential, there prominence in literature has also soared recently.

Online multi-sided platforms solve a transaction-cost problem that made it previously impossible for certain groups of people to get together and engage in a bilateral transaction (Evans & Schmalensee, 2013). In the recent years platform mechanisms, such as crowdfunding platforms (Gerber et al., 2012), have also been used to solve problems in the financial domain. As this design study is focussing on the creation of a factoring platform, it is relevant to understand why and how platforms work. In this section the definition and mechanisms behind multi-sided platforms is discussed following the state-of-the-art literature.

3.3.1. Definition of multi-sided platforms

The notion of platforms refers to disparate things in different domains, such as marketing and software engineering, where platforms are used to define product lines and respectively software families (Tiwana et al., 2010). In business and economics platforms are aimed at products and services that bring together groups of users in two-sided networks (Eisenmann, Parker, & Van Alstyne, 2006). In the information systems literature focusses on platforms as infrastructural investments (Fichman, 2004). In the industrial organization literature platforms are described as forming systems (Katz & Shapiro, 1994). To understand what platforms actually are, it is important to know that this diversity of the use of it is applied. However, for the purpose of this thesis it is important to focus on one of them.

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In order to define what platform this thesis is actually creating and what aspects are important for it, first the relevance of the before mentioned disciplines for the domain (financial platforms) is analysed. As the platform is really about bringing an existing functioning financial mechanism online, the economical and information systems domains are chosen to be most important. Also, in order to reach the goal of this thesis and really create a platform where two user types are brought together it is though that these two disciplines are most relevant. Therefore a definition is needed that incorporates all important aspects of these domains.

From an economical point of view the definition of multisided platforms according to Hagiu and Wright (2011) is an organization that creates value primarily by enabling direct interactions between two (or more) distinct types of affiliated customers. From an information system point of view, a platform can be defined as the extensible codebase of a software based system that provides core functionality shared by the modules that interoperate with it and the interfaces through which they interoperate (e.g., Apple's iOS and Mozilla's Firefox browser) (Tiwana et al., 2010). Gawer (2011) describe the main building blocks of a platform.

For the purpose of this thesis both the aspects that focus on the customers and the aspects that focus on the modularity are important. Therefore, it is chosen to create a combinative definition between the one from Hagiu and Wright (2011) and Tiwana et al. (2010). Thus, in this thesis, a platform is defined as follows.

A multisided platform creates value primarily by enabling direct interactions between two (or more) distinct types of customers by providing core functionalities, which are shared through interfaces by modules that interoperate with it.

By using the definition described, both the economical and the technical side of the concept platform has been incorporated. It will also force us to think from both of these perspectives throughout the design process of the platform. This definition also tells us that it is really about the interaction of different modules. Together with the modules, the multi-sided platform is often referred to as an *ecosystem*. An ecosystem is the collection of the platforms and the modules specific to it. The modules are connected with interfaces, that can either be technical and automated or not. When a platform is designed it is important to have an overview of the ecosystem. The architecture, a blueprint of the ecosystem will be used to see how the platform is actually positioned towards the complementary modules.

However we take an organisational definition of a platform it should be emphasized that there is a conceptual ambiguity about the notions. These ambiguities depend on from which perspective the concept is viewed. As is being discussed in De Reuver (2015 (under review)), the ecosystem is sometimes referred to as the business ecosystem that is intimately related to the platform and sometimes not. There is still a need to get more clarification on the role of a platform within an ecosystem, but for the purpose of this thesis it is important to also introduce the interplay between modules (which can be fulfilled by other businesses) and the platform, which is in this case Advanon. Therefore an ecosystem is defined as the collection of the platform organization and the modules specific to it.

Table 6 The elements of a multi-sided platform based on Tiwana et al. (2010).

Concept	Definition	Guiding references
Platform	an organization that creates value primarily by enabling direct interactions between two (or more) distinct types of customers by providing core functionalities, which are shared by modules that interoperate with it and the interfaces through which they interoperate	(Eisenmann et al., 2006); Gawer (2011); (Hagiu & Wright, 2011)
Module	add-on subsystem that connects to the platform to add functionality to the platform. In our definition, these can be consisting of but are not limited to the customer facing processes.	(Sanchez & Mahoney, 1996)
Ecosystem	the collection of the platform organization and the modules specific to it	(Gawer & Cusumano, 2002); (Tiwana et al., 2010)
Architecture	conceptual blueprint and design rules that describe how the ecosystem is partitioned into a relatively stable platform and a complementary set of modules that are encouraged to vary, and the binding on both	(Sanchez & Mahoney, 1996)
Interfaces	specifications and design rules that describe how the platform and modules interact and exchange information	(Katz & Shapiro, 1994)

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Table 6 shows the definitions of all the relevant elements of a platform ecosystem that are used for this thesis. Figure 8 shows the interrelations between the elements.
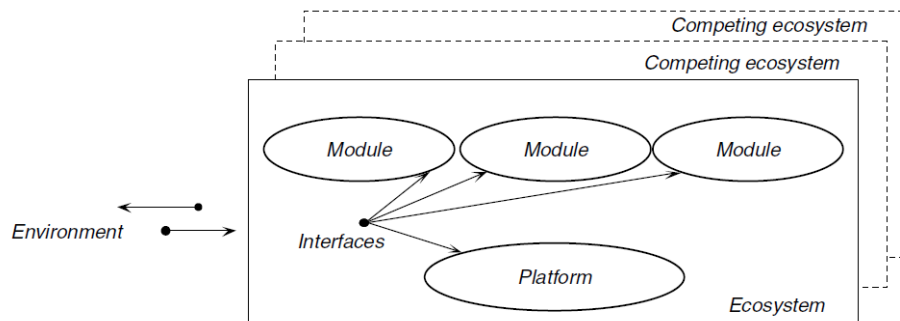
Figure 8 Elements of a platform ecosystem, taken from Tiwana et al. (2010)

Now the multi-sided platform has been defined, the remainder of this section will discuss the mechanisms how multi-sided platforms are thought to be functioning and why there have been so many examples of online multi-sided platforms that have become a success.

3.3.2. Four macro-economic drivers of platforms

Market opportunities for multi-sided platforms can be understood by looking at the *network* and *lock-in effects and economies of scale*, that their digital ecosystems create (Hagiu & Wright, 2011). On top of these effects, it should be understood that there is the effect that transaction cost are lowered when an interaction is performed through an online platform. All effects are discussed, but as transaction costs is one of the main kernel theories of this thesis, this effect is highlighted.

Network effects
A common understanding in literature is that multi-sided platforms are able to grow and outperform competitors because of the existence of network effects. There are different types of network effects, both direct, indirect and cross-side (Evans, 2002).

Economies of scale
Economies of scale take place and create a way for lower transaction costs, if the platform has reached a certain critical mass of users on all sides in order to make it worthwhile for all users.

Lock-in effects
Another effect that comes into play are the lock-in effects that make it, due to the fact that you already signed up and learned how to use a platform and have created a network of users of the other type that acts as a barrier to switch to another platform. The larger the platform becomes the less opportunities there are out there for users to switch, as the usefulness of using one platform outweighs all the benefits of the other platform.

Lower transaction costs
There are multiple views on multi-sided platforms, but one common denominator is that transaction costs are usually mentioned as one of the reasons why multi-sided platforms work. There are two reasons why transaction costs of online platforms can be lowered. Firstly, because of the pure effect that is caused by bringing factoring online and the extra use of IT and secondly by the effects that come from the fact that it is a platform or marketplace that can facilitate certain things that were not possible in the manual setting before.

1. Lowered by IT automation in general
Transaction costs are actually lowered by IT due to three types of effects (Elgar Fleisch, 2010). 1) There is a fixed reduction due to the fact that one transaction being done automatically costs less than a manual transaction, 2) There is a variable reduction of the implementation of IT, as automated transactions can scaled better. 3) The asset specificity of a certain partnership might become lower as the tasks that are done can be better transposed. For bringing factoring online, these effects will also

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take place. These three effects make it possible to create marketplaces for things that previously could not have been marketplaces. Due to the fact that the equilibrium for the three coordination types *Market, Network* and *Hierarchic* has been shifted. This has been illustrated in Figure 9. This is important to understand, as it might explain why transaction cost have both a role in enabling for a marketplace/platform (due to the role of IT) as well as on the platform which lowers transaction costs even more. It also shows directly the theoretical limitation of an online market place, as it shows that not all asset specific tasks can be performed on an online marketplace, as the impact of the IT introduction is only limited.
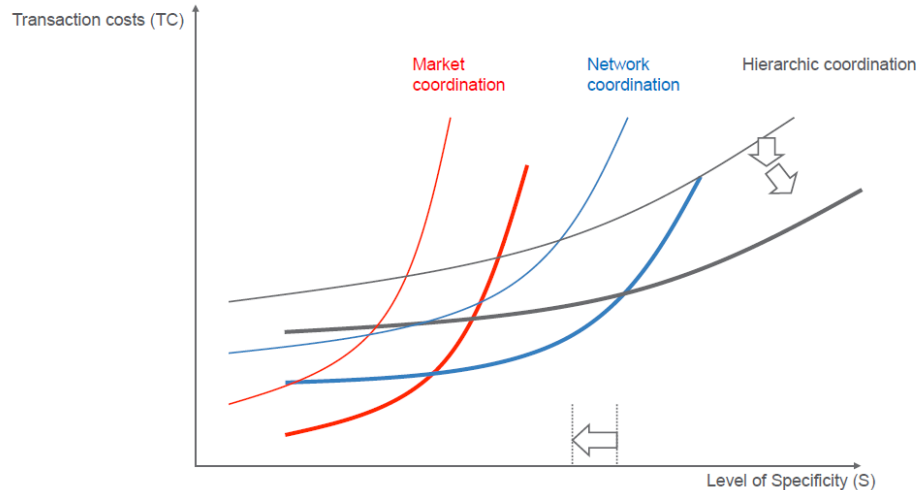
Figure 9 Showing the shift of equilibria for the different coordination types. It depicts the three normal lines for coordination in thin stripes. The figure shows that IT can enable markets due to the three effects of transaction costs going fixed down (upper arrow down), going variable down (the slanting arrow) and the asset specificity itself going down (arrow to the left). As can be seen are the three equilibria more to the right, meaning that more asset specific tasks (such as for example factoring) can be possible coordinated on a marketplace with the help of IT. Figure has been adapted from E Fleisch (2015 (Unpublished)).

2. Lowered on the multi-sided platforms

Multi-sided platforms solve a transaction cost problem that made it previously difficult or impossible for agents in different groups to get together (Evans & Schmalensee, 2013). Hagiu (2009) show that platforms are able to reducing search costs and reducing shared transaction costs among its multiple sides. In other words, a platform can provide a transaction with less friction.

Why platforms reduce search and information costs is generally described due to the fact that a platform provides a way for one user to screen the other by providing the necessary information about the other (Tiwana, 2013). The secret of why platforms are considered to reduce shared transaction costs, is according to Rochet and Tirole (2004), in the fact that the price that would be asked that can be different between the user-types. The pricing would determine who takes the burden of the transaction costs. Usually, the unique point of a multi-sided platform is that this price is paid by only one side of the platform and the profits on the other side are usually lower.

Another important thing to bear in mind is the fact that when the *frequency* of the transactions go up, the trust usually also gets higher. On an online platform the collective frequency of the transactions can be at least as high as in the traditional setup. Furthermore, as more data is collected online, statistical methods can help comparing certain companies which could be seen as a proxy for the real frequency going up. This could thus also explain lower transaction costs on platforms.

Taking an information system approach, when the platform is seen as an extensible code-base, the modularity of a platform helps also decreasing transaction costs. Modularity literature indicates that modularity decreases coordination costs and transaction costs across the module boundary (Baldwin & Woodard, 2008). However, according to (Tiwana et al., 2010) this premise is yet untested.

However whether these effects may all be true, in order for this to happen a certain volume needs to be created on the platform in order to standardize these transactions and the effects to kick in Tan, Pan, Lu, and Huang (2015). Thus, for the very start of a multi-sided platform organisation, the transaction costs would still be there and network effects would not yet be into place. The question is how these effects can be obtained and how to get to this point. The next section describes this.

3.3.3. Reach the critical mass and enabling growth

Up until this point in this report it has become clear that platforms might be a good setup in certain situations to actually scale it. However, it is still unclear what should happen in order to get to this scale. According to the different views on the economics of platforms, it becomes clear that multi-sided platforms are really about the numbers. The reinforcing mechanisms make sure that a platform can be more beneficial than a traditional approach. However, before this volume of all users can be achieved a certain critical mass has to be achieved. Therefore, platform owners must ultimately solve a coordination problem to get both sets of users to get on board their platforms (Evans, 2009).

This need for a critical mass, simplified for a two-sided platform, is explained by Evans and Schmalensee (2013). According to Evans and Schmalensee (2013) an ignition takes place after the reach of the critical mass. When focussing on only a two-sided setting, the chance of finding a value-increasing interaction depends on how many agents of the first kind an agent of the second kind can reach and often vice versa. He elaborates on the multiple strategies that can be taken for the phase where the movements are starting to achieve critical mass. This period is described as the area OC'C*C'' in Figure 10.
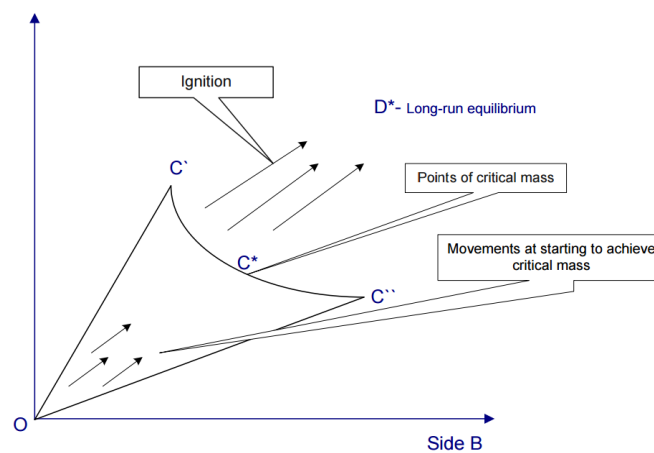
Figure 10 Igniting a catalytic reaction on a MSP by solving coordination problems, taken from (Evans & Schmalensee, 2013)

Different strategies can be taken in order to achieve this critical mass. It is the task of the platform provider (sponsor) to ensure that there are enough agents of each type to make participation worthwhile for all types (Evans, 2009; Evans & Schmalensee, 2013). The five specific strategies that Evans provide insights in how the critical mass could be reached quickly. There are basically three types how the critical mass can be achieved (specifically for two-sided platforms). First, the sequential entry in which both types of users are drawn to the platform one after another. Second, an entry with significant pre-commitment investment, in which for example one side of the platform is offered the service for free in order to get the second type on board. Third, simultaneous entry of sides, where both types of users are drawn to the platform at the same time.

Although the insights of Evans and Schmalensee (2013) are useful to understand when creating a customer acquisition strategy. However, they do not provide any insight in how the platform should be designed in order to get the benefit of all the effects, being network effects economies of scale, lock-in effects and lower transaction costs. By synthesising the literature on platforms, sometimes referred to as platform theories, can help understand how this critical mass can be obtained. Understanding this, in its turn, will be helpful during the design process of the platform.

3.4. Synthesis of platform design theories

In order to make sure the design will be working in its competitive environment, the dynamics of multi-sided platforms and their ecosystem have been reviewed, from an economical perspective. However, there is still the question, which mechanisms can be used to enable growth of the platform and actually achieve the transaction

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cost benefit that platforms can achieve. This section reviews the literature on platform development and elaborates on the way a platform can be designed for growth.

The difference of this sub-section with the previous ones is that is purely aimed at explaining *how to do things*. Gregor (2006) distinguishes five types of literature that can be used within an IS design. Theories that explain how to do things, are about the principles of form and function, methods, and justificatory theoretical knowledge, which can used in the development of the information system. Following this line, this section develops some "prescriptive statements" which are referred to as design guidelines. These guidelines are not per se testable, as are the criteria stemming from section 3.1 and 3.2 and they are used to inform the design throughout the decision making process.

3.4.1. Early-stage platform development strategies (based on platform theory)

In order to get to the platform towards it critical mass, different strategies can be used. Tan et al. (2015) provides insight as one of the only in how these strategies might differ in different phases of the platform. They distinguish three stages. The nascent, formative and mature stage, which are all depicted in Figure 11. Each of the stages do need to have a different strategy within the design process.
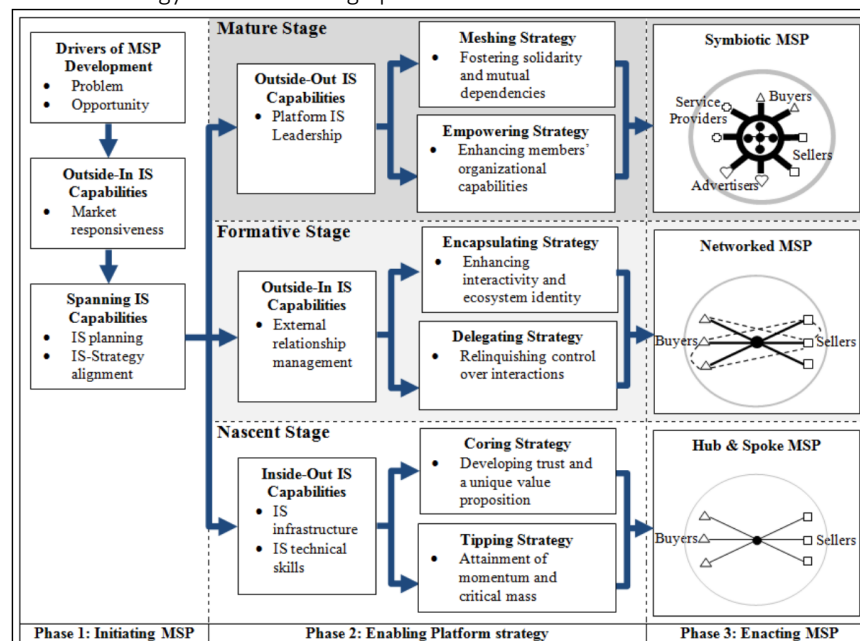
Figure 11 The three phases to get to a functioning MSP for the three stages of the MSP

Tan et al. (2015) argue that there are two main strategies for the starting stage of a MSP, which they call the nascent stage. The first strategy is to focus on the core and develop trust and a unique value proposition, the second is to mainly focus on the attainment of momentum in order to gain the critical mass as quickly as possible. Tan et al. (2015) suggest, it is wise to go for these strategies in the nascent stage of the platform development, as it enables to initially form a value-creating MSP and secondly they enable the previously mentioned network effects (Rochet & Tirole, 2004) to take place, that help attracting platform members and actually reaching the previously mentioned critical mass earlier.

Both of the strategy will require a trial and error process on both the technological side as well on the sales side of the organization. The information system capabilities are usually central in the creation of multi-sided platforms. Yet, as Tan et al. (2015) points out "although these MSPs are underpinned by information systems, there is currently little research on how the IS capabilities of the platform sponsor can influence, and co-evolve with, the development of the platform over time." (Tan et al., 2015 p.) This is in line with the argumentation that not the uncritical development of IT leads to the desired outcome, but the more complex way the business is aligned with the IS development strategies (Y. E. Chan & Reich, 2007). Taking these two strategies can therefore foster this process and allow to focus on that what is really needed for success. Taking this into account for this case, which is in its early-stage development, makes up the following design guideline:

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Design guideline 1: Dedicate all IT efforts to 'building platform trust' and 'attain momentum'

In order to know to what the concrete IT efforts must be leaning towards, these two strategies are derived from platform design and development theory (Tan et al., 2015 p.). More detailed design guidelines on building trust by using the technical artefact can be achieved in multiple ways that will be described in 3.4.4. In order to keep the second strategy of gaining momentum going as well, there is a need for lowering the barriers of entry for an SME and a detailed protection mechanism, in order to prevent that one failing transaction due to opportunistic behaviour is killing the growth. More detailed design guidelines on achieving momentum are by lowering the barriers and minimize opportunistic behaviour are described in 3.4.2 respectively 3.4.3.

3.4.2. Designing to lower the barriers (Based on TCE - barriers)

The barriers are building on the premise that factoring is mainly done due to the wish for an outsourced debt collection. As explained in section 2.3.42.4.1 there are multiple reasons to use factoring and the platform setup of factoring is mainly focussing on the liquidity advantages of factoring. Using factoring for such a reason, the prerequisite that asset specificity must be low is not per se valid, as there would be little emphasis on the outsourcing of the accounts receivables and more on the gain of liquidity. In this specific case the overall transaction costs would thus not increase for cases where a seller's asset specificity is high.

Design guideline 2: Focus on new target groups with higher asset specificity

This design guideline will let the design to process focus on the specific gap that a platform can fill compared to traditional factoring and that is, that more asset specific companies are able to have access to factoring. These types of companies that have for example only a few customers, such as suppliers to large supermarket chains, would need to be able to gain liquidity through a factoring solution, as a platform would not require a low asset specificity. Growing companies, which do not have a track record of successful transactions, could also benefit from this.

The second barrier entails that the factor takes over the role of information intermediary and by doing so it decreases the overall transaction costs, as it has the possibility to diversify over multiple customers and sellers, which brings an information advantage. It is possible that this barrier also stays true or *may be even bigger* for a platform setup. The reason for that is, that in highly decentralized markets, information asymmetries are amplified because the lending process in online environments is almost faceless and close to anonymous (Wang, Wang, Kang, & Sun, 2014). By building in incentive mechanisms, linked to the amount of information that a seller can provide on its customer (thus having a low information asymmetry), a seller with good understanding of its own customer's situation would still be eligible for a factoring setup on the platform.

Design guideline 3: Promote information sharing

In order to sell invoices over an online marketplace, where the environment is close to anonymous, it is needed that incentive mechanisms for sharing customer information should be build. Furthermore this should be made very easy. Even though this design guideline will limit the impact of the barrier of information asymmetry, using only this design guideline will not enable to by-pass this barrier entirely. It should be noted that the information asymmetry barrier creates also a need for more trust in the platform. To cope with the uncertainty that follows from this, the trust should be based on the evaluation of the situation and of transacting parties (Lo & Lie, 2008). The guidelines to enable trust are discussed in section 3.4.4.

3.4.3. Designing to minimize opportunistic behaviour (Based on TCE - social constructs)

From section on transaction cost economy of traditional factoring (3.2) it should be clear that traditional factoring relationships are complex bilateral contracts that involve multiple decision and possibilities for strategic or opportunistic behaviour. To protect the Advanon platform for the discussed hazards of opportunism, safeguards (or governance structures) can be developed.

A safeguard provides, at minimum costs, the control and trust that is necessary for the actors to participate in the transaction (Dyer, 2002). Literature mentions two of these safeguards for the traditional way of factoring, which need to be evaluated during the design of the platform. As mentioned, it is probable that certain safeguards need to be adjusted for the online platform version of factoring.

Design guideline 4: Create exclusivity for one platform (and do not restrict on the platform)

To limit the possibilities for this kind of behaviour the seller of the invoice usually is required to stay at the same factor in an exclusive relationship, where no other factors are allowed. Without such an agreement, the seller would

be able to and have an incentive to "cherry pick" and leading to the previously mentioned adverse selection (0) for the factor (Smith & Schnucker, 1994).

The same safeguard would also be effective to the moral hazard problem (2.3.3) that is in place between the seller and factor. As the seller has incentives not to tell everything negative about his customer, as that might influence the decision of a factor to accept and invoice and might even bring down the price for which an invoice is factored. By claiming exclusivity, the factor would prevent the seller from doing such a thing, as it will be a barrier for the seller to sell his upcoming invoices. Summarizing the design guideline can be done by saying: *There should be exclusivity towards one factor in place, in order to mitigate adverse selection and moral hazard.*

However, even though there is the need of taking only one factor, this is only needed if there is a possibility of the new factor not knowing about the other factor. The adverse selection and moral hazard could be reduced if the offering would *not be restricted to only 1 investor/factor*, but in the same time restrict the user to not use multiple platforms. In this case, this design guideline is also in line with the argumentation from Armstrong (2006), who argues that "multi-homing" of platforms should be reduce the necessity of a platform member to join multiple platforms. By allowing for multiple factors (i.e. investors) to be buying invoices on the platform, but at the same time restrict the use of multiple platforms, both the moral hazard and adverse selection can be reduced, by keeping the openness of a market. This fosters competition on the platform and thus could offer a better deal towards the SMEs.

Design guideline 5: Use each other's reputation (structural assurance)

The written contract does not help a lot to protect a seller from opportunism by a factor. As explained, adverse selection works both ways in factoring. The seller would want to sell his worst invoices and the factor would like to buy its best. Both have different information perspectives on this. Therefore, there is also a need for another social safeguard to prevent this from happening. Using each other's mutual reputation can prevent both parties from cherry picking which invoices to sell and buy (Smith & Schnucker, 1994). As this safeguard seems to be needed, it can be better explain the principal providers of factoring services are a few well-established old-line factors, commercial banks and factoring subsidiaries of bank holding companies and why factoring is used more for larger companies than for smaller. This is explained by the fact that their reputation can be better put at stake and used as a safeguard mechanism. Summarizing the design guideline can be done by saying: *The reputation of both the seller and the factor should be at stake in order to mitigate adverse selection and moral hazard.* This is also referred to as structural assurance, of which the perception is also relevant for the platform adoption, as will be explained in the next section.

3.4.4. Designing for platform acceptance: theoretical antecedents of trust and institutional risk

Research in the other financial platform types mentioned in the previous section, some antecedents of platform acceptance, which are needed to evaluate the platform success can be deduced. Wang et al. (2014) performed an empirical research to dynamics of platform trust and perceived institutional risk at peer to peer lending platforms, which are listed in Figure 12. Their research can be useful in order to better understand which antecedents of platform acceptance are important and furthermore, the concepts can be used to evaluate the platform success.
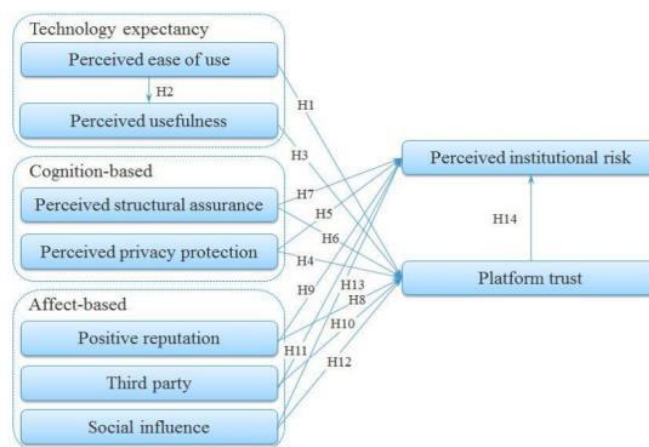
Figure 12 Trust model based on the Technology Acceptance Model taken from Wang et al. (2014), from which the antecedents can be used to determine the design guidelines

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The study is interesting as they both provide insights in the way trust is affected by the technology expectancy, the cognition-based and affect-based factors. The framework of Wang et al. (2014) was created based on the technology acceptance model and specifically for peer-to-peer platforms that offer *unsecured* loans sought by individual borrowers. As explained before in 3.4.2, is there a larger need for trust as the information asymmetry of an online platform is larger than its manual off-line counterpart.

As explained in 3.2.1 play the perceived or calculative trust in the other parties a crucial role in determining the estimated transaction costs. In other words, building trusts has also a beneficial effect on the perceived level of risk or the subjective beliefs regarding the possibility of loss in the interaction will be. According to the empirical research of Wang et al. (2014), trust is built by (1) a belief that the vendor has nothing to gain by cheating, (2) a belief that there are safety mechanisms built into the Web site, and (3) by having a typical interface, (4) one that is, moreover, easy to use. Moreover, trust is able to increase the end-users' motivation to cooperate with the other party online in an uncertain environment (D Harrison McKnight, 2001). Following the antecedents from the empirical research from Wang et al. (2014), the following design guidelines have been formulated. The reason for them to include the measurability, is because Wang et al. (2014) gave good insights in how these antecedents can be measured, although some adjustments should be made for the specific case.

Design guideline 6: Set goals for and measure the platform's perceived ease of use and perceived usefulness

In order to be able to improve the trust and the structural assurance Wang et al. (2014) show that the ease of use and usefulness of the platform is of importance. This lies in the same line as the Technology Acceptance Model (TAM), which is a generic model that has been used very often to conceptualize the acceptance of certain technology. Though criticised, the TAM model has often showed to be useful determining the factors that facilitate the use of information systems (Legris, Ingham, & Collerette, 2003). Therefore ease of use and usefulness are taken into account in this design guideline 6, which is applied in the establishment of the requirements.

Design guideline 7: Set goals for and measure the platform's perceived structural assurance and perceived privacy protection

The structural assurance does not only help directly preventing opportunistic behaviour, but also as a second effect improve the trust on the platform, which allows for more adoption of the platform. The perceived privacy is also a real concern here. Wang et al. (2014) showed that privacy issues on P2P lending platforms can be of serious concern. Therefore both of these aspects needs to be taken into account while designing the platform.

Design guideline 8: Set goals for and measure the platforms positive reputation, links with trustworthy third parties and the social influence.

The platforms reputation can should be measured, as well as the directly related external parties with which the platform is connected (module providers e.g.) should be considered to be trustworthy by the users. The social influence can also be obtained by being present on social media platforms for example. These things need to be taken into account throughout the design process.

3.5. Conclusions

This chapter provided an overview of a selection of theories and concepts that are useful in the design process of the factoring platform. More specifically, it aimed at answering the question: *SQ2: What state-of-the-art theories and concepts provide justificatory knowledge to inform the design of an online multi-sided invoice factoring platform?* In order to answer this question a thorough literature research has been performed. While transaction costs have been often mentioned as one of the drivers of multi-sided platforms, it can be concluded that literature still lacks on synthesizing this knowledge into knowledge that can be used in the design process of a platform. More specifically, the design process of a platform that is still in its nascent phase.

It can be concluded that it can be beneficial, in order to be able to transpose a factoring setup to a multi-sided platform setup, to understand the transaction cost economics of factoring. Following this view, two barriers for the use of traditional factoring by SMEs are discussed: a low asset specificity and a high information asymmetry between the seller and the buyer. These barriers should theoretically be improved with the introduction of a factoring platform, if designed right. Therefore they five design evaluation criteria have been set up in order to evaluate the platform on its sufficiency to improve of factoring as much as that is theoretically expected.

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Furthermore, 5 social constructs of opportunistic behaviour have been identified for factoring, which are moral hazard, adverse selection, distorting important business information, shirking and reneging. In order to mitigate these social constructs the designed platform would need to have certain safeguards in place. The need for these safeguards for all of these social constructs have also been defined as 5 design evaluation criteria.

After a platform has reached its critical mass, it can achieve a more beneficial cost structure due to economies of scale, network- and lock-in effects. Applying a transaction cost perspective on multi-sided platform teaches us that, once at a certain scale, multi-sided platforms are can be assumed to have lower overall transaction costs. This is due to two reasons: 1) the mere effect of automation of the IS 2) the reduction of transaction costs on the platform. The latter reason is explained by different effect, depending on the perspective that is taken:

1) The fact that platforms make it easier to find certain service or goods providers, which reduces search and information costs on a platform.
2) As there are multiple user-types on the platform, governing the pricing model on both sides helps distribute the transaction costs better.
3) When designed correctly the fact that the frequency of the transaction is larger on platforms, make that transaction costs should be lowered, as trust increases with the frequency of the transaction.
4) It decreases coordination costs if the platform is set up as an extensible code base, as modules can easily be connect their functionality to the platform core.

Having deducted these notions of multi-sided platforms from literature, also reveals the limitations on state-of-the-art research to explain the applicability of these concepts for platform *design*. Especially there is still little research on the design process of multi-sided platforms in the initial phase of their development. Even-though the economic notions are understood, it is insufficiently known how these notions should be put into place when the architecture and the governance structure of a multi-sided platform should be designed to achieve the previously mentioned effects.

In an attempt to transfer the knowledge of these theories to design knowledge, multiple prescriptive **design guidelines** have been created on the basis of the synthesis of the previously mentioned notions. The main design guideline can be formulated as 1) **dedicate all IT efforts to 'building platform trust' and 'attain momentum'.** Based on both transaction cost economy and design theory more specific design guidelines have been established, that aim at explaining *how* this trust and momentum should be obtained taking into account the theoretical notions.

The design guidelines are formulated as follows: *2)* Focus on new target groups with higher asset specificity; 3) Promote information sharing; 4) Create exclusivity for one platform (and do not restrict on the platform); 5) Use each other's reputation (structural assurance); 6) Set goals for and measure the platforms perceived ease of use and perceived usefulness; 7) Set goals for and measure the platform's perceived structural assurance and perceived privacy protection; 8) Set goals for and measure the platforms positive reputation, links with trustworthy third parties and the social influence. All of these design guidelines should be used throughout the design process in order to guide the design to be more effective in achieving its goal.

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4. Design research methodology

4.1. Introduction

This study is, at its core, a design study. In the introduction the design research method is briefly introduced. This chapter further elaborates on this research methodology. By doing so, it gives answer to the following sub-question.

SQ3: What <u>design methodology</u> can be used in order to study the design challenges in a live environment, while keeping its rigour?

This chapter proceeds as follows. First, the main concepts of design science, of which this research is part, will be introduced. Secondly, the chosen design method of action design research and how it is useful for this research is explained. Third, our approach and the more specific design and research principles used in this study are mentioned. And, fourth, the empirical research methods are explained more in detail. This chapter concludes with a section on the contribution of this research.

4.2. Design science

Design science was introduced in 1963 by Fuller and Inventory (1967) who defined it as a systematic form of designing. This study also concerns this practice and therefore the state-of-the-art design science literature is reviewed. According to Verschuren and Hartog (2005) design science has always been recognized as being both an art and a science. Within the field of design science, the focus may lie either on the improvement of what is existing in reality or on the creation of something new. In design science literature, the classification of both types of improvements are often referred to as 'normal' or 'incremental' improvements (Eder, 1999) versus 'radical' (Vincenti, 1990) or 'innovative' (Dasgupta, 2009) improvements. Verschuren and Hartog (2005) identify this as respectively improvement problems or construction problems.

In this context, this research focuses on construction problems, which can therefore be called a *design-oriented research*. Design-oriented research is already existing in technical disciplines for a long while. From these fields, certain good practises can be derived by looking at design methods that are used in this field. Given that this research is design-oriented, it should take into account the importance of the utility and satisfaction of the future users and other stakeholders. Hence, the evaluation of the designed artefact should have an important role *in the process* of designing. In engineering terms this means the design should satisfy a set of design criteria. The challenge for construction problems in general lies in defining these criteria, while not yet fully knowing and understanding its context, as the context will be formed at the same time as the artefact.

Multiple recent publications on design science suggest ways to tackle the latter problem. (Verschuren & Hartog, 2005) -focussing largely on social sciences- propose to use design cycles as a counterpart of the intervention or policy cycle in business and policy administration. Based on a systematic analysis of the design process, they identify 6 stages that together form one design cycle. Further and perhaps more importantly, they make some remarks on these stages. One of the most important remarks is that even though the stages are presented to be a linear process, they are almost always part of an *iterative process*. Moreover, Verschuren and Hartog (2005) mentions the importance of *evaluation* of the goal (or plan), the means (or process) and the relationship between them (or product).

Even though Verschuren and Hartog (2005) provide good insights in the set-up and added value of design research, they fail to take into account the organizational context in which the artefact is developed. Others therefore proposed a way to cross-fertilize design research with *action research* (R. Cole, Purao, Rossi, & Sein, 2005; Figueiredo & Da Cunha, 2006). Action design entails the combination of theory generation with researcher intervention to solve immediate organizational problem (Baskerville & Wood-Harper, 1998). In the context of IT design, Sein et al. (2011) elaborate detailed on the ways design research can be fully combined with action research and hence providing an explicit guidance for combining building, intervention, and evaluation in a concerted research effort. They use the term 'Action design research' (ADR), first coined by (Iivari, 2003), for their method to better be able to combine both theory and practice.

4.2.1. Action design research

Theory and practise are have always shown to be divergent. This is especially the case for design problems. In executing this study there are also two problems to be identified. First, as there has not yet been build a factoring

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platform for SMEs in Switzerland, the problem is that not all criteria would be fully clear in forethought. Second, as explained for 'construction problems' in general- the problem of this specific design research would be that focussing purely on the designing of the artefact, would neglect the fact that it should be evaluated by the users. Hence, just starting with a traditional IT development process would leave a non-evaluated artefact and starting with pure research before designing would not reveal the full problem in the context of Advanon.

In order to address both of these problems, Action Design Research is used as our research method. It focuses on "generating prescriptive design knowledge building and evaluating ensemble IT artefacts in an organizational setting" (Sein et al., 2011 p.40). It enables us to 1) address the problem situation encountered in a specific organizational setting by intervening and evaluating; and 2) construct and evaluate an IT artefact that addresses the class of problems typified by the encountered situation.

As an addition Insider Action Design Research (IADR) should be mentioned. The IADR method described by Jrad, Ahmed, and Sundaram (2014) is a method that is multi-methodological approach that allows employees to conduct from within participating organizations to conduct the research in Information Systems, combining Design Science with Action Research. The theory reflects ADR (Sein et al., 2011), with the addition that a staff member of the organization, the researcher is learning from the Core cycles of Action Research. As this is a research carried out at a start-up, this seems as a useful addition, as it includes important learnings from Insider Action Research in the field of design.

4.2.2. The need of research on designing in a start-up environment

In pursuit of solving the SME financing problem, it is important to know whether the design will actually be used. Also, due to the fact that this research is conducted at a start-up the relevance of the solution will be of critical importance for the success of it. On the other hand, this research can contribute to the design knowledge base specifically on multi-sided platforms and factoring. In order to achieve both, the design challenge will be solved by creating a *specific solution* for the Swiss market from which learnings for both practice and academia can be taken.

This type of research is in line with the Design Science Research (DSR) methodology, as this type of research aims to serve these two goals. The first goal of DSR is to guide design and evaluation of artefacts (Sein et al., 2011; von Alan et al., 2004) and the second is to fill the gap between responding to the need of practitioners and research rigour (Gallupe, 2007). There are multiple DSR methods, but Iivari (2015) argues that two main strategies can be identified. In the first, a researcher constructs an IT meta-artefact as a general solution concept to address a class of problem and in the second, the researcher creates a concrete IT artefact in a specific context. Because, especially in the case of the second strategy, it would be beneficial to have more research projects in the future (Iivari, 2015). Because there is less known about the second strategy, it is more risky to take this approach.

Nevertheless, this research is following that strategy, as the pro and cons still need to be better understood. It is then also needed to mention that the case of Advanon provides a real opportunity to follow this strategy, as it performs a design case study in a very insecure environment, namely a start-up. Within the process of starting up a company, it is in fact impossible to set up the interesting research topics completely beforehand. In such an uncertain environment it is usually the case that while performing the design, the questions that relate to specific theory emerge. By following the ADR approach and doing research both on the literature and empirically, the design can be improved and lessons can be learned. As this approach both suits the need of a start-up as well as the need for more real life cases to be described in literature of the previously mentioned (second) strategy, it is chosen as the main research approach. The inherent risk of ADR of not finding interesting concepts is acceptable, due to applicability of ADR for this specific case. The way ADR is specifically applied is described in the next section.

4.3. Design, development and prototyping approach

4.3.1. Method and action design principles

Taking into account the ADR method previously described, this study is being performed in one cycle. The cycle will contain the following stages 1) Problem Formulation, 2) Building, Intervention, and Evaluation 3) Reflection and Learning and 4) Formalization of Learning. Furthermore, within these stages, there are principles to which are being adhered during the design process. Figure 13 shows an overview on the ADR approach.

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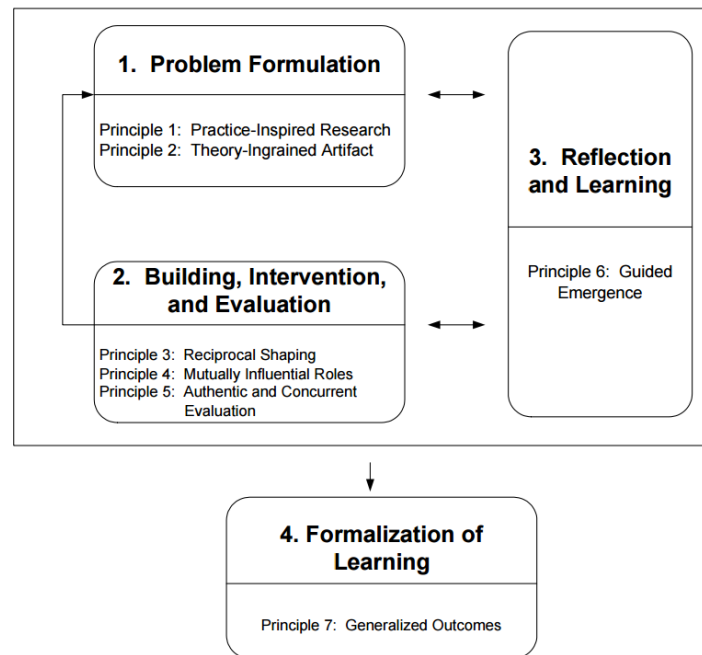
Figure 13 The overview of the design stages and principles of ADR, from (Sein et al., 2011)

Figure 13 shows how, other than the structure of this thesis, the real process of performing the design research was done. It should that the problem formulation mainly adheres to two principles: practice-inspired research and theory-ingrained artefact. The first principle refers to the fact that the research in ADR is focused on field problems as knowledge-creation opportunities, instead of theoretical puzzles. The second principle refers to the fact that the artefact can be seen as the carrier of theoretical traces and iterations are based on the theoretical insights that have been obtained.

The second block focuses on the building, intervention and evaluation (BIE) of the artefact. Action design research acknowledges that building, intervention, and evaluation are interwoven. There are three principles adhered to in this research. First, the reciprocal shaping, which means that it should be emphasized on the influences from two domains the IT artifact and the organizational context. Mutually influential roles, refers to the fact that all participants of the ADR project should learn from each other. Authentic and concurrent evaluation, means that it should be made sure that the evaluation is formative, in order for the knowledge to generalizable. *It should be noted that how the process of performing BIE is applied in this thesis, is discussed more in detail in section 4.3.2.*

The principle that has been adhered to within the reflection and learning is the principle 6: guided emergence. This consists of three types of reflections: 1) on the intervention results, 2) the learnings in terms of theories selected and 3) the evaluation of adherence to the ADR principles. It provides a reflection of the seemingly incongruent perspectives. This reflection is represented in the outcome of the formative evaluations.

The last block of ADR is the formalization of learning. It has the principle that the learnings should be abstracted to a class of field problems that should be communicated well. Sein et al. (2011) describes that this is best done by providing design principles and specific contributions to theory. This report can be fully seen as part of this formalisation, however mainly chapter 8 focusses on this.

4.3.2. Development approach

In order to not only design a meta-artefact, but also create a real prototype by which the research is conducted a certain development approach needed to be taken. Within the BIE process this artefact is developed and thus it should be further be defined how this BIE process will be applied. According to Sein et al. (2011) there are two approaches to this development process either an IT dominant process or an organisation dominant approach. Due to the high complexity and sensitivity of the problem that has been solved, it would have been very difficult to directly test the alpha version of the platform with the sellers. Therefore the more IT dominant process could be chosen, in which the possibilities to implement all needed aspects of factoring on the platform and tested all aspects internally, such as the usability of the features that have been designed through mock-ups. However, the prototype

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has also been evaluated very lightly with the end-users. Therefore a small adaption to the model of Sein et al. (2011) is made, and one could argue a hybrid focus is taken, in which the alpha version is mainly internally evaluated, but also externally. After this, the platform prototype has been tested with the end-users, being the sellers and investors. This all has been done, that at the end of this thesis, three different types of contributions are provided. The full overview of this development approach is depicted in Figure 14.
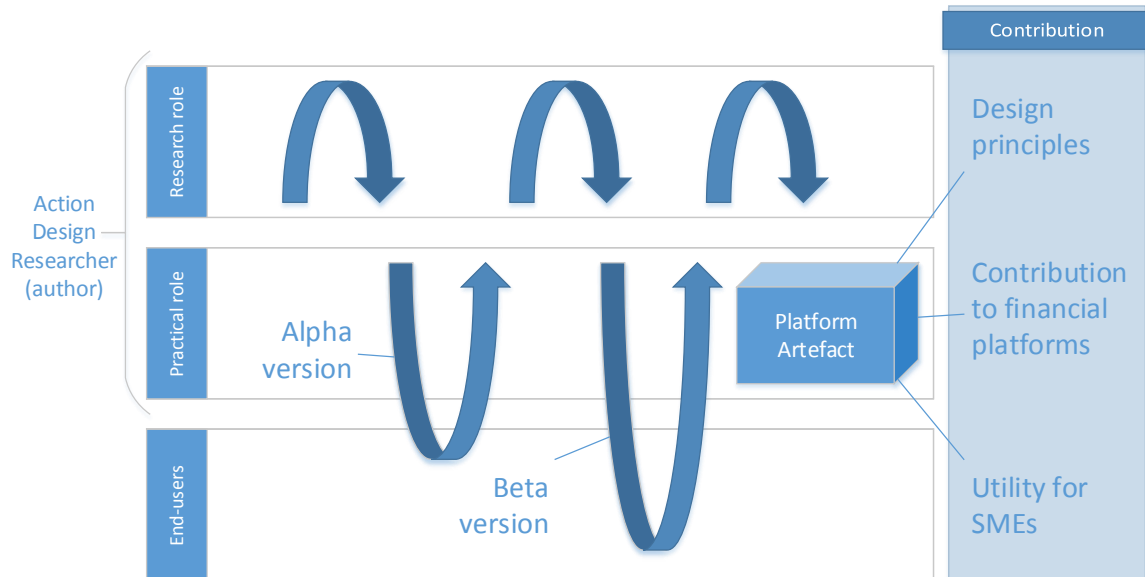
Figure 14 The hybrid process (both IT and organisational) used over the second and third stage adapted from (Sein et al., 2011). The main adaption is in the hybrid alpha version which is lightly evaluated with the end-users. This could be seen as a hybrid between organisational and IT dominant.

Figure 14 shows an overview of the development approach. What should be noted is that the practical and the research view are both taken by the author of the thesis. The approach is explained more in detail. The process of creating the internal version has been done iteratively with the mock-ups of the platform. Furthermore, the structural specification of the platform has been discussed with external parties that are relevant to the platform, such as the module providers. The outcome of this effort can be classified as the alpha version of the platform.

After having the alpha version tested internally, questions have been asked again from a researcher's perspective and the evaluation was done. In this thesis, this evaluation is mainly described in chapter 5. After this, the platform prototype has been developed and tested with the end-users. This has not been done on one project without intermediate testing, such as is usually the case in plan-driven or rigorous software development methodologies. While developing the prototype a more agile approach that suits a small start-up was needed. Agile software development is the name of a group of software development processes that promote early delivery, adaptive planning and flexible and rapid response to change (Cohen, Lindvall, & Costa, 2003). From this set of development approaches, scrum (Schwaber, 1997) has been chosen for this project. Scrum is a well-known software development methodology that really acknowledges that the problem cannot be understood or defined fully beforehand. It focuses on the other hand on maximizing the team's ability to quickly deliver and remain flexible to changes in the requirements. The reason for this methodology to be taken, was the fact that, due to the uncertainty and complexity of the problem, it could not be defined fully beforehand. Therefore, scrum allowed for rapid prototyping and learning quickly. During the development, scrum makes use of different sprints in which a subset of the to-be-designed features is delivered in a time-boxed effort. At the end of every sprint an internal and external evaluation has been done.

In order to make clear what the terminology of scrum is, the main process is explained. While designing the platform different user stories have been created in a list, the so-called back-log. Expressing requirements in the form of user stories is the short descriptions of functionality, told from the perspective of a user, that are valuable to either a user of the software or the customer of the software (Cohn, 2004a). By formulating the requirements as such, the value of the feature is better captured. This limits the chances of a feature being implemented, while having no added value for the users. From the back-log of user stories, every sprint of for

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example 2 weeks selects the top priority user stories for that time in a so called sprint backlog. In every sprint this list of selected user stories is expected to be developed up to full production. At the end of every sprint an evaluation can be done internally or externally, as that specific version should be mostly free of unneeded bugs and is thus testable.

At the end of this thesis, after having tested the prototype multiple times with the end-customers during the sprints, the platform artefact is used for the different contributions. First of all, from a research perspective, from the platform artefact different design principles are set up. Secondly, the platform itself serves as a contribution to the set of existing financial platforms. Thirdly, the platform contributes to the utility of the SMEs of gaining liquidity.

4.4. Empirical research approach

All research methods will be shortly introduced in this chapter. In the chapters that use specific research methods, the methods are explained more in detail. Regard therefore, that the methods are only briefly explained. In order to structure the report the three phases of the domain analysis, structural specification and the platform prototyping. For all these phases empirical evaluation steps have been performed. In order to give insights in the context in which these evaluation methods have been performed Table 7 (also depicted in Chapter 1), is explained more in detail. For two design perspectives, the more detailed technical perspective and the more organisational perspective, different empirical methods and corresponding kernel theories have been applied.

Table 7 Overview of the design approach

Timing (Chapter)	Design Phase	Technical Perspective		Organisational Perspective		Empirical Research
		Method	Kernel	Method	Kernel	
PHASE I Jan-May 2015 Chapter 5	**Domain analysis** – The problem and assumptions	-Interview with users	- Platform transaction costs	-Survey	-Transaction cost economics	-User Interviews -Domain Survey
PHASE II Mar-May 2015 Chapter 6	**Structural specifications** - Platform Modelling and Design	-Mock-up testing -Semi-structured interviews	- Platform design theories	-Organisational arrangements	-Transaction cost economics - Platform transaction costs	- Stakeholder interviews - User interviews
PHASE III Mar-Jul 2015 Chapter 7	**Platform prototyping** and evaluation	-Pilot testing of process model & technical artefact	- Platform design theories (designing for platform acceptance)	-Agile software development	- Platform design theories	-Experiment and prototype survey -Log data analysis

First, in the domain analysis, interviews and a survey have been performed. This phase mainly focusses on answering the question: *What assumptions on the theoretical transaction cost problems of factoring in Switzerland are valid that could be solved by a multi-sided platform and what should the general platform requirements then be?* The kernel theories that were used to investigate these assumptions are multi-sided platforms, transaction cost economy. Furthermore, before this phase started, the general factoring literature has been used to establish the first hunch of requirements. In this phase the main focus lies on validating the assumptions that are underlying the problem of traditional factoring. By applying a transaction cost perspective on platforms it is assumed that certain costs in the current factoring transaction is withholding people to use factoring as well as letting SMEs being unhappy with certain aspects of the transaction. By doing so the premises on which the theoretical evaluation criterions are based are tested. To further pin-point the problems with factoring, user interviews with SMEs and a domain survey have been executed. These are discussed in the next section.

Second, in the structural specification phase, the platform design theories are used to guide the establishment of the structural specifications. It answers the question: *Given the need for short term financing, what should the conceptual design (architecture and organisational arrangements) of a factoring platform look like, from both a technical and an organisational perspective?* For the technical perspective of the design, mainly the core platform theories have been used. They are used in the setup and evaluation of the mock-up and the semi-structured interviews that were conducted to evaluate these mock-ups. The design guidelines based on the

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transaction cost economics and platforms transaction costs are being taken into account mainly in the organisational perspective. Both theories are used to design the *organisational arrangements* of the structural specifications. This is done as it is mainly concerning the inter-organisational aspects which can be improved by the guidance of these economic theories. In order to lower the transaction costs a certain organisational setup needs to be designed which allows for the whole process to become online and at the same time improve trust.

Third, in the platform prototype phase, the platform theories are used again to design the technical parts of the prototype and set up the pilot testing. It is answering the following question: does an online factoring platform prototype, which follows the design requirements, enable financial investors to provide invoice financing to small and medium-sized enterprises? Now the organisational perspective of the design is only relating to the way the prototype is implemented within the start-up. The agile software development method has been used to explain this perspective. This phase is evaluated by the experiment and prototype survey and a log data analysis. In the evaluation, the focus lies on the transaction costs that occur in using the platform.

4.4.1.   Phase I – Chapter 5

Semi-structured user interviews I

In total **26 semi-structured interviews** have been performed. Firstly, 24 interviews have been performed over the phone with SMEs in which information was gained on their liquidity status and openness to try a platform setup of selling invoices. The 2 remaining have been performed less formal with investors during presentations of the idea. The two investors that showed great interest in the idea were willing to provide their view on the solvability of the liquidity problems SMEs face and as well giving insight in how they would like the platform to be like. The insights from these interviews have been used to understand the industry structure and get a better understanding of the liquidity problem at SMEs that helped **shape the design requirements and verify important assumptions**.

Domain survey

In order to gain first insights from the market, a survey is being conducted under SMEs to identify the main problems they face with liquidity and short term financing. The survey consist of both closed and open questions. The latter will allow the respondents to provide more input about their opinion about factoring and their liquidity problem. The closed questions will be used to test the hypothesis on the market's opinion to factoring.

The questionnaire has been conducted in the German language and set out on the KMU Business World platform. KMU business world is an initiative of Swisscom which focusses on the realisation, consultation and conceptualisation about all for small and medium businesses relevant business ideas (Pieren, 2014). The concept of this platform is widely used by SMEs and has a good reputation for listing the state-of-the-art online services (Swisscom, 2013). At the time of sending out the survey the exact number of visitors on the KMU Business World website was unknown to the author. Though it is not sure, this is estimated to be group of approximately **100 SMEs**.

The survey consists of a part that is accessible for all respondents and two parts that are dependent on a filter question. The filter question divides the respondents into a group that used factoring and a group that has not yet used factoring before. Both got different questions respectively on the reason to use factoring and the reason not to use it. Furthermore the questionnaire is being used to find out whether SMEs would be interested in using an *online* version of invoice financing.

4.4.1.   Phase II – Chapter 6

Unstructured stakeholder and expert interviews

To be able to understand the context of the Invoice financing, in total **11 unstructured interviews** with the relevant stakeholders and experts in the field have been performed. Since these are all performed in a fast moving start-up and thus in a highly dynamic environment it was not preferred to perform all interviews in a strict and structured way. Although a lot of interviews did not have this structure and can therefore be called unstructured. All interviews have been logged and notes have been made. These notes are later analyses and consolidated in the analysis described in Chapter 6. This evaluation has been used to evaluate some of the **context requirements** of the artefact.

Semi-structured user interviews II

Next to the survey there has also been **semi-structured discussions** with a group of approximately **10** early adopters. This group early adopters consist of the SME representatives that have filled in the domain survey and had indicated to be open to help testing the platform and of SME representatives that had signed up on the website or via the newsletter that has been set up on a separate blog website.

By having a semi-structured interview with these users on the platform features and mock-ups more insights in the requirements could be gained. Moreover, by letting the interviews open for discussion allows for the

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creation of new ideas that would benefit the fit of the platform to the needs of its users. All these semi-structured interviews are held either through the platform chat-function, email or phone.

The semi-structured interviews have been accompanied with a visual and clickable mock-up. Also, **one survey** has been send to **5 investors** in order to gain some information on the main features needed on the platform. However, this survey was only filled in by 1 investor and therefore was complemented with a semi-structured interview.

4.4.2. Phase III – Chapter 7

Prototype survey

The last survey that has been performed, is the survey that tests the platform in prototype phase. In this survey the user is also asked to perform the tasks on the platform, however in this case the user is less guided and needs to interact with the prototype platform more naturally. By the means of a questionnaire the user is asked to provide feedback on the platform. It aims at evaluating the artefact to be sufficing some of the **context and user requirements**.

It should be noted that the questions of the prototype are all based on the theory mentioned in *designing for platform acceptance in* paragraph 3.4.4. The questions have been reconstructed to fit the goal of this thesis. The evaluation of the prototype with the survey is mainly done to evaluate the context and user requirements of the prototype. By evaluating these, it can be verified that the prototype actually works according to the previously set up specifications.

Log data analysis

By using the data that is being collected on the website from multiple sources, such as Google Analytics, Intercom.io, Papertrail and Newrelic it is possible to do more detailed analysis about the used behaviour on the platform. By using very detailed and real data on the real use of the platform can be tracked and analysed. Google analytics (Clifton, 2012; Inc., 2015; Plaza, 2011) and Intercom.io (Intercom, 2015) data is used to analyse the acquisition of the customers and its behaviour on the website. Intercom.io is used to track the user interaction with the platform and the administrators. Papertrail is used to analyse all changes of state of all actions on the server and Newrelic is used to check the server availability and responsiveness during the pilot.

The log data analysis has been mainly used to evaluate whether the platform actually had user sign-ups and what the user's behaviour consisted of. This has been done in order to evaluate the **functional** requirements and infer the evaluation of some **context and user requirements**.

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DESIGN PHASE I

Design requirement and assumptions

5. Domain analysis – Problem and assumptions

5.1. Introduction

To get a clear picture on the design challenge ahead, research has been done in the domain of invoice factoring. As for every design the design phase should start with a complete understanding of the customer needs (Sage & Rouse, 2009). The focus of this chapter is therefore also to understand the problems and assumptions of factoring in Switzerland, aimed finding the improvements that a multi-sided platform could have for the current situation. The sub-question that will be answered in this chapter is as follows.

SQ4: What assumptions on the theoretical transaction cost problems of factoring in Switzerland are valid that could be solved by a multi-sided platform and what should the general platform requirements then be?

This research question is two-fold as it contains both the problem and the assumptions. According to Verschuren and Hartog (2005) this means that not only the problem needs to be understood in order for the design of the platform to be meeting the user needs, it should also be specified what qualities the users and the context should have in order to make a fruitful use possible. The first are denoted as the design requirements and the second are denoted as assumptions.

5.2. Process towards requirements & assumptions

As the goal of this research is to design and prototype an online factoring platform to enable small and medium-sized enterprises to get liquidity financing by private Investors more directly, the design requirements need to be set up accordingly. According to Verschuren and Hartog (2005), the design requirements consist of functional-, user- and context requirements. As this research has been executed in an action context, the construction of these requirements are shaped during the development and use of the artefact (Sein et al., 2011). Thus, the eventual design requirements are not developed at once. The same is true for the assumptions, which are according to Verschuren and Hartog (2005) also entail functional-, user- and context assumptions. Therefore, which is also presented by Gregor and Hevner (2013), the main focus of presenting the requirements and assumptions is to show the design search (development) process.

5.2.1. Design requirements from the initial hunch and stakeholder interaction

Parts of the requirements have been established discussing them internally at Advanon during the initial hunch and parts have been evaluated beyond the borders of the company. The process of establishing the three types of requirements that are mentioned by Verschuren and Hartog (2005), was a non-linear process of interaction with the internal team (goals/functional requirements), the stakeholders (context requirements), the two customer groups (user-requirements). From this interaction some global requirements have been established.

Functional requirements: The goal

The functional requirements indicate the functions that the artefact should fulfil or enable to perform once it is realised, given the objective of this research (Verschuren & Hartog, 2005). The initial objective of this research is to design and prototype an online factoring platform to enable small and medium-sized enterprises to get liquidity financing by private. The functional requirements should describe the functions needed to achieve that and nothing more than that. These functional requirements stem from the *First Hunch* phase of the platform design. As explained in the introduction, is this phase not specifically described in this report but is represented in the first chapters. The first hunch is the phase in which the initial idea of the design has been formed. This and the description of the goals are described in Chapter 1. In the design requirement phase, there have been multiple internal discussions within the Advanon team to further specify these requirements to as they are depicted below in Table 8.

The most important function of the artefact is actually performs the platform function. Thus, it should be focussed creating value for both user groups and module on the platform, allowing for scale. Value should be create from lowering transaction costs and exploiting the other effects such as network effects to grow the added value of the platform. The main focus is to provide an (initially basic) invoice financing function to the seller and an invoice financing investment vehicle for private investors. Table 1 lists the most important functional requirements that

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have been decided upon. R_f1 - R_f3 are the main functional requirements. For simplicity and readability reasons the detailed functional requirements are not mentioned here.

Table 8 The main functional requirements, derived in the first hunch phase

Id	Requirement
R_f1	the design should enable direct interactions between SMEs in need of cash and investors
R_f2	the design should provide invoice financing to SMEs
R_f3	the design should provide an invoice investment vehicle for private investors

Context requirements: Stakeholder roles and their interest

To understand the context requirements, the main actors that have a role within the field of factoring are studied. It should be noted that some, but not all roles can be executed by a single stakeholder. An overview of the stakeholder roles relevant to Advanon are depicted in Figure 15. It shows some roles that can be seen as *module providers* on the platform, such as credit data agencies. Furthermore, the providers of platform or factoring solutions are placed on one row, as they can be seen as complementary. Lastly, the stakeholders that can be seen as the focal modules on the platform are depicted, which are the potential investors, the sellers and their customers. All are stakeholders within the ecosystem are briefly introduced under the figure.
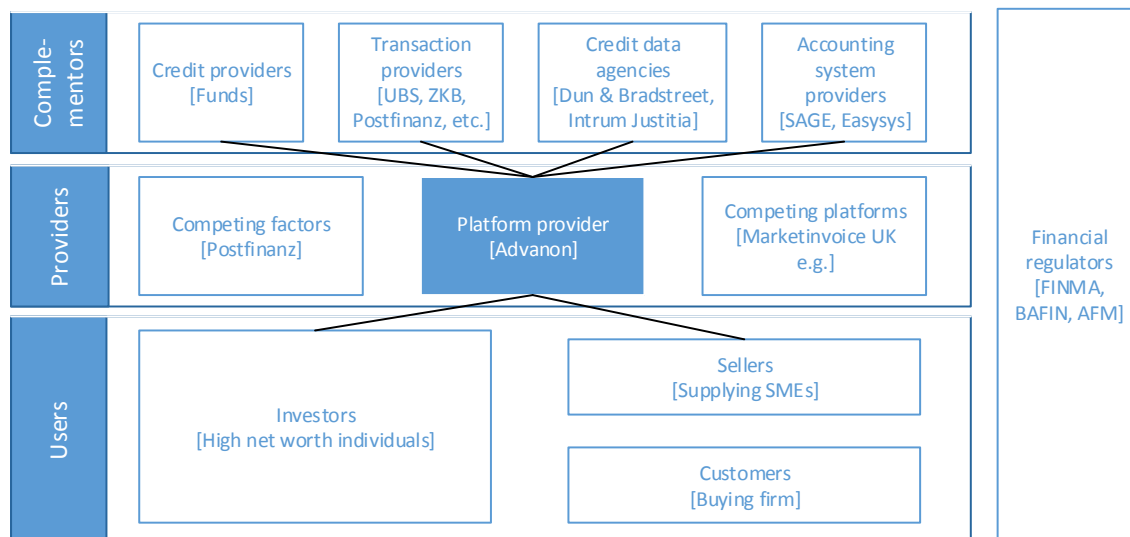
Figure 15 Overview of roles relevant to Advanon

Financial regulators

The financial regulators are not really part of the ecosystem, as they provide a separate independent role of monitoring the ecosystem. In Switzerland the financial regulator is the FINMA. In Germany and Austria these are the BAFIN and the AFM respectively.

Complementors / module providers

With complementors the external parties that provide services on the platform are meant. They can also be refered to as the module providers. They consist of multiple functions. First, the institutional credit providers, such as funds, provide the underlying credit for the money that is being prefinanced. Through a module, they would be able to invest automatically. Second, the transaction providers, who consist usually of the banks. By connecting their transaction services to the platform, it becomes possible for the investor and SME to more easily get the money transferred instead of having to do that manually. Third, credit data agencies, such as Dun & Bradstreet, could be added to the platform to enable more accurate and quicker credit rating data. Fourth, the accounting systems can be connected to the system, which would allow for easier data sharing.

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Platform providers

Within the ecosystem, also competing factors and competing factoring markets must be taken into account. Examples of platform providers have been earlier mentioned in chapter 2, such as Marketinvoice in the UK. Competitors on the traditional factoring side would be Postfinanz, which is one of the larger banks in Switzerland.

Users

The users can be divided into two groups: the investors and the sellers. Both are considered to be users, but for the design of the platform the volume of sellers will be one key factor and will be (in absolute numbers) higher than the side of the investors. Therefore, in the evaluation, the main focus lies on the sellers. The end-customers, who are the customers of the sellers are *not* considered direct users of the platform, but *indirect* users as they will not personally use the platform but only their invoice will be on it. They are therefore not taken into account in the user evaluations.

In the design process the important roles for the platform and the stakeholders have been identified. The strategic interest of all actors have been identified throughout the process. On top of the continuous conversations with the stakeholders, in order to evaluate and establish the context requirements, the light-weight research method *semi-structured interview* is used to identify and verify the strategic interest of the different stakeholders.

In order to have the design fully functioning format, the discussed design guidelines should also be taken into account. Therefore, the context requirements are based on some of the design guidelines. Based on **design guideline 2** the R_c6 requirement has been formulated and following from **design guideline 2** the R_c7 and R_c8 requirement have been formulated. The openness of the platform and at the same time not allowing sellers to use other platforms, is one of the requirements that follow from **design guideline 4**. The fact that a structural assurance and privacy are an important requirement [R_c10, R_c11], follows from **design guideline 7**. Furthermore, the requirements of R_c12 and R_c13 follow from **design guideline 8**. Table 9 shows the full overview of the main context requirements.

Table 9. The main context requirements

Id	Requirement
R_c1	the design should comply with law and regulation that is defined by the financial regulator (FINMA)
R_c2	the design should allow for different and undetermined credit providers to step in and invest as well in invoice financing (openness)
R_c3	the design should allow for different and undetermined transaction providers to link their system with the platform (openness)
R_c4	the design should allow for different and undetermined credit data providers to link their system with the platform (openness)
R_c5	the design should allow for different and undetermined accounting system providers to link their system with the platform (openness)
R_c6	the design should allow for new target groups (e.g. with higher asset specificity) to sell invoices in the platform
R_c7	the design should allow for easy customer information sharing
R_c8	the design should promote customer information sharing
R_c9	the design should restrict users of using other platforms, but open up the market on the platform.
R_c10	the design should have a structural assurance in place in order to foster valuation of the reputation across the user-groups
R_c11	the design should show clear privacy statements
R_c12	the module providers of the platform need to be trustworthy providers
R_c13	the design should present on social media and use social influence to improve platform acceptance
R_c14	the design should use the pricing to balance the demand and supply on the platform

User requirements: The financing problem

Both by using the **design guidelines** defined from literature and by interacting with the users, user requirements have been set up and defined. As described it is very difficult to measure the user requirements before the artefact has actually been built. In order to evaluate and establish the user requirements, also the light-weight research method *domain survey* have been used to identify and verify the real intent and problem from a user's perspective.

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From **design guideline 1**, R_u1 and R_u2 has been formed. It is extremely important to provide easy access to platform and trustworthy in order for it to be able to reach its critical mass. From **design guideline 6**, the user requirements R_u3 and R_u4 have been formulated. The **design guideline 7** has led to R_u5.

Table 10 The main user requirements

Id	Requirement
R_u1	the design should be extremely easy accessible (low entry barrier)
R_u2	the design should be perceived trustworthy
R_u3	the design should be perceived to be useful by potential sellers and investors
R_u4	the design should be perceived to be easy to use by potential sellers and investors
R_u5	the design should be perceived to have highly privacy protection standards by potential sellers and investors

5.2.1. Assumptions

When defining the requirements, also numerous assumptions are made, which are based on the theories mentioned in Chapter 3. As explained will these mainly be evaluated by the light weight research methods described in section 545.3. As Verschuren and Hartog (2005) explains, the credibility and acceptance of the assumptions need to be verified. As this was done in an iterative and sometimes implicit way throughout the whole action design research, it is difficult to specifically mention all steps taken in the verification methods that have been used to verify an assumption. However, in an attempt to list them in this report and structurally present them, they are listed in according to functional, contextual and user assumptions.

Functional assumptions

The main functional assumptions are around the problem that the artefact actually solves. The main thing then to consider, is the liquidity and cash flow management of the SMEs. It is important to verify whether liquidity and cash flow management is actually a problem for some of the small and medium-sized enterprises in Switzerland. These assumptions have been tested in the semi-structured interview and a domain survey [A_f1, A_f2].

Furthermore, it is of course important to understand if factoring is actually a considerable alternative source of financing for SMEs [A_f3]. There are two other important assumptions that are about the fact that a direct interaction between the seller and investor is actually beneficial for both parties [A_f4, A_f6]. In order to understand this, from a seller perspective why traditional factoring is not used and a platform solution could be an option, both unstructured and semi-structured interviews have been used. Also, the domain survey and prototyping process was used to verify these assumptions even better. To understand the added value of a platform on the investor side [A_f6] the similar verification methods have been used. But, in addition of knowing whether a platform setup would be beneficial for an investor, also the interest for a factoring invoice investment needed to be verified. This has been done in the unstructured and semi-structured interviews [A_f5].

Table 11 Functional assumptions and their verification method

Id	Assumption	Verification method
A_f1	liquidity is a problem for SMEs in Switzerland	Semi-structured user interviews, Domain survey
A_f2	cash flow management is a problem for SMEs in Switzerland	Semi-structured user interviews, Domain survey
A_f3	direct interaction with investors creates added value for sellers	Unstructured stakeholder and expert interviews, Semi-structured user interviews, Experiment and prototype survey
A_f4	factoring is a considerable alternative financing possibility for SMEs	Domain survey
A_f5	SME invoice investments are of interest for financial investors	Unstructured stakeholder and expert interviews, Semi-structured interviews
A_f6	direct interaction with sellers creates added value for investors	Unstructured stakeholder and expert interviews, Domain survey, Semi-structured user

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		interviews, Experiment and prototype survey

Context assumptions

The main functional assumptions are that there are the possibilities to use the different actors, credit providers, transaction providers, credit rating agencies and accounting system providers really as complementing modules. In other words, if it will technically be possible to create (automated) interfaces to these modules and if other parties will be technically able to connect to it [A_c1]. Also, it will be relevant to know whether the external parties will be willing to connect their system to a factoring platform [A_c2].

Another important context assumption that needs evaluation is the legal possibilities and compliances of the creation of a factoring platform. There are assumptions around the legality of the connection of the different modules [A_c3]. In order to verify these assumptions, the main verification methods that have been used are the unstructured interviews. These are only described in section 0.

Table 12 Context assumptions and their verification method

Id	Assumption	Verification method
A_c1	it will be *beneficial* to allow different relevant actors such as credit providers, transaction providers, credit rating agencies and accounting system providers to **connect** to a factoring platform, through application programming interfaces	Unstructured interviews
A_c2	different relevant actors such as credit providers, transaction providers, credit rating agencies and accounting system providers *will be willing* to connect to a factoring platform	Unstructured interviews
A_c3	It will be *legally allowed* to connect the different modules to the platform	Unstructured interviews

User assumptions

Table 13 shows the user requirements that have been testing within the domain survey. Is has bene questioned whether the current demand for factoring (or lack of it), are due to pricing [A_u7] or image [A_u8] reasons for example. Almost all assumptions have been evaluated within the domain survey, as can be seen in the table.

Table 13 User assumptions and their verification method

Id	Assumption	Verification method
A_u1	the satisfaction with factoring solutions is low	Domain survey
A_u2	the satisfaction of the duration of the credit issuing process of traditional factoring is low	Domain survey
A_u3	the satisfaction of the cost of the credit issuing of traditional factoring is low	Domain survey
A_u4	the satisfaction of the data provision requirements of traditional factoring is low	Domain survey
A_u5	the satisfaction of the service of traditional factoring is low	Domain survey
A_u6	the reasons not to use factoring is partially due to its mainly "with notification" and customer relationships do not want to be disturbed	Domain survey
A_u7	the reasons not to use factoring is partially due to its pricing	Domain survey
A_u8	the reasons not to use factoring is partially due to its bad image	Domain survey
A_u9	the reasons not to use factoring is partially due to the fact that is not flexible enough	Domain survey
A_u10	the reasons not to use factoring is partially due to the fact that it is unknown	Domain survey
A_u11	sellers are willing to try an online factoring platform as an alternative form of financing	Domain survey
A_u12	investors are willing to try an online factoring platform as an alternative form of financing	Unstructured interviews

5.3. Evaluation methods

5.3.1. Semi-structured user interviews I

In order to understand the problem of traditional short-term lending possibilities, 24 semi-structured interviews are held with sellers. All of the interviews focussed on the following topics. It gains input for the general characteristics of a factoring platform to establish the requirements. It qualitatively verifies the functional assumptions that have been described in

Seller interviews

Quick, semi-structured interviews have been held with sellers, in order to understand their situation and view on the creation of a factoring platform. The sellers have been selected on their industry in order to get a representative representation of the results. All interviews were held by phone and the main conclusions were written down. By performing these interviews information has been collected about the assumptions behind the user problem [A_f]. Table 14 provides an overview of the specific questions that were asked and the assumption that is aims to verify.

Table 14 Questions that are used to verify the specific assumptions with the semi-structured user interviews I

Questions asked	Assumption id
Is liquidity a big concern for the company?	A_f1
What is the main financing resource?	A_f2
Do you believe that better offers are possible for direct investor contact?	A_f3
What is the main resource of financing? Would you consider using factoring?	A_f4

Investor interviews

In a similar fashion as with the seller interviews, interviews with 2 investors have been taken place during certain events or specific meetings where it was requested that the idea was explained and feedback has been received in that manner. These conversations were also mainly aimed at collecting information about the user problem [R_u] and the assumptions [A_u] behind the envisioned solution.

Table 15 Questions that are used to verify the specific assumptions with the semi-structured user interviews I

Questions asked	Assumption id
Would you be willing to invest in SME invoices?	A_f5
Would it add value for you to directly invest in the invoices?	A_f6

5.3.2. Domain survey

The objective of the Domain survey is to evaluate the requirements and assumptions mentioned in section 5.2. It needs to be noted that the survey is an *ex ante* evaluation method, as the artefact is not yet realised when the survey was send out. Thus, in this survey it is difficult to already evaluate the potential of the factoring platform, as the results will be based on "a mental eye" on the future of such a platform.

Nevertheless, the survey has been send to a large group of small and medium enterprises. As briefly mention in section 4.4, the survey was set out on the KMU Business World platform (Swisscom, 2013). The number of SMEs on the platform is estimated to be group of approximately 300, of which approximately 100 were reached. The questions for the survey have been established based on the information need at the time of sending the survey.

The questions that have been asked have been send through an online tool called Unipark. The questionnaire contained a filter question that allowed for splitting the questions shown to respondents that had used factoring before (and asked what their satisfaction was with the service) and respondents that not used factoring before (and asked why not). The sending and formulating of the questions has been done in collaboration with the internal management team of Advanon. The questions have been used to test the assumptions quantitatively shown in Table 16.

Table 16 Assumptions that are evaluated by the domain survey and its corresponding questions

Id	Question
A_f1	Liquidity planning is very difficult for our company
A_f2	Obtaining credit is very difficult for our company
A_u1	Factor of A_u2- A_u5
A_u2	Please rate the various factors on the scale below on your satisfaction with factoring: Waiting time [completely unsatisfied – satisfied]
A_u3	Please rate the various factors on the scale below on your satisfaction with factoring: Costs [completely unsatisfied – satisfied]
A_u4	Please rate the various factors on the scale below on your satisfaction with factoring: Duration [completely unsatisfied – satisfied]
A_u5	Please rate the various factors on the scale below on your satisfaction with factoring: Service [completely unsatisfied – satisfied]

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A_u6	Please rate the various factors on the scale below on your satisfaction with factoring: Dealing with our customers [completely unsatisfied – satisfied]
A_u7	Why have you not made use of [factoring]? – Too Expensive
A_u8	Why have you not made use of [factoring]? – Too Bad image
A_u9	Why have you not made use of [factoring]? – Too Not flexible enough
A_u10	Why have you not made use of [factoring]? – I do not know factoring / I do not know a trustworthy supplier
A_u11	I am willing to test a factoring platform

5.3.3. Critical notion interviews and domain survey

It should be noted that both the survey and the interviews have been held under a sample group of SMEs respectively SMEs and investors. Although the diversity of the answers are very satisfactory, the sampling was limited and contained proportionately many financial and high-tech start-ups. Also, the documentation of both the results and the contact data of the different respondents could have been improved. The dataset of the survey only contained a limited amount of contacting details. This also partially influenced the data quality. Due to this, in combination with time limits, the analysis of the assumptions should be taken with precaution. Nevertheless, many descriptive analysis could be made that were very useful for the further development process of the platform.

5.4. Results

From the interviews with the stakeholders insights have been acquired about the opinion on current liquidity financing options and the attitude towards using an online platform. The main implications from the interviews for the requirements and assumptions are described.

5.4.1. Results from semi-structured user interviews I

Firstly, the implications of the information collected from the interviews for the functional requirements are discussed. This means that the assumption around the problem and need for different functions have become more clear in the interviews. One of the functional assumptions was that liquidity is a problem for SMEs in Switzerland. Another one that cash flow management is a problem for SMEs in Switzerland. The problem with asking this question in the interviews was that this turned out to be a sensitive topic for many of the SMEs. Therefore, often the subject was talked around and it turned out to be too difficult to assess whether and for which SMEs this was actually a problem. Thus, even though, some SMEs showed interest in the factoring solution, and even indicated that they would be willing to make use of such a factoring solution, the assumptions were difficult to assess.

Nevertheless, from the conversation summary presented in Appendix I, it can be deduced that 9 out of 23 responses answered a cautious yes to the question: is liquidity a big concern for the company. Thus, one could argue that the notion that liquidity is an issue for small and medium-sized enterprises in Switzerland is partially supported.

Other important assumptions were the ones about the direct interaction with the investors. This means that it had to be evaluated whether direct factoring can be of value for SMEs and under which conditions. It became clear that factoring can be of use for small and medium businesses. One of the reactions from the sellers when asking openly for the opinions was (translated from German):

"Factoring makes perfect sense if you need growth finance. For start-up companies, who have a long development time and lead time to go to market, the financing is not solved. In my opinion, this area for the Swiss economy is more important, because as well as development projects with high potential but little capital can be realized. So you would also encourage innovation in Switzerland for young start-up companies. Banks have no entrepreneurial approach to finance and only if the income is positive (this, however, also only with collateral, such as personal liability)."

Having studied the different responses of the sellers on the seller interview, the following conclusions can assumptions can be drawn on the assumptions, see Table 17.

Table 17 Assumptions and their conclusions based on the semi-structured interviews

Id	Assumption	Conclusion
A_f1	liquidity is a problem for SMEs in Switzerland	Partially supported
A_f2	cash flow management is a problem for SMEs in Switzerland	Partially supported
A_f3	direct interaction with investors creates added value for sellers	Partially supported
A_f4	factoring is a considerable alternative financing possibility for SMEs	Partially supported
A_f5	SME invoice investments are of interest for financial investors	Partially supported
A_f6	direct interaction with sellers creates added value for investors	Partially supported

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5.4.2.   Results from domain survey

The questions asked in the survey were in German and are depicted in Appendix II, the responses are translated to English and summarized in Appendix III. For verification reasons the questions have been translated back to German to see whether a similar question came out. The quantity of the responses of the survey over time are depicted in Figure 16. Furthermore, some main metrics on the responses are shown in both absolute numbers and percentages in Table 2.
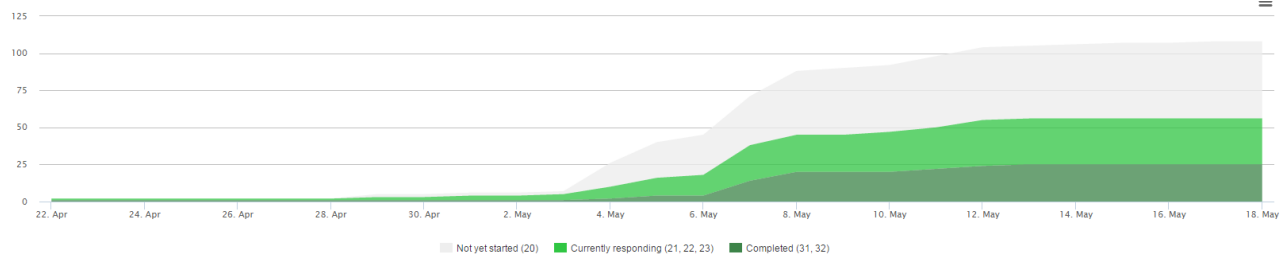

Figure 16 responses of the survey over time

The overview of the responses show that there have been 121 responses, but with a completion rate of 21,49% there are only 25 responses complete. This might *seem as a high drop-out* for a certain survey. However, these statistics include everyone who opened the survey only to check out the article that was posted with it. The survey was –for technical reasons– embedded in a news article. In order to filter out these responses, a data cleaning process has been executed in order to filter the test responses and responses where the results are so little filled in that the origin of the responses are questionable. However, this meant that only 26 respondents actually completed the whole survey and 4 respondents could be used although they did not fully finish the survey.

Table 18 The metrics of the responses of the survey in absolute numbers and percentages

Total sample (Gross 1)	121 (100.00%)
Adjusted total sample (Gross 2)	121 (100.00%)
Net participation	62 (51.24%)
Response rate	51.24%
Completion rate	21.49%
Statistical characteristics	
Mean processing time (arithm. mean)	0h 4m 50.33s
Mean processing time (Median)	0h 3m 27s
Time of day with most accesses	Hour 12 Count 14
Average number of participants per day	5.76
Average number of participants per week	24.20
Page with most drop-outs	Page: Start Count 61

5.4.3.   Results and implications for the assumptions

After the dataset had been cleaned, the following descriptive analysis have been performed, the assumptions are all evaluated by analysing the responses on the survey.

Liquidity issues in Switzerland

By analysing the questions "Liquidity planning is very difficult for our company" and "Obtaining credit is very difficult for our company" it was aimed to be able to verify the assumption that liquidity planning and credit flow management would be a problem for Swiss companies. Table 19 shows the response on the first and Table 20 shows the response on the second.

Table 19 Frequency table on the question: Liquidity planning is very difficult for our company

	n
Mean	3,12
Median	3
Population	30
Standard deviation	1,177

Both frequency tables 19 and 20 have been plotted into one bar chart in Figure 17.The results in Table 19 show that both the mean (3,12) and the median (3) are not widely diverging from three. This can be interpreted as such, that

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there in the population that filled in the survey there was no specific divergence towards either totally agree nor totally disagree. This means that it cannot be concluded that there would be a liquidity problem for Swiss SMEs. Likewise, when looking at Table 20, it can also not be concluded that the results, with mean (3,10) and median (3) are divergent from the expected value, being neutral. However, it should still be noticed that the fact that also in both tables 11 respondents (38%) filled in to agree to a certain degree to the fact that they have either a problem with their liquidity and/or obtaining credit. Therefore the assumptions are concluded to be partially supported, which is summarized in Table 21.

Table 20 Frequency table on the question: Obtaining credit is very difficult for our company

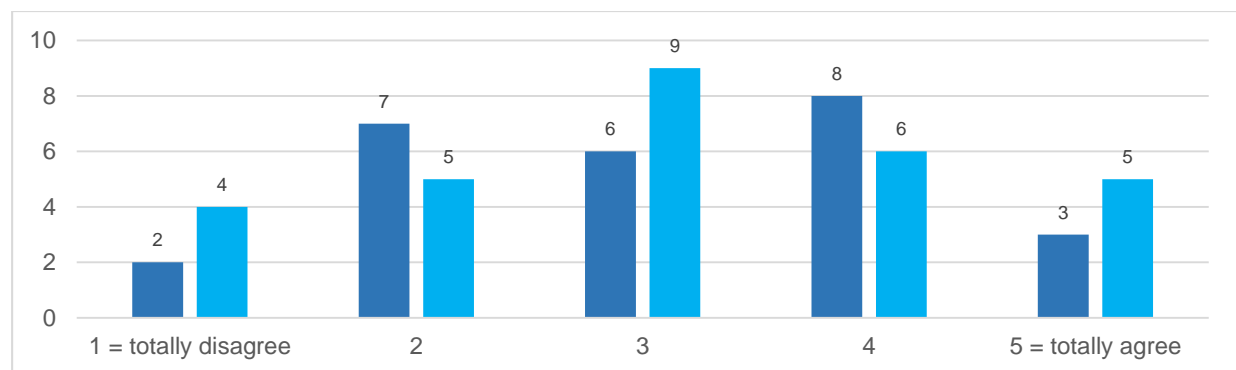|	n
Mean	3,10
Median	3
Population	30
Standard deviation	1,291

Figure 17 The frequency of the answers on the questions Liquidity planning is very difficult for our company (Left) and Obtaining credit is very difficult for our company (Right)

In order to understand whether there would be a possibility to reject the assumptions, a one-sample Wilcoxon Signed Rank Test has been performed on the hypothesis: the median of the question about liquidity and cashflow management the median of refinancing diverges significantly from 3.0. With a value of .727 and 3.76 this hypothesis is rejected, thus based on the data the assumptions are not rejected (but also not accepted) based on the sample of the survey. Based on the results that were obtained in the unstructured interview, it is still plausible that in a niche of the companies do have a problem with their liquidity and cash flow management.

Table 21 Results of the analysis on the different assumptions

Id	Assumption	Result
A_f1	liquidity is a problem for SMEs in Switzerland	Partially supported
A_f2	cash flow management is a problem for SMEs in Switzerland	Partially supported

Satisfaction of traditional factoring services

The survey indicated that around 80% of the respondents did not make use of factoring before. As explained in section 5.3.2, the survey contained a filter on that question in order to assess the different groups of respondents differently. When asking about the Satisfaction with factoring, five different dimensions where asked for. Figure 18 shows the frequency distribution of this question.

![Advanon logo] **Advanon**
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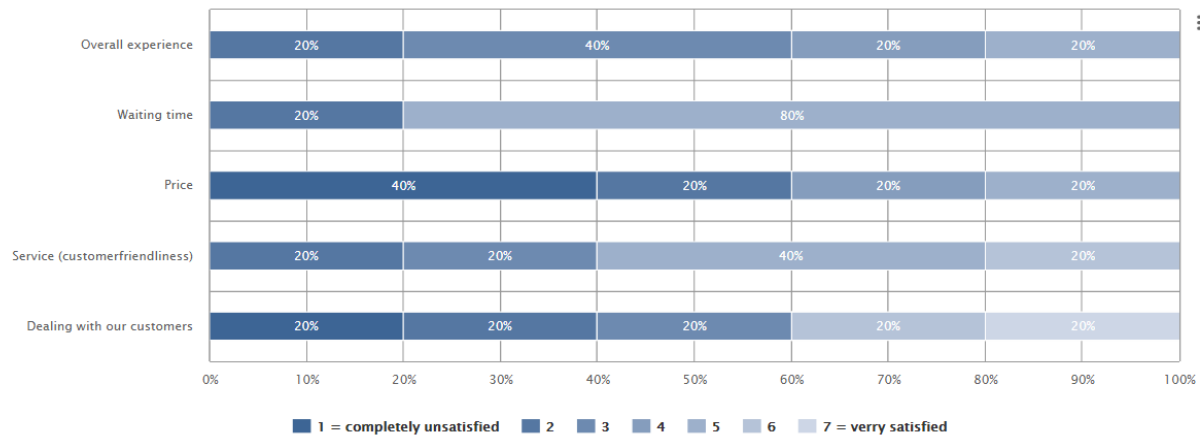
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Figure 18 Frequency distribution graph on the question: Please rate the various factors on the scale below on the satisfaction your factoring company. It measures the Satisfaction with factoring

The goal of analysing the satisfaction with traditional factoring is to understand where Advanon as a new factoring provider can improve compared to the competitors. The main conclusion that can be driven from Figure 18 is that mainly the price, the overall experience and the change in dealing with the end-customers were points of dissatisfaction. No seller was completely dissatisfied with the waiting time. This is remarkable, as the time it took the sellers to gain factoring services was never lower than 3 days, as can be seen in Table 22. Even though the number of responses is low, it is remarkable that none of the respondents had experienced a factoring service below the 3 days.

Table 22 Frequency table on the question: How long did the process from application to cash flow?

CODE	ANSWER OPTION	n	%
1	< 3 Days	0	0%
2	4 - 7 Days	5	83%
3	8 - 14 Days	1	17%
4	> 14 Days	0	0%

For the design process, this notion can be used to further focus on the time in which factoring can be provided. If the design would succeed in providing cash flow in less than three days, this could mean that it has a unique value proposition. Having a unique value proposition in the beginning phase of the design is important as has been pointed out in section 2.4.1.

Another important assumption was that the cost of the credit issuing of traditional factoring is low. Table 23 shows that the costs are actually usually above the 2.6%. On an average invoice duration of 44 days (average in Switzerland), this is a high percentage compared to other lending alternatives. This might explain a dissatisfaction with the price.

Table 23 Frequency table on the question: What were the costs as a percentage of the invoice total?

CODE	ANSWER OPTION	n	%
1	< 1%	0	0%
2	1 - 2.5%	1	13%
3	2.6 - 4 %	4	50%
4	> 4%	3	38%

Table 24 summarizes the results of the analysis of the survey data on the different assumptions. This section of the questionnaire, due to its low response rate (only 20% of the respondents used factoring before), could not be supported with durable statistical analysis. However, it can be said that the opinion on the overall experience with factoring is much divided.

Table 24 Results of the analysis on the different assumptions why factoring is used

Id	Assumption	Result
Au1	the satisfaction with factoring solutions is low	Not supported

Au2	the satisfaction of the duration of the credit issuing process of traditional factoring is low	Supported
Au3	the satisfaction of the cost of the credit issuing of traditional factoring is low	Supported
Au4	the satisfaction of the duration of the data provision requirements of traditional factoring is low	Not supported
Au5	the satisfaction of the service of traditional factoring is low	Supported
Au6	the reasons not to use factoring is partially due to its mainly "with notification" and customer relationships do not want to be disturbed	Supported

Reasons not to use traditional factoring services

In order to assess the reasons why factoring has not been used by 80% of the respondents and to get insights in the validity of the user assumptions, the question "Why have you not made use of it (factoring)?" is analysed. Figure 19 shows the responses of the different reasons. None of the respondents answered "else", therefore it is assumed that the answer possibilities were according to the real reasons not to use factoring. As biggest reason "I do not know a trustworthy supplier" (of factoring) has been chosen. Second highest is the answer "I do not know factoring at all". That means that within the sample the knowledge on factoring has been low.
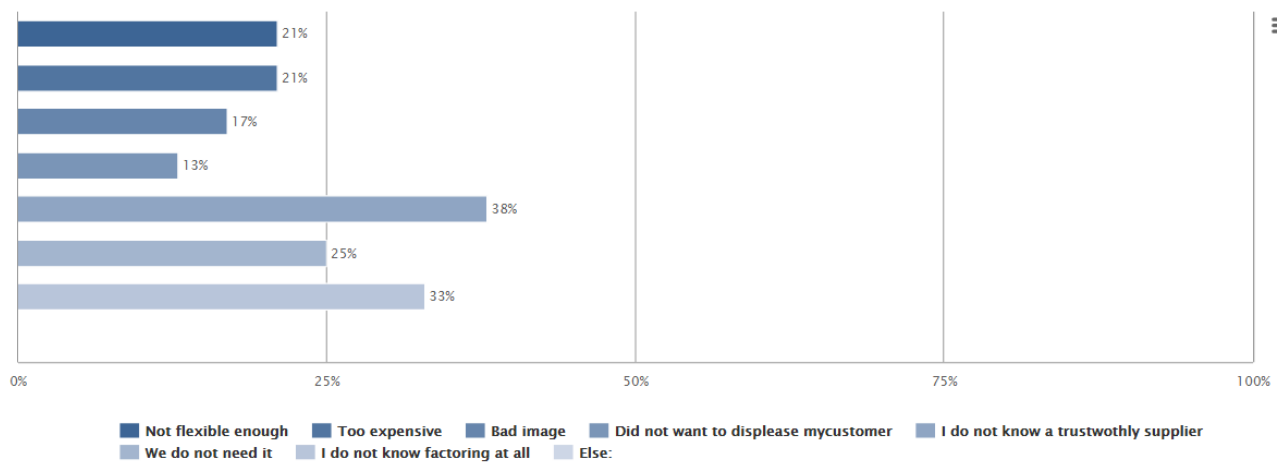
Figure 19 Frequency distribution graph on the question: Why have you not made use of it (factoring)?

When looking at the last assumption, that is that sellers would be willing to use factoring in general, and that sellers would be willing to test factoring on the prototype platform Figure 20 provides insights. 79% of the respondents would be in principle open to use factoring as an alternative source of financing, and 64% wants to test the platform to try it out. Thus the latter assumption is assumed to be supported.
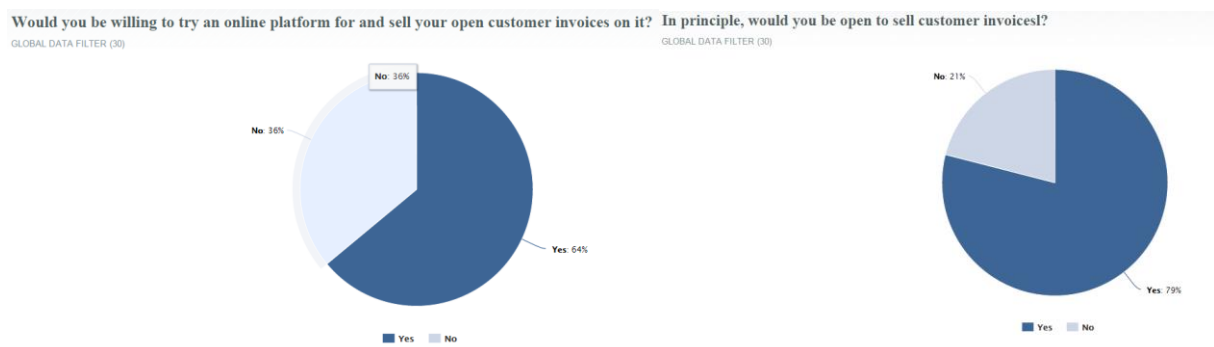
Figure 20 The responses on the questions "Would you be willing to try an online platform for and sell your open customer invoices on it?" and "In principle, would you be open to sell customer invoices?" (right)

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Table 25 Results of the analysis on the different assumptions why factoring is not used

Id	Assumption	Result
A_u7	the reasons not to use factoring is partially due to its pricing	Not supported
A_u8	the reasons not to use factoring is partially due to its bad image	Partially supported
A_u9	the reasons not to use factoring is partially due to the fact that is not flexible enough	Not supported
A_u10	the reasons not to use factoring is partially due to the fact that it is unknown	Partially supported
A_u11	sellers are willing to try an online factoring platform as an alternative form of financing	Supported

5.5. Discussion and conclusion

The sub-question that has been answered in this chapter is as follows: *What assumptions on the theoretical transaction cost problems of factoring in Switzerland are valid that could be solved by a multi-sided platform and what should the general platform requirements then be?*

Both the design requirements and the assumptions are listed in this chapter. With the requirements the main problem that needs to be solved by the platform is specified. With the assumption, it is also specified what qualities the users and the context should have in order to make a fruitful use possible. These assumptions are also empirically tested in both semi-structured interview with sellers and a survey that has been send out to sellers.

While keeping in mind that the results of the empirical methods had their limitations, still several significant contributions to the knowledge on the problem could be obtained. These insights have been used iteratively to improve the design requirements. Furthermore, the assumptions have been adjusted according to the findings in the empirical methods. These assumptions are very useful to have verified or falsified during the design process, as they help shape the artefact towards something that will actually solve a problem and at the same time be useful for its users.

A last remark that needs to be given, is that not only the information written in this report has been used during the design process. Also, less documented, more tacit knowledge that the interviews and the survey provided have been used during the process. The assumptions that were verified during the domain analysis and the survey. The outcomes and impact on the requirements are presented in Table 26.

Table 26 Verified and non-verified assumptions and their impact on the requirements

Id	Assumption	Result	Adjusted assumption	Impact on requirements
A_f1	liquidity is a problem for SMEs in Switzerland	Not supported	liquidity is a problem for some SMEs in Switzerland	The artefact needs to be more open to accept a niche, focussing on smaller companies with higher asset specificity, as they are currently not being served by the market. Therefore R_c6 has been added.
A_f2	cash flow management is a problem for SMEs in Switzerland	Not supported	liquidity is a problem for some SMEs in Switzerland	The artefact needs to be more open to accept a niche, focussing on smaller companies with higher asset specificity, as they are currently not being served by the market. Therefore R_c6 has been added.
A_f3	direct interaction with investors creates added value for sellers	Partially supported	N/A	N/A
A_f4	factoring is a considerable alternative financing possibility for SMEs	Partially supported	N/A	N/A
A_f5	SME invoice investments are of interest for financial investors	Partially supported	N/A	N/A
A_f6	direct interaction with sellers creates added value for investors	Partially supported	N/A	N/A
Au1	the satisfaction with factoring solutions is low	Not supported	The satisfaction with factoring is very divided	A specific niche of sellers that were not served with or familiar with the current factoring solutions needs to be found. Therefore R_c6 has been added.

Au2	the satisfaction of the duration of the credit issuing process of traditional factoring is low	Supported	N/A	N/A
Au3	the satisfaction of the cost of the credit issuing of traditional factoring is low	Supported	N/A	N/A
Au4	the satisfaction of the data provision requirements of traditional factoring is low	Not supported	The specific data that had to be provided was asked in the interview (see appendix III), but satisfaction was not measured	The information sharing on the platform [R_c7 and R_c8] was added in order to first investigate the possibilities to obtain this data, while at the same time make it as easy as possible for users to provide the data.
Au5	the satisfaction of the service of traditional factoring is low	Supported	N/A	N/A
Au6	the reasons not to use factoring is partially due to its mainly "with notification" and customer relationships do not want to be disturbed	Supported	N/A	N/A
A_u7	the reasons not to use factoring is partially due to its pricing	Not supported	Pricing was not indicated as a big barrier to use factoring	This meant that pricing could be even more freely used to balance the platform demand and supply. Therefore R_c14 was added.
A_u8	the reasons not to use factoring is partially due to its bad image	Partially supported	N/A	N/A
A_u9	the reasons not to use factoring is partially due to the fact that is not flexible enough	Not supported	N/A	N/A
A_u10	the reasons not to use factoring is partially due to the fact that it is unknown	Partially supported	N/A	N/A
A_u11	sellers are willing to try an online factoring platform as an alternative form of financing	Supported	N/A	N/A

All the assumptions that were (partially) supported, did not have any influence on the requirements. This means that the requirements that had been set up from the first hunch and further internal discussions did not change. The evaluation enabled to update the requirements, which was useful for the rest of the design as it actually enabled to more specifically design towards a solution, as the problem was now better understood.

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DESIGN PHASE II

Structural specifications

6. Structural specification – Platform modelling and design

6.1. Introduction

In a typical design study, the structural specification explains the reasoning behind the different design choices. The choices are dependent on multiple infrastructural circumstances, desires of the users and stakeholders, and financial costs (Verschuren & Hartog, 2005). It could be In order to make these choices and reasoning clear for the reader, this is also done for the platform design. An outline of the platform 'on paper' is given, which is referred to as the 'conceptual design'. The following sub-question will be answered.

SQ5: Given the need for short term financing, what should the <u>conceptual design</u> (architecture and organisational arrangements) of a factoring platform look like, from both a technical and an organisational perspective?

In order to specify the conceptual design both the architecture and organisational arrangements are specified. The ecosystem architecture, that consist of a blueprint and design rules of the relatively stable platform (6.2.1 Platform architecture) and the complementary set of modules that are encouraged to vary and the binding between them (6.2.2 Technological and user interfaces). By setting out the blueprint and design rules, the way the platform functions will be better understood.
Tiwana et al. (2010) introduces a framework to study platform evolution which includes both the architecture and the governance structure of the platform that can be viewed through a theoretical lens to be evaluated. As has been concluded from the literature review chapter (Chapter 3), platforms are viewed from both a platform theory perspective and a transaction cost perspective. In order to perform this evaluation in a later chapter, this chapter is structured according to the Tiwana et al. (2010) framework.

The in literature discussed governance structures or safeguards and empirical results are used to define the organisational arrangements of the platform. They are set up in order to guide the non-technical interaction needed with the users and modules of the platform. They follow from the empirical research that has been done and the theoretical notions that gave structure to the way the interaction can be organised. The main difference between the organisational arrangements and the ecosystem architecture is that the latter is built for scale. This chapter discusses both the architecture and the organisational arrangements of the platform. It concludes with a discussion and conclusion section.

6.2. Ecosystem architecture

All variables that are being designed in the platform are informed by platform theory. As the discussed platform theories suggest, a platform should consist of a core and several modules which are ideally interchangeable. In order to provide an architecture for the ecosystem an overview of the ecosystem is provided. The different modular parts and the different user groups have been structurally presented in Figure 21.
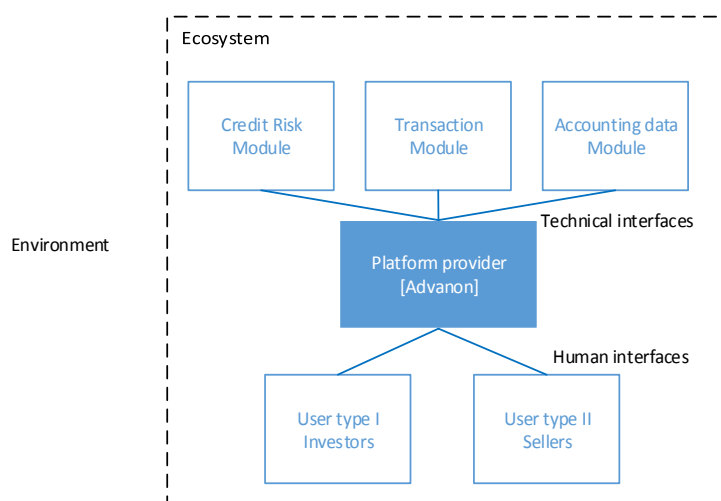

Figure 21 Overview of the ecosystem

Although there has been much attention for the need to focus on the IT artefact within the Information System literature, there has been not much work that actually did so (Orlikowski & Iacono, 2006). However, it is viewed important to explain the platform architecture of the platform, as it is an important part of the design and will have a large influence on the success of the platform. Section 6.2.1 will elaborate on the Platform architecture, according to the

To this day, there is still little knowledge on the beneficial effects of the modularity of the platform on the evolutionary consequences and scalability of the ecosystem (Tiwana et al., 2010). However, it is viewed as important to elaborate on the modularity in the design of the platform. Therefore, the different functionalities of the modules are explained.

6.2.1. Platform architecture

In order to present the platform architecture, descriptive enterprise architecture meta-elements have been used (Janssen, 2009). According to Janssen (2009) an architecture can be descriptive, prescriptive or both. The enterprise architecture that is presented here is mainly descriptive of the current state of the platform. Four types of architectures described by the framework have been used to describe the platform architecture: business, business process, information (and data) and the application architecture are presented. They are all interrelated, but all present a part of the platform from a different perspective. These interrelationships are illustrated in Figure 22 as different architectural layers.
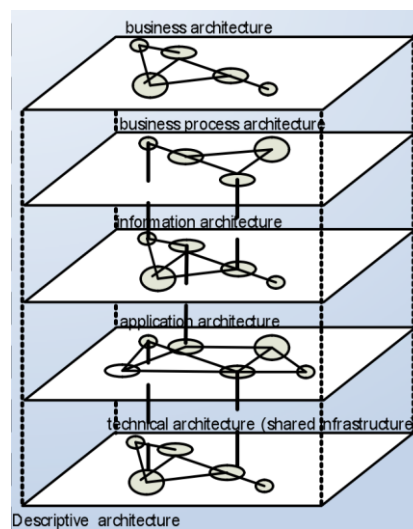

Figure 22 The interrelationship between the different architecture according to the meta framework of Janssen (2009). Copied from Janssen (2009).

Business architecture

The business architecture of the current platform contains the multiple actors described in section 5.2 and two types of roles. These are depicted in Figure 23. The current status of the platform does not fully include the modules, but as the interviews with the module providers were very positive on the potential of adding the modules to the platform, they are still depicted in the figure. Furthermore, the architectural principles and open interfaces have been established as such that the modules can be added in a later phase.

The latter architectural principles are based on platform theory from Tiwana et al. (2010). By setting up the business as a platform, the conventional notion of firm boundaries is expanding to harness outside expertise and ingenuity on an unprecedented scale. In order to be able to implement the platform artefact, it is of particular importance to understand the points of view of external parties and the interactions that the platform will have with its environment.
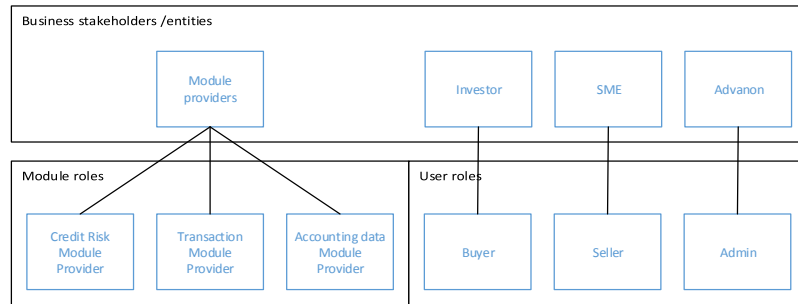
Figure 23 Overview of the busines roles and stakeholders/entities

The admin role is fulfilled by either internal Advanon employees specialized in the investment due diligence and service or the seller due diligence and service. The most important user roles were the investor and seller role. The main focus of this design research is also to bring these two user groups together. It should therefore be noted that much time has been invested in defining the processes, information needs surrounding these two groups.

Business process architecture

The overall process from signing up to performing the repayment of the investment are global processes that had to be specified individually. The overall process is depicted in Figure 24. After the user signed up a due diligence process takes place for both the investor and seller. This process is both needed in order to only have high quality sellers and investors on the platform and thus lower the risk of fraud and create more trust, it is also needed from a legal perspective. All companies that operate in the area of financial intermediation are obliged to perform a due diligence check in order to prevent money laundry (FINMA, 2015).

After the due diligence has taken place the seller had to provide financial information on his company. Although the risk is being transferred to the end-customer the invoices on the platform are sold with recourse and thus the seller is partially responsible for it. This makes that the information on the selling company is needed in order to perform the credit risk check that represents the risk of the invoice. Furthermore, the seller also needs to provide end-customer data that will also be used in the credit risk check. (The process of credit risk checks will be enhanced by every credit data module that is added to the system. Also, the process of providing data on the end-customer will be improved when accounting modules are added to the platform.) After this data has been provided, the invoice information and confirmation on the sale timeframe must be provided by the seller.

On the investor side, a similar due diligence process is taking place before the investor can access the platform. After an investor has been through this process and can access the platform he can start providing his investment preferences and browse the invoices for sale. Once the credit risk check, the invoice information and the investor has browsed the investment, the invoice can be viewed in detail by the investor and the credit risk can be assessed. By providing a good overview of the credit risk, the investor should be enabled to make fast decisions on whether to buy the invoice. The invoices are bought on a first-come first-serve basis. After an invoice is bought, the transaction of the advancement is made manually by the investor and indicated on the platform. This process will be enhanced once more and more transaction modules are added to the system. The initial setup of the transactions is currently being tested and standardized in order for the transaction modules to connect in a later stage.

After the investment/advancement had been made by the investor the seller is obliged to pay back the advanced money on the due date of the invoice. If the end-customer has payed within that timeframe the seller can perform this repayment also earlier. When the invoice is not yet payed back on the due date, a higher rate will be charged towards the seller in benefit of the investor. If the invoice is not repaid within a timeframe of +/- 90 days a recollection process is initiated by the admin on behalf of the investor.
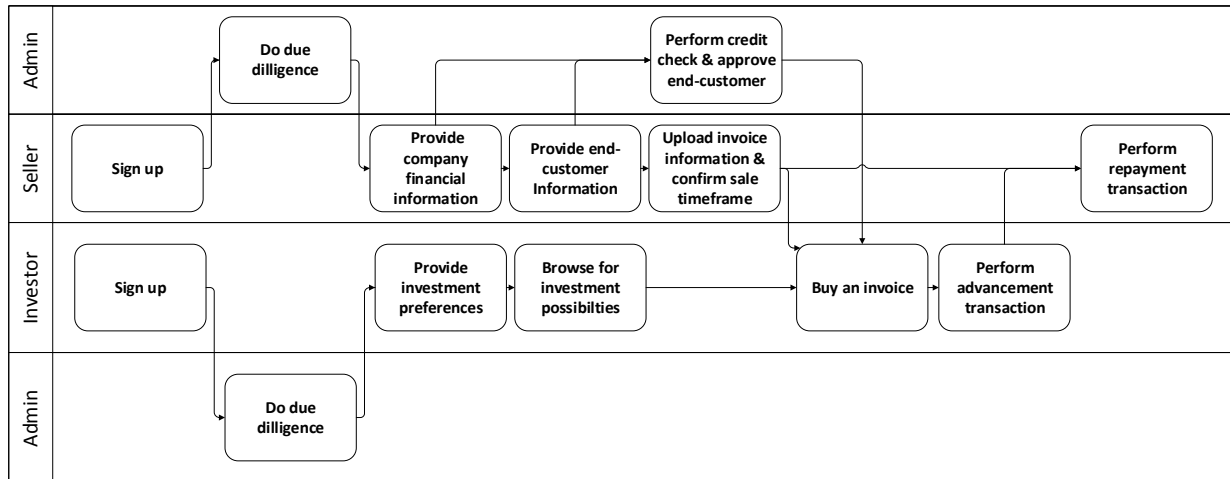
Figure 24 Overview of processes on the platform performed by the three usertypes

Information and data architecture

Like the other architectures, the information and data architecture has been established throughout the creation of the platform. In order to structure the information, the different important processes have been further specified and different statuses of data formats have been defined. By doing so, not only the database structure could be better defined, also the functional and unit programming tests (see section 7.2) could be better specified.

The basic user roles and user data needed to be added to the database model. As soon as the user signs up it needs to be declared which user type he is of. Therefore it needs to be asked during signup whether the user is signing up as a seller and investor. Both is not possible, due to business requirements.
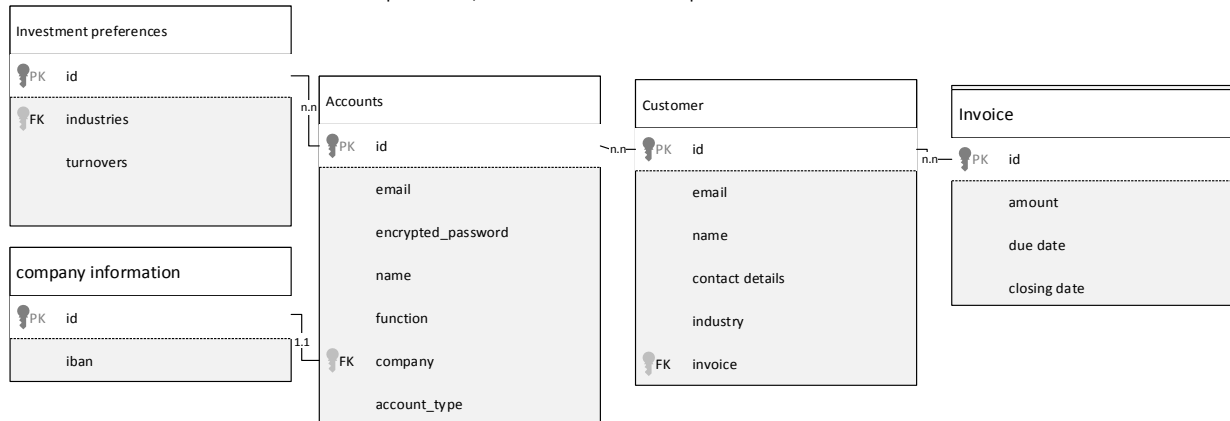
Figure 25 Simplified UML model of the database structure used during sign up

The transactional process determines the data structure of the invoices. The main workflow from uploading the invoice to repaying it, is for a large part the process of transactions. After the investor has bought the invoice, it is important to keep track of what the statuses of the invoice is. Therefore the status structure presented in *Figure 26* shows the structure that has been designed for the invoice statuses.

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Figure 26 Showing the different statuses an invoice can be in, used to develop the workflow and database structure of the invoices

Application architecture

The platform consists of different applications are tailored for the platform function and thus are also set up as modular as possible. The main application follows the model view controller (MVC). MCV is a very useful design pattern for architecting interactive software systems (Leff & Rayfield, 2001). In order to understand the set up used, Figure 27 shows the main elements that are used in the system. They are briefly described.

The layouts view contain the main templates of the different pages, that are not changing such as the header and footer of the landing and application pages. The devise view includes the login and signup parts of the application. The landing page contains the main landing page setup, where the seller and investor contain the views for the application once the respective seller or investor are logged in.
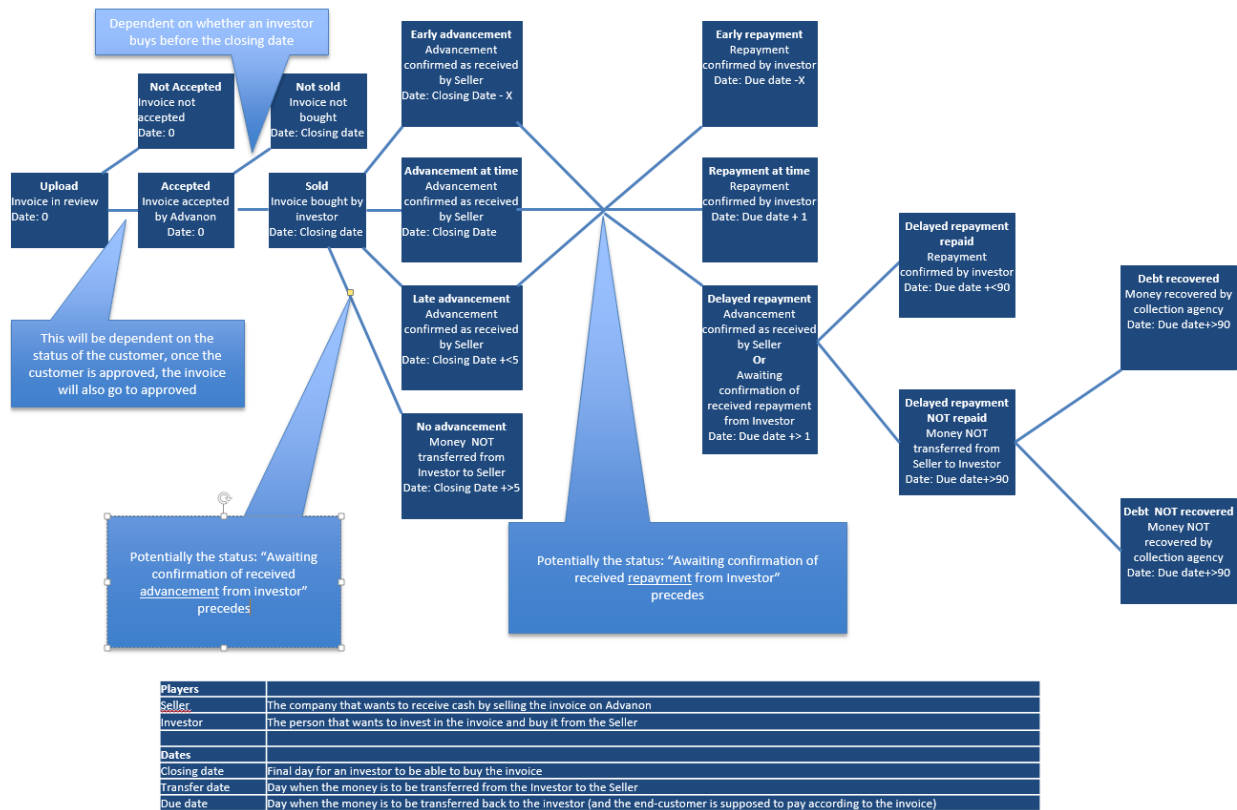
The controller groups are divided in the accounts, investor, seller and concerns. They all consist of a *base controller* and some specific controllers on the functionalities for the specific groups. The account controllers for example control the actions on what is happening when someone logs in or updates its account. The investor and seller controllers define actions such as buying or selling an invoice.

The ability active record entails the user data models on what users can and cannot do once they are logged in. The seller controller defines the changes that the seller can and should do while editing its financial information. The invoice controller define all actions that are performed on the invoice entity. It is for example defining the states that a certain invoice can be in.
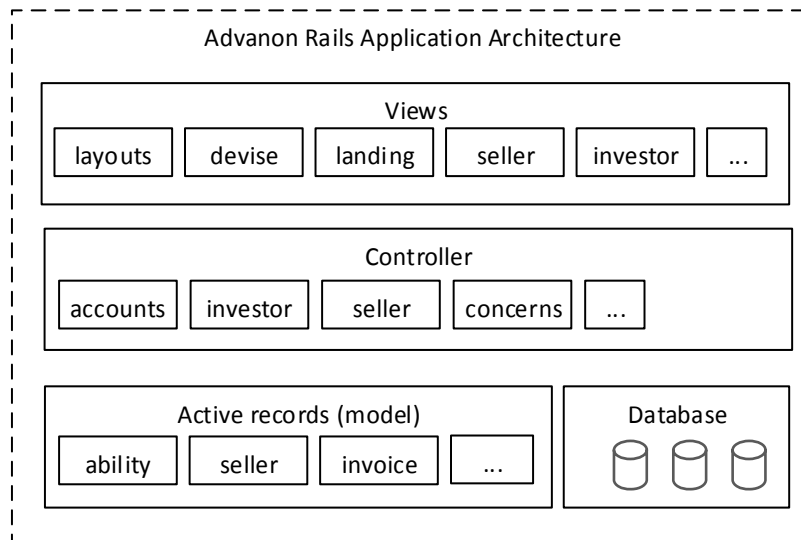
Figure 27. Overview of the main model, views and controllers used in the platform application

On top of the main platform application, multiple scalable services have been used. Figure 27 lists all the services that have been deployed on the staging version of the application. It contains some log management and real time error reporting services. They allow for quicker development and flexibility in case of a bug. Other services are used for security or maintenance reasons, such as Autobus and Adminium, that creates more secure back-up and admin interface for the database.

Table 27 services used in Heroku and their explanation

Logo	Name of the service	Explanation
	Adminium	Admin interface for PostgreSQL
	Autobus	Automatic backup service for Heroku Postgres
	Deploy Hooks :: Http	Provisioning, configuration and deployment of third-party apps
	Heroku Postgres :: Crimson	Heroku PostgreSQL database service
	Papertrail	Log management service
	Raygun.io	Real time error reporting
	SSL	SSL encryption for https:// urls.

Technology architecture

As explained in the application architecture, MVC was used to for the subdivision of the application. Ruby on rails is an MVC Framework that is used to implement this design pattern in the application. For the platform development Ruby version 2.1.5 and the Ruby on Rails version 4.2 has been used. The following technologies are used to build the platform:

Language stack: Ruby 2.1.5, HTML+ERB, YAML, JavaScript, SCSS, CSS, HTML, Text, SVG, Markdown
Frameworks: Ruby on Rails 4.2, Inspinia, Bootstrap
Database: PostgreSQL 9.1
Production server: Heroku
File storage: Amazon AWS S3
Email service: Mailgun

In order to give an overview of how all these technical components are interconnected, a component diagram is depicted in Figure 28.
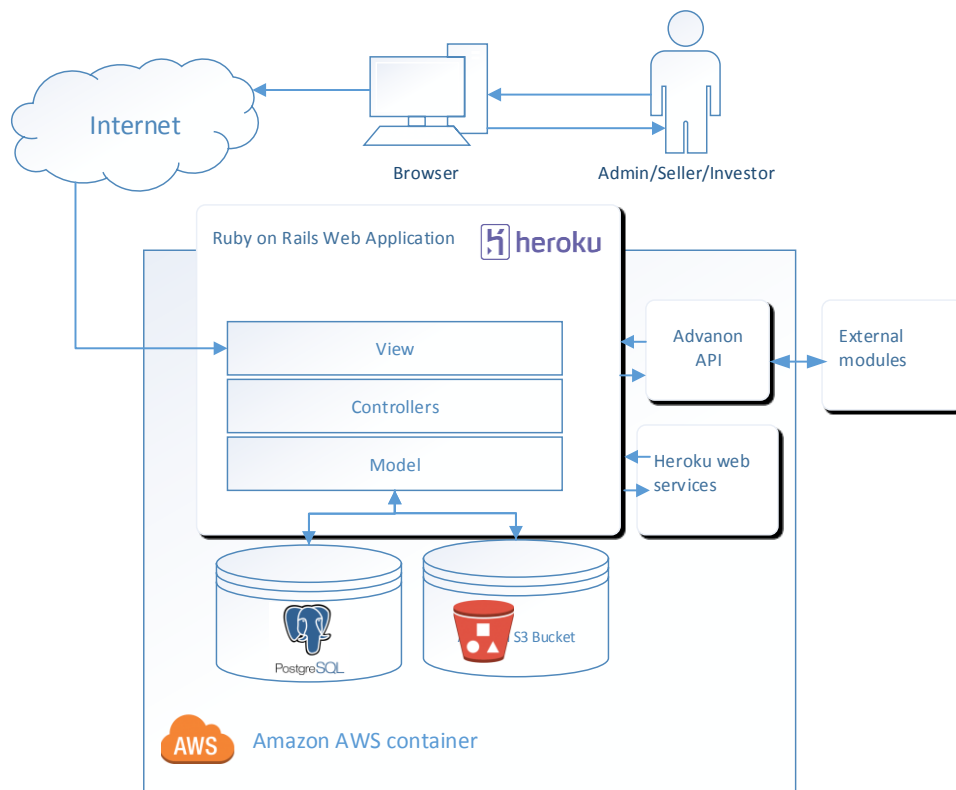
Figure 28 Compontent diagram of the technological architecture of the platform

6.2.2. Technological and user interfaces

In order to design the ecosystem, the platform needs to have technological interfaces with the different modules. Furthermore, the interface with the platform users, which can be referred to as the user interface. The structural specification of these interfaces is discussed in this section. In order to establish the technological interfaces, certain standards and processes are designed in order for later development to have standardized interfaces to foster platform adoption (see section 3.4).

Credit rating and accounting data interface

The process of gaining credit data that allows for a good prediction of the default rate of a company is often a tedious process (Mester, 1997). Although it is difficult to create trustworthy credit scorings, it is one of the essential parts of the underwriting process of a transactional loan, including factoring (Berger & Frame, 2007). The industry uses a very large variety of standards and methods of creating credit scores. This makes it difficult to create standards for all possible ways.

Al though the calculation of the score is often varying, the way is similar and makes usually makes use of a diversity of ratios (Mays, 2004). Therefore, in order for data providers to offer their services through Advanon, there should be a possibility to link this data with the internal database. A lot of research has been done on the credit risk process and the available information. The main information that is needed to perform a good due diligence and credit risk process is presented in Table 28. All data is both needed on the end-customer and the seller. In order to have all data, first a manual input mock-up have been created followed by a real implementation described in the next chapter.

Table 28 the main data needed in order to perform a good due diligence and credit risk process

Type of information	Potential source
Basic information	
UID/VAT number	User input/Accounting
Age	User input/ Accounting

Credit rating	User input/ Accounting
Credit score	Credit score provider
Credit recommendation	Credit score provider
Legal collection case	Credit score provider
Legal collection case	Credit score provider
OPTIONAL: Corporate structure?	User input/ Accounting
Seller directors	
Credit rating	Credit score provider
Other firms' rating (if owner involved is other businesses)	Credit score provider
Legal collection data	Credit score provider
Number of bankruptcy companies	Credit score provider
Change of address of individual	Credit score provider
Additional checks	
Name - Check against Credit-report tool	Credit score provider
Company page - Personal profile	Credit score provider
Address	Credit score provider
Page	Credit score provider
Customers	Credit score provider
Ratios	
Solvency ratio (Net income+depreciation and amortization)/(Short-term liabilities+long-term liabilities)	Accounting
Net debt/EBITDA ratio (Short-term liabilities + long-term liabilities - cash)/EBITDA	Accounting
Gearing (Short-term liabilities + long-term liabilities - cash)/Shareholders Equity	Accounting
Interest coverage (EBIT/Interest expenses)	Accounting
Current ratio ((Cash + inventory + receivables))/(Short-term liabilities)	Accounting
Quick ratio ((Cash + receivables)/short-term liabilities)	Accounting
Cash ratio ((Cash + Cash equivalents)/Short-term liabilities)	Accounting
Turnover	Accounting

Figure 29 shows the mock-up of the credit rating data that has been created on the seller side. A similar input mechanism has been designed for the admin interface.

Figure 29. The mockup for the credit data input on the seller side

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Transactional interface

The process of transactions has been standardized in order for the transactional modules to be added in a later phase. *Figure 30* shows the standardized statuses and actions that are used on the platform. The actions are currently performed manually by the investors and sellers, but are taken over by a module once added.
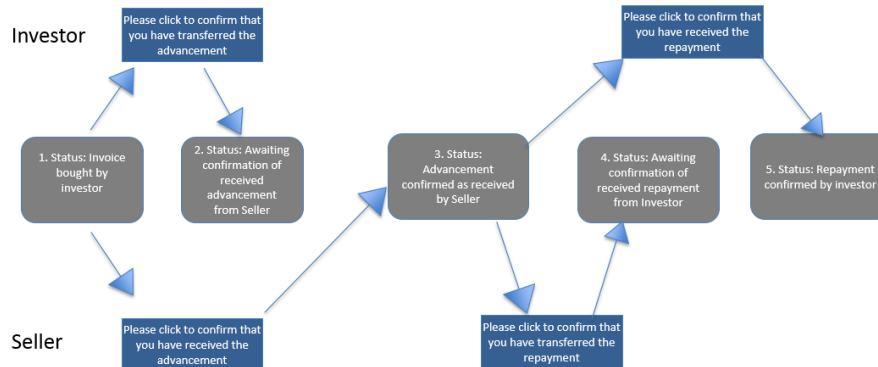
Figure 30 standardized process of transaction confirmations

Furthermore, the industry standards of transaction protocols, in Switzerland SEPA and DTA, are investigated and used to determine the architecture of storing the transaction instantiations. For the manual set up, where the users perform the transactions themselves instead of one of the module providers, the manual buttons have been designed as can be seen in Figure 31.
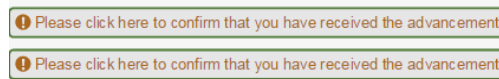
Figure 31. Mockup of transactional butons

User interface

In order to rapidly understand the way the platform would be interpreted by the user, mock-ups have been created. The mock-ups have been used in the semi-structured interviews with the users and been improved by several iterations. The final mock-up of the overview page on the seller side is shown in Figure 32. The progress that has been made throughout the iterations and more mock-ups can be found in Appendix IV.

The live version of the mock-ups can be found through the following URL:
https://moqups.com/philip.kornmann@gmail.com/A90TKctw/p:a16340ced
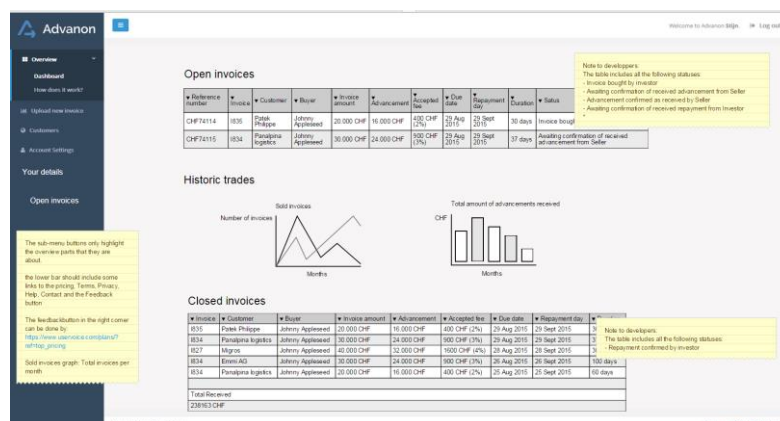
Figure 32. Mock-up on seller side overview after set of semi-structured user iterations

The user interface follows a similar but different menu structure for both the seller and the investor side. Details on that can be found in Appendix IV.

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6.3. Organisational arrangements

In order to determine the organisational arrangements, the theoretical prerequisites and social constructs need to be interpreted for this case. By doing so it becomes clearer how the platform setup differs or should differ from the traditional safeguards that are used in factoring. After that the specific targeted user groups need to be defined, (6.3.1) in order to better adjust he arrangements according to the specific user groups. Lastly, the arrangements need to be described (6.3.2).

6.3.1. Defining the targeted user groups

Table 29 and Table 30 defined the targeted user groups for the seller and investor side. These user groups have been identified during to the iterative process of user and expert interviews and internal discussions. Here it should be explicitly noted that the **design guidelines 2 and 5** have been taken into account. The reason of selecting certain industries and sized of the companies are derived from the fact that the sellers that are more asset specific are theoretically currently underserved and would be able to be served through an online factoring platform solution. This is mainly applied on the seller side. For the investor side design principle 5 is taken into account as well, as the trust on the platform has be high, it is preferable that the investors on the platform are possibly derived back to one person. Furthermore, it will require less effort to get individual investors interested in the platform, instead of institutional investors, which would require more of an advanced platform. By doing so, also **design guideline 1** is taken into account, as the focus is laid on the attainment of momentum, by selecting these groups. Even though both groups also have their drawbacks, for example the guidance that they need to explain the platform, when design guideline 6 is implemented well, the momentum will be best attained with smaller parties. This also allows for quicker splitting of invoices, instead of forcing investors to take over full invoices (which is the initial design). Implementing splitting of invoices would lower the risk of investing and will make better use of the network effects of platforms. It would also adhere to design guideline 7 (structural assurance), but cannot be implemented in the initial design of the platform, due to the absence of volume on the platform.

Table 29 Targeted seller user group

Industry	Food production/Production of Metal Products/Architecture and engineering
Geo	Zurich/North-West Switzerland
Turnover	100k-2MM
Years in Business	1-3
Service Area	B2B / Large Corporations
Invoice period	30-90 days
Financial Status	Growing

Table 30 Targeted investor user group

Main Group	High Net Worth Individuals
Geo	Zurich/North-West Switzerland
Age	45+
Experience	Former Entrepreneur or Director
Special interest in	1) Local Start-ups / Businesses 2) Alternative investment types
Investment possibilities	$1M - 10M$
Willing to invest in	Wholesale/Production of Metal Products/Architecture and engineering

6.3.2. Rules on the platform

As the initial version of the platform has a triangular relationship graph, there are three main social relations for which specific rules need to be designed. These are as follows.

Social contracts between the Seller-Investor

Following **design guideline 2**, the seller should be longer responsible for its own debt collection, in order to allow for a higher asset specificity. This means that the invoices will be sold *with recourse*. For this, special contract have been set up in order to provide the investor with the safeguard that adverse selection (see literature chapter 3) takes place.

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Social contracts between the Seller-Platform

The seller should allow insights in the details of its customer information. Although, never fully controllable, this should be embedded in the contracts, as this will be beneficial for the information asymmetry between the customer and the factor. Furthermore, the moral hazard of providing bad invoices needs to be covered as well. By ensuring this, the factor, already having external information from the modules, will be enriching its own data with that from the seller. Thus, as mentioned above, the platform should be focussing on factoring setup *with recourse*.

Social contracts between the Investor-Platform

In order to create the trust that is needed for an investor to invest, the social contracts need to be set up as such that there is an aligned interest between the investors and the platform. This can be done in multiple ways, but the most prevalent is to both share the positive and the negative returns/defaults on an invoice. Also, it should be clear to an investor that the platform provider is taking all precautions needed to include the best invoices on the platform. However, it should also be stated clearly that the platform provider is never legally liable in case of an unfortunate default of an invoice. Thus it should be clearly stated what the duty of the platform is and, maybe more importantly, what is not.

6.4. Evaluation methods

6.4.1. Unstructured stakeholder and expert interviews

In order to iterate over the structural specifications of the platform, all potential actors involved and their role have been interviewed. Numerous unstructured interviews with the relevant stakeholders in the field have been performed. Due to a lack of knowledge on platform development and the factoring industry and the fast context in which this research has been conducted, **11 interviews** have been taken in an unstructured format. Even though the interviews were held in an unstructured way, they provide valuable insight used during the process of creating the structural specifications.

As it is not common to use unstructured interviews in scientific research the definition and reason of using it is briefly elaborated upon. The definitions of an unstructured interview are various. Minichiello (1990) defined unstructured interviews as interviews in which neither the question nor the answer categories are predetermined. Instead, they rely on social interaction between the researcher and the informant. As Wildemuth and Zhang (2012) points out, it does not mean that just because unstructured interviews do not use predefined questions that they are random and non-directive.

Especially because the nature of the potential relation with the actors in the field is still unknown, it is beneficial to have an open interaction with the third parties. However, the goal of making the parties willing to link their system as a module to the platform have always been taken into account. The way the interaction took place with the different actions differed from actor to actor. The different interactions are described for every actor. It should be noted that the amount of interviews per actor type is low (between 2 and 5). Thus, conclusions can be drawn on the total population, but have to be generalized with caution. The **assumptions** that these unstructured interviews evaluated are presented in Table 31. Furthermore, the **context requirements** that followed from these assumptions are also evaluated in the same interviews.

Table 31 The assumptions that are evaluated by the unstructured interviews

Id	Assumption
A_c1	it will be *beneficial* to allow different relevant actors such as credit providers, transaction providers, credit rating agencies and accounting system providers to **connect** to a factoring platform, through application programming interfaces
A_c2	different relevant actors such as credit providers, transaction providers, credit rating agencies and accounting system providers *will be willing* to connect to a factoring platform
A_c3	It will be *legally allowed* to connect the different modules to the platform

Unstructured credit rating provider interviews

In order to understand whether it would be possible to connect external credit risk data sources with the platform, **two** interviews have been held with the technical and sales staff of two credit risk providers who specialize on small

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and medium enterprise credit risk. Questions about the technical possibilities and willingness to connect were discussed.

Unstructured payment transaction provider interviews

In order to understand how to connect a payment solution to the platform, **three** banks and **two** payment service providers have been interviewed exploratively. It needs to be stressed that the banks had a double role in this process, as many of them also offer a factoring solution themselves. Questions about the technical possibilities and willingness to connect a payment solution were discussed.

Unstructured accounting software providers interviews

In order to understand whether it would be possible to connect the accounting software data with the platform, **two** interviews have been held with the technical staff of accounting software companies who specialize on small and medium enterprise accounting. Questions about the technical possibilities and willingness to connect were discussed.

Unstructured credit provider interviews

As discussions with potential investors in the company Advanon moved on, the interest of an investment in terms of a fund have also been investigated. By interactively explaining the business plan, institutional investors (such as venture capitalists, family offices and hedge fund managers) were also asked whether an institutional investment in the factoring platform would be considered. These investments would be something to add as a module to the platform in a later stage, and therefore were often only asked in a hypothetical way. In total **two** investors have been interviewed on this topic.

Unstructured legal and regulatory interviews

In order to understand the legal context of the platform, **two** interviews have been performed. One with the Swiss central financial regulator, the FINMA, and the other with a group of PWC experts that provided insights in the rules and regulation to which the platform needed to adhere. By sending the financial process on the platform to both parties, through mail and phone contact, iteratively, the legal context requirement could be evaluated.

6.4.2. Semi-structured user interviews II

As Stapleton (1997) note out, there is a need for rapid prototyping to reshape the requirements and assumptions. While and after creating the structural specifications, it is therefore useful to keep interacting with the end-user and thus iterate the specifications according to the needs of the users. Therefore the mock-ups were used to gain information on the usability.

Seller interviews

After having identified potential target group of sellers, they have been contacted both directly by phone and email. By performing pitches at multiple events, some SMEs also found the beta platform themselves and started asking questions about the idea. In this manner
The interviews were held with a group of approximately 10 early adopters. This group early adopters consist of the SME representatives that have filled in the market survey and had indicated to be open to help testing the platform and of SME representatives that had signed up on the website or via the newsletter that has been set up on a separate blog website. The questions that were asked to investors and to sellers were partially overlapping and partially different.

In Appendix V the questions that were asked to the sellers. It shows that both the login function in the mock-up was questioned, the provision of the financial details were discussed on the willingness of customers to do that, the add customer functionality and eventually the intended use of the sell invoice functionality was questioned.

Investor interviews

On the investor side, a questionnaire was send out at first. However, due to the fact that this questionnaire only got 1 response, this and other investors were followed up with phone calls to better understand their opinion about the mock-ups and functionalities. The questions used in the questionnaire and (later) phone interviews with the investors can be found at the end of Appendix VI. A lot of the investor feedback came from a few closely

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collaborative investors. All investors came from a financing background and had senior positions at banks, consultancy companies and venture capitalist firms.

6.4.3. Critical notion interviews

Both of the interview types have been very useful for the understanding of the structural specification of the platform design. Due to the high speed of development of the design study, many of the interviews have only been roughly noted down. This creates difficulties in the verification and validation of the information that has been provided in these interviews. Also, the reproducibility of the conclusions that were drawn from them should be assessed very critically. On the other hand, the richness of the information, just due to this fact reaches further than many similar studies done in the field.

6.5. Results

The results of the unstructured interviews with the stakeholders and experts are presented in this section. The main results are discussed in order to evaluate the concept of the artefact suffices the **contextual requirements**.

6.5.1. Unstructured stakeholder and expert interviews

The results from the unstructured interviews are discussed per actor, which are at the same time also experts on their specific fields of expertise.

Credit rating provider

A first interview with the credit rating providers, gave insight in the fact that they were willing to collaborate on providing credit data on the platform. Not as expected was it not only from a sales perspective interesting for the providers. They also indicated that there were possibilities to set up a further collaboration in which the platform would be fulfilling a reselling functionality for them. This seemed as an interesting case for providing the credit data interface for investors on which the providers could gain money, by charging on the platform. It actually fitted very well in the real platform functionality that Advanon is aiming to gain.

A second interview actually revealed the technical possibilities and data sources that there were available. Hereby the technical interface and standards were discussed. One of the main reflections that created changes in the design was the fact the UID (or VAT number) of the company was needed in order better integrate the standards. In the case a UID would be available, the integration between the systems would be working better and better extendable. Although the full integration is not yet done, the architecture currently does allow for external companies to import their data. By this doing this, the fourth contextual design requirement [R_c4] could be evaluated as sufficing.

Payment Transaction provider

The interviews with the transaction providers created insights in the way the transactions could be set up. Also, it indicated that it is relatively difficult to make use of a standard transaction protocol that can integrate with all transaction providers, such as the SEPA standard aims to do(Bolt & Humphrey, 2007). As the Swiss banks are not yet obliged to use this standard, the open interviews revealed that the main standard currently used is the DTA format (ISO20022, 2015). By this doing this, the third contextual design requirement [R_c3] could be evaluated as sufficing. However, to create a general interface that standardizes these transactions the DTA format will be outdated soon. Furthermore, the interviews gave some insights in how the payments on the platforms could be arranged. This verified that the current setup of the transactions was a good start.

Accounting software providers interviews

In order to enhance the usability of the platform, exploratory interviews with accounting software companies that are used in Switzerland took place. The interviews revealed a strong willingness by the accounting software providers to assist the creation of an interface. Also, because all of the interviewed accounting companies had their own application programming interface that allowed for exportation. The addition of a factoring platform would also mean added value from their perspective, as it will create new functionality for their customers. Standards in the data that is stored about the credit information of a seller and its customers were adjusted to better match the data availability of the accounting software. By this doing this, the fifth contextual design requirement [R_c5] could be evaluated as sufficing.

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Credit provider interviews

In short conversations with several institutional investors, the interest was expressed in using the platform as an investment diversification method. For this the idea of an investment module and interface was embedded in the platform design. By this doing this, the second contextual design requirement [R_c2] could be evaluated as sufficing. Furthermore, this interest could be seen as a verification of the current platform architecture, as multiple investors showed this interest.

Legal and regulatory interviews

By interviewing the legal firm first, a first idea of the legal requirements [R_c1] had been further specified. By doing so, a number of things came about that actually needed to be done before the license for becoming a financial intermediary could be official. The process of where the money flows and the specific roles that Advanon can have in that have been accordingly adjusted. However, the financial regulator also requires an educated person in the team to do the obligatory due diligence process. For this, Advanon is still finding a solution. It can thus be concluded that by changing the process, the first contextual design requirement [R_c1] could be evaluated as not yet sufficing.

Note: Although the interviews have provided good insights in how the architecture could be adjusted to allow for the extension of the code, the implementation of the code is not part of this thesis anymore, due to time constraints.

Figure 33 Context requirements that have been evaluated by the stakeholder interviews

Id	Requirement	Conclusion
R_c1	the design should comply with law and regulation that is defined by the financial regulator (FINMA)	This requirement is not yet sufficing, due to the fact that the internal operational team needs an experienced person to perform the due diligence. This needs to be sorted out. However, the full process of performing the transactions, as designed, all suffice for this requirement.
R_c2	the design should allow for different and undetermined credit providers to step in and invest as well in invoice financing (openness)	By introducing a technical interface (API) in the architecture of the app, a possibility has been created for different credit providers to extend the code-base.
R_c3	the design should allow for different and undetermined transaction providers to link their system with the platform (openness)	By introducing a technical interface (API) in the architecture of the app, a possibility has been created for different transaction providers to extend the code-base
R_c4	the design should allow for different and undetermined credit data providers to link their system with the platform (openness)	By introducing a technical interface (API) in the architecture of the app, a possibility has been created for different credit data providers to extend the code-base
R_c5	the design should allow for different and undetermined accounting system providers to link their system with the platform (openness)	By introducing a technical interface (API) in the architecture of the app, a possibility has been created for different accounting systems providers to extend the code-base

6.5.2. Semi-structured user interviews II

The answers given in three interviews have been summarized in Appendix V. From the interviews with the sellers the following results were distilled as user input for the structural specification. The results are split into seller and investor. Due to time constraints the interviews have not been coded, thus only the most important conclusions are shown here.

The main results for seller side are:
- The order in which the different tasks, being providing financial information, providing customer information and the uploading of the invoice, are not self-explanatory from the mock-ups. There will need to be more information in the prototype about the exact instructions on these aspects.
- The main information provision seems to be also common for other financial products, thus could be asked to the seller. However, the way of providing the information can be drastically improved.
- The mock-up landing page should provide a more detailed overview of what the process, the terms and conditions (who is responsible for the invoice) and the process of getting the invoice sold.
- Factoring "with notification" is accepted by some, but not by all the different sellers.

The main results for the investor side are:
- A large part of the transaction costs that is found important by investors is in the credit risk of the invoices and the physical transaction costs (platform fee, fee for transacting, etc.).

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- More due diligence information would need to be available for the investors to make their decision.
- The credit analytics need a better presentation and explanation, as they are not understood.
- The investor module get different reactions, both positive and negative. Some investors want to have full control over each transaction and some investors would like to get things more automated.
- Price and data transparency are indicated to be of high importance for platform adoption and investment potential.
- The time spend on making investments is estimated usually a couple of hours per product.

On top of these concrete improvements on the application design, the context requirements R_c6- R_c13 have been evaluated through the semi-structured interviews. Table 32 shows the conclusions that have been drawn based on these interviews. By interpreting the interviews with the internal team these conclusions were drawn.

Table 32 Context requirements that have been evaluated by the user interviews II

Id	Requirement	Conclusion
R_c6	the design should allow for new target groups (e.g. with higher asset specificity) to sell invoices in the platform	By speaking to companies that sell more asset specific products that only have a few customers, the conclusion has been drawn that conceptually speaking the platform setup would be more beneficial for some sellers.
R_c7	the design should allow for easy customer information sharing	The design did not include a possibility for the users to automatically share their accounting data. This was noted by the users to be a point of improvement. Because of this lack, this requirement is not assumed to be sufficiently implemented yet.
R_c8	the design should promote customer information sharing	The design does not provide clear steps on how the data that is needed for a factoring transaction should be delivered by the user. Because of this lack, this requirement is not assumed to be sufficiently implemented yet.
R_c9	the design should restrict users of using other platforms, but open up the market on the platform.	This functionality has been designed, as discussed in the organisational arrangements. By evaluating the way this setup was received by the customers, the design suffices to this requirement.
R_c10	the design should have a structural assurance in place in order to foster valuation of the reputation across the user-groups	This functionality has been designed, as discussed in the organisational arrangements. By evaluating the way this setup was received by the potential users some small changes had to be made on the design, but main feedback was positive on this regard. Therefore, it can be said that the design suffices this requirement.
R_c11	the design should show clear privacy statements	During the evaluations, the privacy statements were not yet completed. However, the legal aspect of this requirement was already settled.
R_c12	the module providers of the platform need to be trustworthy providers	The way the external parties are connected to the system, for example the credit data providers need to be better explained
R_c13	the design should present on social media and use social influence to improve platform acceptance	It was difficult to assess this requirement, as there has been some social media used to promote the platform, but all respondents on the survey did not come through that medium.
R_c14	the design should use the pricing to balance the demand and supply on the platform	From the interviews it became clear that the pricing mechanism balances out as the demand on investor and seller side does contain a certain profit margin.

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6.6. Discussion and conclusion

The information of the previous chapters have served as the input for the structural specification of the platform. Chapter 5 has elaborated on the short term financing need for a number of SMEs and pointed out the main for important aspects in a two sided factoring platform. Now, in order to design the platform further, the need for short term financing has been assumed and the following sub-question is answered. *Given the need for short term financing, what should the <u>conceptual design</u> (architecture and organisational arrangements) of a factoring platform look like, from both a technical and a stakeholder's perspective?*

In order to answer this question both the architecture and the organisational arrangements of the platform should be specified. Multiple information sources have been used in the process of designing these structural specifications of the platform. As the functional requirements indicate, the main focus of the platform design has been on the creation of value for its two main user groups, being sellers and investors. It requires a good specification on all aspects of the platform to create this added value. Furthermore, in order to build the platform as such that it is prepared for the addition of the later modules, also the contextual requirements have been taken into account in both the architecture and the governance structure of the platform.

As it concerns a conceptual design of a new artefact, it is important that efforts are taken that all parts of the platform are understood while the technical specification is being developed. In order to come to an internal consistent conceptual design from a technical point of view, five architectural views of the architecture create a way to touch the surface of what structural design choices have been made. Simplified, the business roles of the platform exist of both user roles, that entail the seller, buyer and administrator, and the module provider roles, which entail for example a credit risk module. For the role of the seller, important business processes are the sign-up, data provision and sale of the invoice. For the investor role, the main business processes are the sign-up, the investment assessment or due diligence and the buying the invoice (transactional part). The processes for the administrator are the due diligence of both sides of the platform and facilitating the information if needed on one side manually. The information needed for all parties are complex, but can be simplified by using industry standard database structures and data formats for the database. For simplicity reasons only one database has been used for the storage of the platform. This also benefits the modularity of the platform. The right storage method of the data is not only important for the users, but also for the security and legality of the platform itself. The application architecture follows the Rails MVC framework, which is extended by services that enhance the performance, maintainability and security of the platform. The application infrastructure is set up as modular as possible, within the constraints of the project.

On top of the core architecture of the application, the interfaces between the modules and the platform need a standardized and well-thought through description. The main interfaces for the factoring platform are the credit rating and accounting interface, the transactional interface and the user interface. The first has been evaluated with unstructured interviews with potential module providers. The latter has been evaluated with mock-ups. These evaluations have been used throughout the whole process of designing the architecture.

From an organisational point of view, the arrangements that are needed for the platform are defined. They focus on the definition of the target groups, the social arrangements between the seller and the investor; the seller and the platform; and the investor and the platform. In order to cope with the theoretical prerequisites and social constructs for factoring in a platform setting, the target groups and the rules on the platform had to be well-defined. As the target groups need to satisfy the main characteristics of a seller and factor in the traditional setup, specific industries and specific type of investors are targeted. Throughout the process of making important design decisions and evaluating, the design guidelines have been taken into account.

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DESIGN PHASE III

Prototype and Implementation

7. The Platform - Prototyping and evaluation

7.1. Introduction

In order to continue the description of the Action Design Research that has been executed, the *functioning prototype is described and evaluated in this chapter*. The prototype is build according to the functional requirements and follows the structural specification described in the previous chapter. Also, the artefact is evaluated under the premise the transaction costs of a traditional factoring platform could be higher. It answers the following question:

SQ6: Does an <u>online factoring platform prototype</u>, which follows the design requirements, enable financial investors to provide invoice financing to small and medium-sized enterprises?

To answer this question a real online factoring prototype has been developed. First it is explained how the artefact is developed, by elaborating on the software development method that has been applied. Secondly, the prototype itself is explained in more detail. Thirdly, the evaluation methods are explained, followed by their results and conclusion on the requirements. This chapter ends with a discussion and conclusion.

7.2. Software development method

Firstly, the software development method of the platform artefact is described. This is relevant as it will provide a context to how the platform has been developed iteratively with the users involved.

7.2.1. Agile software development and responsibilities

From an Information Systems perspective the technological development of the artefacts often fails due to the lack of interaction with its context (Rosemann & Vessey, 2008). Therefore, by using the principles from action design research during the building, intervention and evaluation (BIE) of the artefact have been applied. These entail Reciprocal Shaping, Mutually Influential Roles, and Authentic and Concurrent Evaluation. This study mainly focussed on the IT-dominant-BIE, which requires a lot of participation of the user in the process. In order to organise a good flow from user feedback to implementation, the well-known agile software development method Scrum (Schwaber, 1997) has been adopted during the process of developing the platform.

Scrum consists formally of a *backlog* of product features, which are all prioritized, and through an iterations that contain a certain amount of these product features are implemented (Schwaber, 2004). These iterations are referred to as sprints. During every sprint a 24 hour inspection period in which team members review each other's code and implementations. This method is effective for having a continuous development and improvement process of the product, which allows for rapid evaluation with the users. To implement the Scrum methodology, strict roles and responsibilities have been defined. As the prototyping is being done in a team of both internal employees and external it is important to define the roles. Table 33 shows an overview of the roles and responsibilities in the prototyping team.

Table 33 Roles and responsibilities of the prototyping research

Role	Description responsibilities	Responsible
Scrum Master	Organise and attend all Scrum Meetings,, Day to day Team and Project Management, remove roadblocks occurring during development, Define Product with User Stories, Assist implementing User Stories	-Advanon (Stijn Pieper, author)
Product Owner	Prioritise, test completed User Stories (UAT), attend Sprint Planning and Demo Meetings	-Advanon (Philip Kornman)
Product Owner Assistant	Support the Scrum Master and Product Owner in his roles. Bring in experience and advice, Attend Grooming and Planning Meetings	-Panter (Martin Mächler, Peter Schiratzki)
Scrum Team/Programmers	Attend Daily Stand-up Meeting, Demo/Planning Meetings, Implement User Stories, estimate User Story complexity	-Panter Development Team (consisting out of 3 programmers) -Advanon (Stijn Pieper, author)

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7.2.2. Project plan

The prototyping project have contained 5 sprints of 2 weeks each. The different sprint goals and timelines were as defined in Table 34.

Table 34 Project plan including the description and time period of the different iterations

Iteration	Description of product improvement	Time period
Sprint 1	Finish Seller side, Improve Quality	14.04. - 24.04.2015
Sprint 2	Finish Investor-side	27.04. - 08.05.2015
Sprint 3	Make full workflow possible	11.05. - 22.05.2015
Sprint 4	Finish Minimal Viable Product (MVP)	25.05. - 12.06.2015
Sprint 5	User Feedback/further Backlog Items	15.06. - 26.06.2015

7.3. Prototype

7.3.1. Through brainstorming from requirements to user stories

From the functional, context and user requirements that had been defined in the previous chapter, specific features had to be constructed. In order to achieve this, brainstorm sessions have been held at the end of every sprint. Each sprint had a demo meeting, in which the new version of the developed prototype was developed. From this demo meeting, the new user stories for the next sprint were obtained by brainstorming both with the product owner, the scrum team/programmers. From this brainstorm session, the backlog of user stories was been created, while keeping in mind the design guidelines that were guiding in the design choices. At the start of every new sprint, the user stories with highest priority were selected from the product backlog into the sprint backlog. In order to define the exact amount of user stories per sprint that would be possible, a specific planning meeting was set with the scrum team/programmers in order to estimate the complexity of every user story. This allowed to be better able to plan ahead and keep track of the speed of development throughout the whole project.

In order to keep be able to define specific features that would add value to the end-customer, all the feature definitions have been done by defining user stories. User stories are short stories from a user perspective, in which the action and the goal of that action is explained (Cohn, 2004b). By defining feature requests like that, it is prevented that the perspective of the end-customer is never lost out of sight. Appendix III shows all more specific user stories that have been created throughout the whole process. Table 35 shows the user stories very compactly aggregated.

Table 35. The main user stories

Id	Global user stories
US1	As a seller I want to be able to apply for liquidity finance online in order to get quicker access to cash
US2	As an investor I want to be able to buy invoices through a factoring setup in order to diversify my investment portfolio
US3	As a seller I want to be able to provide my invoices as collateral to investors through a factoring setup in order to get liquidity
US4	As an investor I want to be able to assess the risk properly before I buy invoices

During all the sprints, the empirical evaluation methods have been performed. From these evaluations many user feedback points have been collected. Furthermore, the internal team also provided feedback at the end of every sprint meeting. This feedback has been iteratively used in the first coming sprint planning meeting, in which the prioritisation decision has been made. Before that the feedback points have been analysed and filtered. The full overview of feedback points have are presented in Appendix IX on page 142.

7.3.2. Web engineering aspects

While working in a collaborative team setting on software development, the versioning of the code is always a complicated problem. In order to solve this the code has been developed on Git an open source document version control system (Loeliger & McCullough, 2012). Git is designed to facilitate distributed development and perform that quickly and efficiently, while maintaining integrity and trust and enforcing accountability (and many more features). It works with different branches, on which features can be developed and tested. A master branch has been established with a continuous integration service included that automatically tested the functional tests of the code. In case these tests were passes, the master branch is automatically deployed to a staging server on which the features were thoroughly tested by the internal team (similar to the practitioners in Figure 14). Only at the end of

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every sprint, when all features were accepted, the code features were tested by external users (end-users in Figure 14).

Four main development environments were used for this, being the production, staging, (automated) testing and development. The settings for the staging and production have been identical with the exception of seed data, which allowed for quicker internal user testing on the staging server. The testing server has been run by Semaphore, which performed the testing automatically before deployment to staging. A screenshot of the development environment of the author is shown in Figure 34.
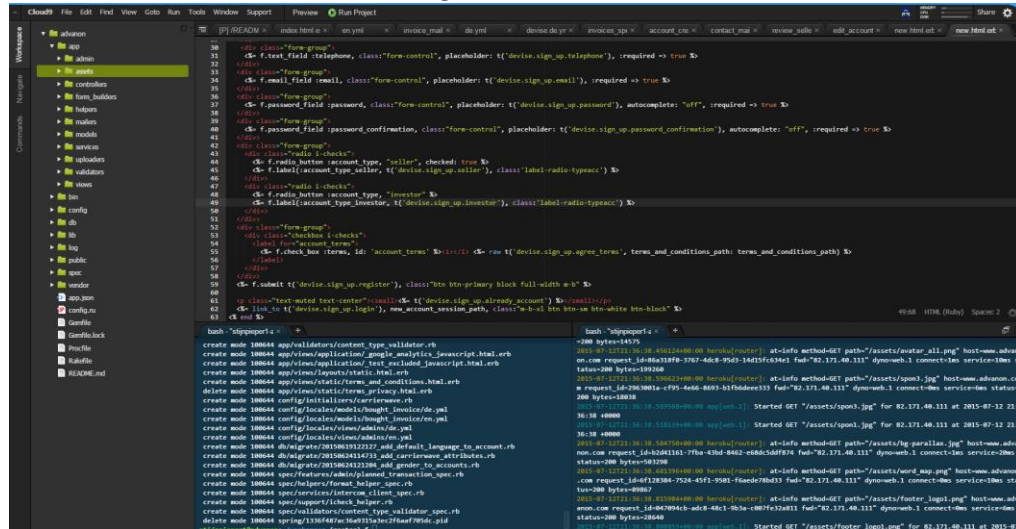

Figure 34. Development environment of the platform

The application code has been hosted on a closed repository of the Git hosting service Github.com. Through GitHub, the branch structure has been managed and code reviews have been performed in order to sustain a high code quality in the master and production branches. For an impression on the activity on the development, Last month, excluding merges, 6 authors have pushed 134 commits to master and 192 commits to all branches. On master, 150 files have changed and there have been 3,334 additions and 1,193 code deletions. In total, the author of this thesis, performed 135 commits, contributed 26,273 additions and 1,748 lines of code deletions over the course of the whole project, see Figure 35.
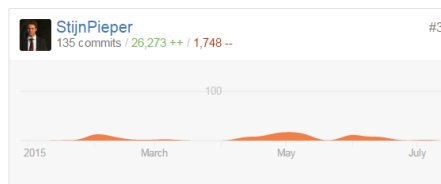
Figure 35. Contributions of the author over time

7.3.3. User interface

The user interface of the seller and investor side are depicted in Figure 36 respectively Figure 37. For the purpose of the presentation of the platform in this thesis, a copy of the current application has been created and can be viewed on the following link.

https://thesispieper.herokuapp.com

The possibility to experience the platform from a seller's perspective is possible through the following link and credentials.

https://thesispieper.herokuapp.com/en/accounts/sign_in
Login: test-seller@advanon.com
Password: test1234

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To experience the platform from an investor's perspective the following link and credentials can be used.

https://thesispieper.herokuapp.com/en/accounts/sign_in
Login: test-investor@advanon.com
Password: test1234

The author urges the readers not to change the settings of the users as it is only one account that is freely accessible and all changes will be permanent. In order to see the static result of the application, the screenshots are also depicted in Figure 36 and Figure 37.
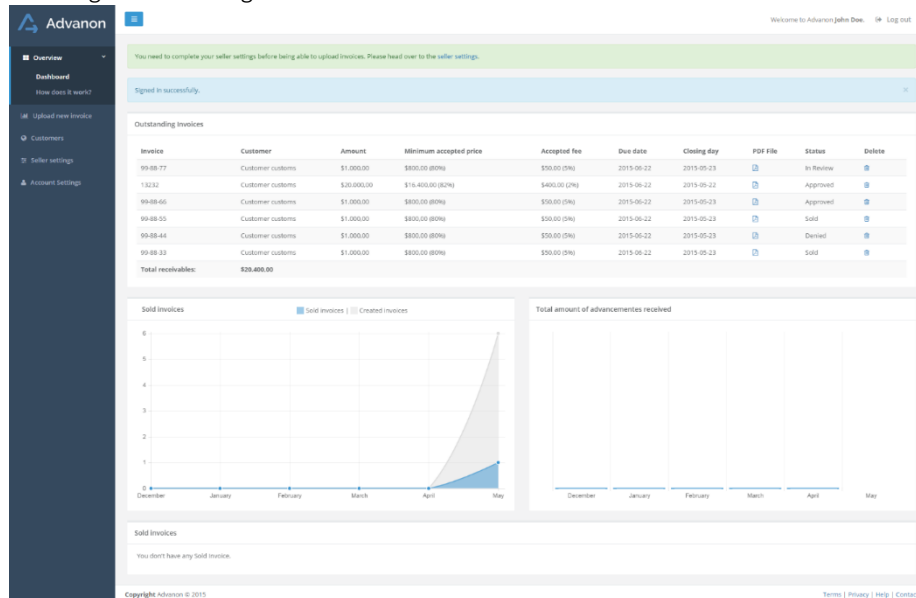
Figure 36. Screenshot of the seller overview page of the application
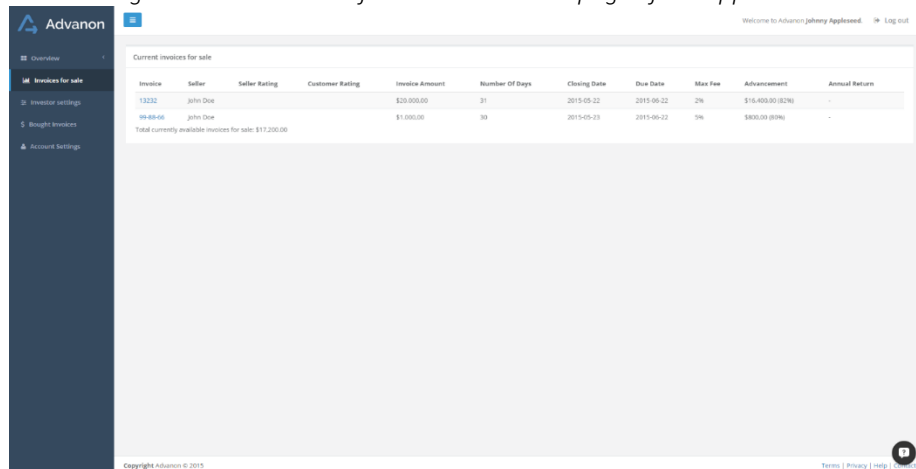
Figure 37 Screenshot of the investor "invoices for sale" page of the application on the investor side

7.4. Evaluation Methods

One of the most important validations are the ones that were executed when the platform prototype was designed and developed. Three methods have been used to evaluate the design according to the need of research and praxis. This chapter mainly covers the *formative evaluation*. First the evaluation based on experts are described, second the experiment and prototype survey is discussed, and third the log data analysis is explained.

7.4.1. Experiment and prototype survey

An experiment with one side of the users, namely the sellers, has been set up to evaluate it to be sufficing the requirements that were developed in Chapter 5. The main focus of the experiment and prototype evaluation is to see whether the platform suffices the **context requirements** and the **user requirements**. Throughout the

development process of the prototype, investors were also involved. However, as the amount of investors on the platform needed is small compared to those of sellers, and the amount of investors that were willing to use the platform was already sufficing, these evaluations were not explicitly included in this thesis. However, some insights were taken into account while evaluating the requirements. Also, the log analysis (next sub section), does take the investors into account.

The experiment and prototype survey has been set up with the insights from the literature study on the determinants on platform adoption. However, as became clear in the literature study that there is no clear overview of what these determinants are for the nascent phase of multi-sided platform development. Therefore, the most important ones have been collected from multiple sources and put together in a questionnaire that has been send out to the following two groups.

1) Financial directors or representatives or the management of potential "seller" companies that showed their interest in the platform either through the domain survey described in section 5.3.2 or through any other channel that has led them to the sign-up on the platform.
2) A group of students that understood the situation for which the platform was designed. This group was added to the questionnaire in order to grow the number of responses.

As one of the first questions, all the respondents was asked to fill in "How did you find our website the first time you visited?" All the respondents from group 2 were asked to fill in "personally know the founders". All responses with this answer were accordingly been classified as the student group. All other responses (for which a reasonable company was filled in) have been classified as group 1. It should also be noted that some of the questions had to be recode, due to the fact that it was an inverse question.

Questions on the platform specific features have been asked. These are shown in Table 36. These feature questions were set up in order to be able to better evaluate the artefact's adherence to the requirements. All the main features of the prototype (at time of the evaluation) have been taken into account in these questions. Furthermore, these questions were established by taking into account the user requirements R_u1 - R_u8.

Table 36 Features and their questions

Feature	Questions
Login screen	The login screen was easy to find The login screen was easy to use Any comments on the login details fields?
Financial information section	It was easy to find the place where I have to provide the financial information It was easy for me to provide these details I am willing to provide the cash balance and other financial information on the platform Do you have suggestions to improve the process of adding financial data?
Adding customer	I was able to provide all details of my customer easily How many customers will you add and sell invoices from if Advanon would be live? Do you have suggestions to improve the process of adding customers?
Accounting software	The "upload invoice" functionality was easy to use The manual upload of invoices and providing of data is a big barrier for me to use the platform Would you be able to export these data-points from your accounting-software easily? What kind of accounting software are you using? I think it will be better to upload customer data in integration with my accounting software on the platform. A full integration with my accounting software would be valuable for me
Customer delivery notification	I am willing to ask my customer to send a delivery notification Letting my customers that I have sold their outstanding invoices on Advanon is a problem for me

Furthermore, the artefact has been evaluated to be sufficing the requirements that came from the design guidelines that were informed by literature. Different questions that were asked have been based on the trust model presented in section 3.4, which includes most of the factors that develop trust and cover all design principles. The different use of the questions are depicted in Table 37. These questions are all adapted from the research from Wang et al. (2014). As explained in Chapter 3, Wang et al. (2014) provide a good overview of the most important

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features that create trust on a multi-sided platform. Their questions however are tailored for specific peer2peer financing platforms. In order to make sure that the questions were usable for this research, some adaption needed to be made. As the survey has been send out to real customers it should also be made sure that there were not too many questions that would create a negative experience. Therefore, in order to limit the number of questions, some of the questions were removed. However, it has been made sure that at least one question per factor was kept.

Table 37 Overview of constructed questions on trust and institutional risk

Factor	Questions	Reference
Perceived usefulness	I believe it is easy to get Advanon to do what I want it to do Learning to operate Advanon is easy for me Overall, I believe that the platform is easy to use	(Wang et al., 2014)
Ease of use	Using this platform would make it easier to gain liquidity Using this platform will enhance my effectiveness in improving my cash balance Overall, I find Advanon useful	(Wang et al., 2014)
Structural assurance	If I were to use Advanon, I will not be concerned about whether it will take care of lending security (e.g. the Lending Agreement) I am concerned about whether Advanon will prevent fraudulent users from undertaking lending activities	(Wang et al., 2014)
Institutional risk	I feel confident that encryption and other technological advances on the Internet make it safe for me to do business there In my opinion, the Internet is now a robust and safe environment in which to transact business.	(Wang et al., 2014) (Wang et al., 2014)
Perceived reputation	I believe that Advanon has the necessary technology knowledge to carry out online lending I believe the chance of having a technical failure on Advanon is quite small	(Wang et al., 2014)
Perceived privacy protection	I do not think that Advanon is collecting too much personal information about my company	(Wang et al., 2014)
Trust	My tendency to trust a person/thing is high Personally, I get the feeling Advanon is genuinely concerned about me Overall, I trust Advanon	(Wang et al., 2014)

7.4.2. Log data analysis and user interaction

Next to the survey also a log analysis of the user interaction with the platform has been performed. For this, a diversity of tools have been used, that are Google Analytics (analytics.google.com), Intercom (Intercom.io) and Mailgun (mailgun.com). By using these tools in the app its source code certain logs have been made to keep track of the user behaviour. The log data has been collected on the live platform environment, which has been updated at the end of every sprint (2 weeks). In order to achieve this, traffic of local development environments and the staging server had to be filtered. For this, the *hostname* was set specifically to contain or not contain 'advanon.com' or 'localhost'. The log data of the other environments is also evaluated on its number of sessions, users, page views, the average session duration and the bounce rate, but these results are considered to be less relevant.

The log data analysis will be mainly used to evaluate whether the platform actually had user sign-ups and what the user's behaviour consisted of. This has been done in order to evaluate the functional requirements and infer the evaluation of some context and user requirements.

7.4.3. Critical notion on survey and log data

As is the case with the other research methods, although both research methods have a quantitative approach, the sample of users it observes can diverge from the real population. In the log data this error can occur due to the fact that also employees visited the live environment, for testing or demo purposes. Due to this, the data can be skewed from that of the customers. Unfortunately, there was no possibility to completely be sure that all employee data was filtered out. In the survey, there must be put emphasis on the fact that a large part of the respondents (around 50%) were actually students of which some of them had their own company. This has been taken into consideration by comparing the student answers with those from real SMEs.

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7.5. Results

7.5.1. Evaluation of prototype based on questionnaires

Firstly the overview of the distribution of people who filled in the survey is depicted in Table 38. It shows a near 50/50 distribution of the respondents. As can be seen in Appendix VII, an independent sample test has been carried out in order to see if there were differences between both user groups.

Table 38 Answers to the questions: how did you find our website the first time you visited?

	Answer	N	Percentage
	Personally know founder(s)	9	56.3
	Word of Mouth	7	43.8
	Total	16	100.0

Table 38 shows that around half of the respondents that did the survey actually were real SMEs that did not know one of the founders personally before entering the survey. In order to take all the results that were filled in by people who personally know the founders have no significant bias from the independent SMEs that filled in the survey, an independent T test has been performed. Based on the results in the Appendix the two user groups do not show significant differences on the different factors, only the question: I am concerned about whether Advanon will prevent fraudulent users from undertaking lending activities, did so. This means, that if equal variances are assumed, on the persons who did not know the founders on average scored .42 higher in the group that did not know the founders beforehand. This could indicate a slight bias in that question. However, in order to be able to analyze the small amount of responses, they are still assumed to be a homogeneous group of SMEs.

The results of the feature specific questions are shown in Figure 38. It shows that the willingness to provide the cash balance would be a problem that requires attention. Furthermore, the manual upload of invoices is not a real big barrier for most of the respondents, however, it was derived from the interviews that some sellers who wanted to upload large amounts of invoices (which is good for the security of the investments and thus should be stimulated) did feel this as a problem.
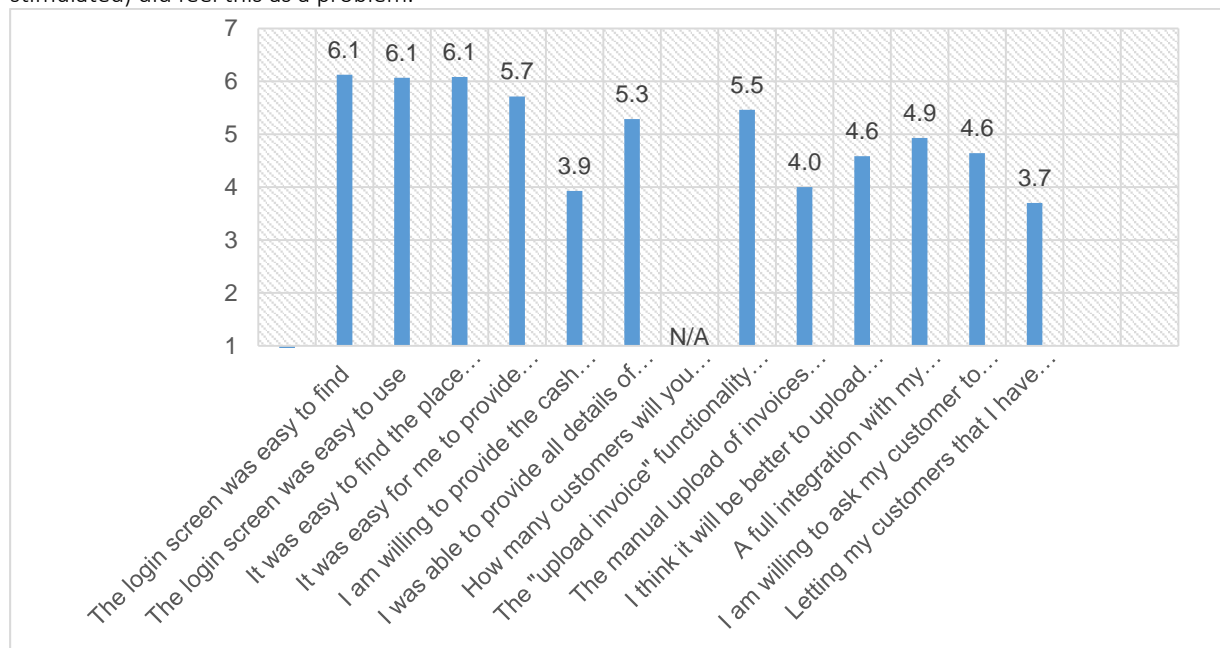

Figure 38 Mean of the answers of the feature specific questions, N=17

The register button has not been tested, but the ease of use of registering is evaluated with the log analysis. The sign-up ease of use is perceived to be high, with a mean of 6.33 and 6.07. Both of these questions can then also be seen statistically having a higher median than 4, with a significance level lower than 0.05. This has been evaluated with the one-sample Wilcoxon signed rank test. The same significance could be found on the question I was able to

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provide all details of my customer easily, I am willing to ask my customer to send a delivery notification and the place to find where to upload the financial information. All other questions did not significantly diverge from 4. Although these statistics tell us something about the way users thought about the ease of use of the platform, they should be taken with care, as the number of responses have been very low. Never-the-less, some of the requirements of the platform could be evaluated by this survey. Table 40 shows the list of requirements and their conclusion based on this survey.

Table 39 The conclusions on the requirements that could be tested by this survey

Id	Requirement	Conclusion
R_u1	the design should be extremely easy accessible (low entry barrier)	The registration is tested in the log analysis, but the sign-up functionality is perceived to be easy to use.
R_u4	the design should be perceived to be easy to use by potential sellers and investors	The evaluation indicates that the design is perceived to be easy to use by potential sellers. Investors were not tested specifically in this evaluation.
R_c7	the design should allow for easy customer information sharing	The features that allow customer sharing have been evaluated positively. Even though the manual uploading of invoices was thought to be a big barrier for the users, the results indicate that this was not really the case for the users who tested it. Also, the mean rating of 5.0 for an automated accounting system (see appendix VII) did not indicate this need. However, this feature would provide even more easier data sharing, which will allow the design to be better able to serve sellers with a low information asymmetry, as they will be automatically sharing the most important data on their customer.

As a first step in explaining the results of the summative evaluation an overview is provided of the mean answers on the different factor questions in Figure 39. An important notion can be seen that the question about the lending securities has been answered seemingly significantly lower than the other factors.
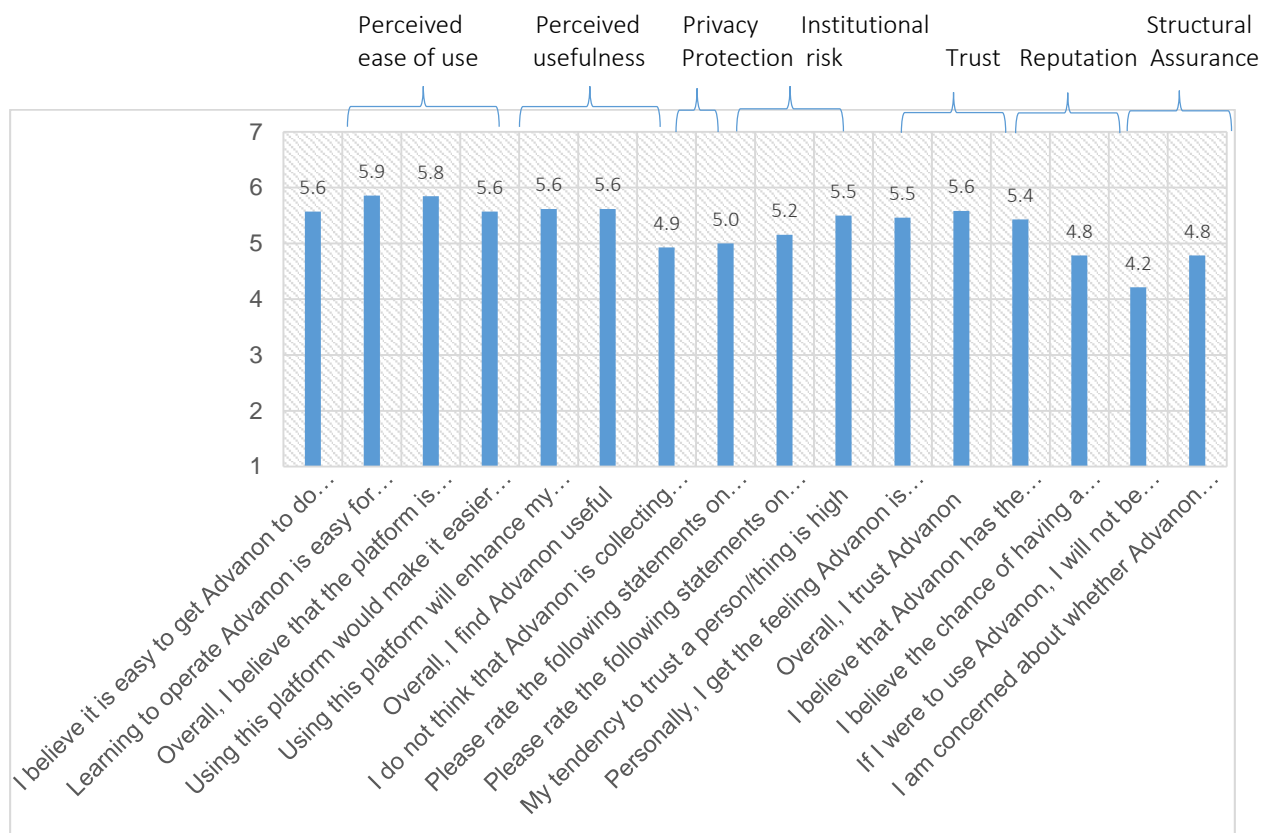

Figure 39 Mean of responses of questions on on trust and institutional risk on a 1-7 scale, N=17

In order to understand whether these questions actually have been filled in higher than the expected median value of 4, a one-sample Wilcoxon signed rank test has been performed. For this test to be performed the data should be of at least ordinal scale, which is the case for this sample. The outcome of the tests are shown in Appendix VII. As noted, some of the variables had to be inversed, due to way the question was asked. It should be noted that all variables had a significantly diverging median from 4, except for the two questions on technical failures, which are part of the structural assurance. This implies that the technical failures on the website had the biggest impact on the users, causing them to not be as satisfied with this, as with the other constructs.

As these variables and questions have been constructed from the same constructs that (Wang et al., 2014) uses, it can be concluded that the perceived trust that has been created on the prototype of the Advanon platform was fairly high. However, it should also be noted that the amount of responses to the survey actually limits the amount of statistical tests that can be performed. Therefore, these conclusions have to be taken with care. Not only are these results good to show the acceptance factors of Wang et al. (2014), they also provide another formative evaluation method for the requirements that relate to these acceptance factors.

Table 40 Conclusions on the user requirements from the evaluation

Id	Requirement	Conclusion
R_u1	the design should be extremely easy accessible (low entry barrier)	The registration is tested in the log analysis (see section 7.5.2), but the sign-up functionality is perceived to be easy to use.
R_u2	the design should be perceived trustworthy	The evaluation indicates that the design is perceived to be trustworthy.
R_u3	the design should be perceived to be useful by potential sellers and investors	The evaluation indicates that the design is perceived to be useful by potential sellers.
R_u4	the design should be perceived to be easy to use by potential sellers and investors	The evaluation indicates that the design is perceived to be easy to use by potential sellers.
R_u5	the design should be perceived to have highly privacy protection standards by potential sellers and investors	The evaluation indicates that the design is perceived to have a high privacy protection standard by potential sellers.

7.5.2. Evaluation of prototype based on log-data

With the log data analysis, two main areas of interest have been evaluated: the use of the main functionalities and the user sign-ups and user retention. They will be respectively discussed.

Evaluation of the use of the main functionalities

The main features have already been user tested in the prototype survey, however their real use has been used to evaluate the main functional requirements of the platform. In order to evaluate the main functional requirements it should be made clear whether it was actually possible to sell invoices through the platform. During the prototyping phase, the number of financing transactions that have been completed (data from the administration interface, filtered for testing data) directly through the platform are listed in Table 41.

Table 41 Invoices sold through Advanon (on 18 August 2015)

Count	Number of sellers	Number of investors
3	1	2

Based on the fact that the prototype enabled the invoice transaction to take place, the functional design requirements have been concluded to suffice, as this proves as well the enabling of direct interaction between SMEs and investors, the fact that invoice financing to SMEs can be done through a platform and the platform can serve as an investment vehicle for private investors. The only notion that should be added to this, is that all the module functions have been done manually. This means that the credit data provisioning, the bank transaction, the accounting data entering, that in a later phase should be taken over by external parties. Also some due diligence and contract signing has been done manually. However, as this thesis only considers the prototype phase of the platform, and these modules could not have been developed yet and the manual actions are only seen as a proxy of the eventual design of the platform. In that design, modules either develop their own interface or the Advanon develops it for them. Table 43 lists the simple conclusions that have been drawn based on Table 42.

Table 43 Conclusions on the functional requirements

Id	Requirement	Conclusion
R_f1	the design should enable direct interactions between SMEs in need of cash and investors	As the prototype was able to have an invoice financed through the platform – even though some module actions and legal issues were solved manually – the platform is considered to suffice this functional requirement
R_f2	the design should provide invoice financing to SMEs	As the prototype was able to have an invoice financed through the platform the platform is considered to suffice this functional requirement
R_f3	the design should provide an invoice investment vehicle for private investors	As the prototype was able to have an invoice financed through the platform the platform is considered to suffice this functional requirement

Evaluation of the user sign-ups and user retention

First, an overview is given on the tracked user sessions during the period of the platform development. The sessions, users and page views per environment are presented in Table 44, together with their average session duration and bounce rate. A high bounce rate indicates a large number of visits without interaction with the page. It is defined as the number of visitors viewing only one page divided by the total entries to the page. The bounce rate is 68,51% for the production environment, which is low compared to the average bounce rate of a landing page[2].

Table 44. Tracked user sessions of the platform

Measurement period	Environment	Sessions	Users	Page views	Avg. Session Duration	Bounce Rate
18/05/2015 – 11/07/2015	All traffic (incl. bots)	108,864	107,872	178,126	00:00:07	61.83%
18/05/2015 – 11/07/2015	Blog.Advanon.com	1,733	1,113	4,571	00:02:40	67.23%
18/05/2015 – 11/07/2015	Development and Localhost	3,482	2,500	11,668	00:03:32	69.61%
18/05/2015 – 11/07/2015	Only production	1,712	1,106	4,408	00:02:32	68.51%

This table was generated on 12/7/15 at 9:38:31 PM

As the production environment contains the live version of the prototype, the visitor flows from this environment has been further analysed. A more elaborate view on the user data can be found in Appendix VIII. The trends, as can be seen in Figure 40 is seemingly upwards since the measurement started.
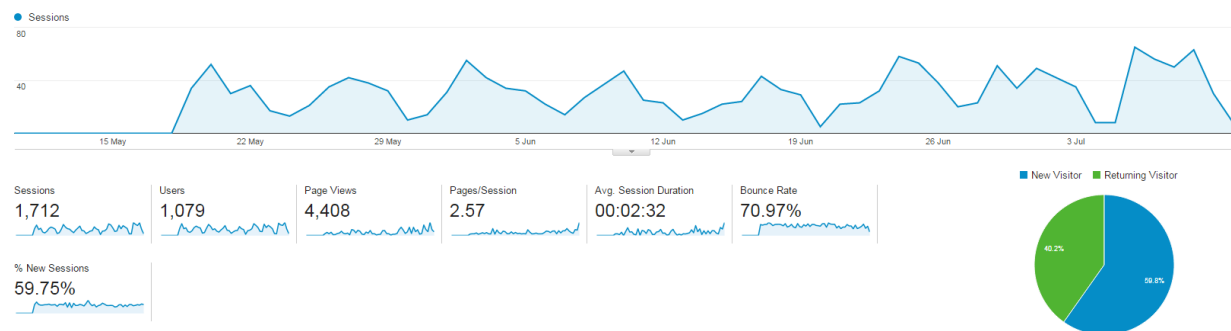

Figure 40 Overview of visitors over the period 18/05/15 12/07/15 on the platform

User flow diagrams on the platform can learn us a lot about the retention and behaviour of the users on the platform. Figure 41 shows the user flow of the new users on the platform filtered on the direct bounce sessions. It for example shows that the majority of the users on the website came from Zurich area, where the platform was developed. One important remark can be taken from the diagram is that a very high bounce rate after the first sign-

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[2] The average bounce rate of landing pages is 70-90% and the overall average bounce rate of all websites 40% (Kelly, 2012).

up is taking place. This is most likely due to the fact the account firstly has to undergo its due diligence process and still needs to be activated. Furthermore, it can be noted that a reasonable amount of the users 93 of the 463 actually clicked on sign-up, which can actually be considered to be a high ratio for industry standards[3]. From this can be concluded that, even the sign-up rates are high, the usability of the sign-up process should be improve on the information provision. Only 21 out of 93 visitors on the sign-up page actually signed up. This means that the sign-up process itself should be improved.
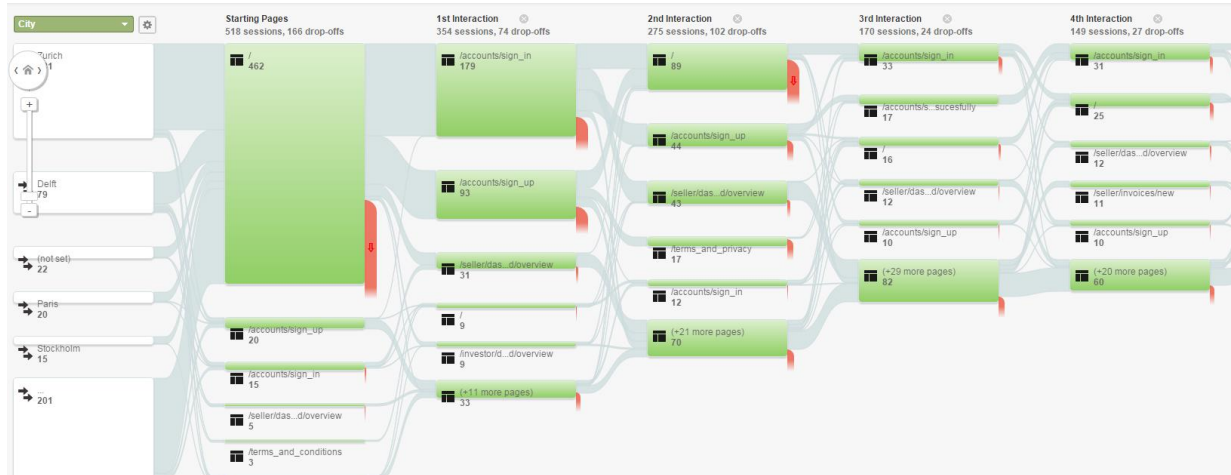

Figure 41 Userflow of the new users on the platform filtered on the direct bounce sessions

The user interaction did not only take place through the web interface. Trackable interaction with the users has happened through email and in-app messaging. The percentage of clicks in the mails went from 0 and 17% in March and April to 21% in July. However, in these mails internal and external traffic could not be selected.
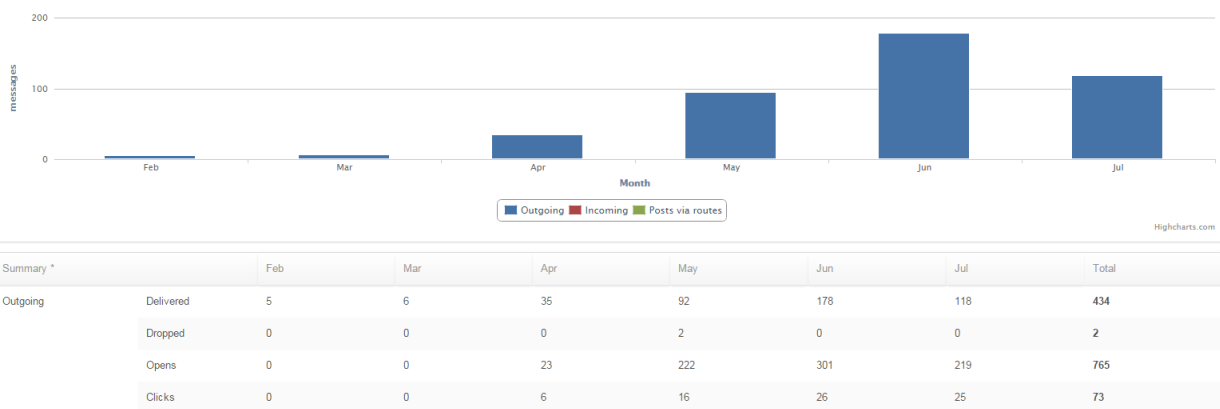

Summary *		Feb	Mar	Apr	May	Jun	Jul	Total
Outgoing	Delivered	5	6	35	92	178	118	434
	Dropped	0	0	0	2	0	0	2
	Opens	0	0	23	222	301	219	765
	Clicks	0	0	6	16	26	25	73

Figure 42 Clicking behaviour on the links that have been send out through the platform

The log data tells us that the visiting rate has been growing, however only slowly. The bounce rate of visitors, shows that the website scores comparably high on the retention of visitors on the website. What can also be seen again in the user flow diagram, is that a fairly large amount of the users actually click on to the sign-up page, but not all sign up at that time. This means that the low sign-up barrier can actually still be improved and that the easiness to sign up should be one of the focus points for further development.

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[3] A typical landing page conversation rate across industries is 2,35 percent, whereas the top 25% converts at 5,31 percent (Kim, 2014)

Table 45 User requirement 1 and its conclusions based on the log data evaluation

Id	Requirement	Conclusion
R$_u$1	the design should be extremely easy accessible (low entry barrier)	The registration and conversion rate of the platform has been analysed through the log data. The data shows a good part of the visitors actually visiting the sign-up page, however, only a small portion of that actually signs up. This means that there is a barrier in the sign-up process that can be improved.

7.6. Discussion and conclusion

The information of the previous chapters have served as the input for the prototyping and evaluation of the platform. As a structural specification of the platform has been laid out in Chapter 6, this chapter focussed on explaining the development of the prototype artefact and its evaluation. It aims at answering the question: *does an online factoring platform prototype, which follows the design requirements, enable financial investors to provide invoice financing to small and medium-sized enterprises?*

In order to answer this question, first the development process has been elaborated upon. Although the development process has not been explicitly evaluated in this thesis, it had a great impact on the actual outcome of the prototype artefact. It was crucial in the selection of the user stories that were obtained by brainstorming at the end of every sprint of the scrum methodology. These design decisions, guided by the design guidelines, eventually shaped the designed platform prototype. Also, the implementation had of course a big impact on the fact whether the prototype would actually suffice the design requirements that are described in Chapter 5.

Next to the development process, an overview of the web engineering aspects of the artefact are presented. A screenshot of the user interface and a link to a separate staging server are provided for the purpose of this thesis, in order to better show the viewer an overview of the artefact. By showcasing the artefact it is shown that the actual artefact was built, the technical implementation details are better understood and the look and feel of it is better presented.

The real answering of the sub-question is being done in the two formative evaluation methods of the prototype experimentation, based on (1) a questionnaire/survey and (2) log-data. Based on the outcome of the survey, the user requirements R$_u$1, R$_u$4 and R$_u$7 could be evaluated with questions on the main features that had been implemented. The main features considered the basic data sharing and facilitating the exchange of the factoring transaction. The requirements were be evaluated positively. The user requirements R$_u$1 - R$_u$5 could be evaluated by using the constructs that are thought to determine trust on a platform, as has been indicated by Wang et al. (2014). All of these requirements could be evaluated positively as well. This evaluation also allows to evaluate the usefulness of the design guidelines and literature. This summative evaluation will be elaborated upon in the next chapter.

The results of the evaluation based on the survey and on the log-data must be taken with caution as there might be errors or biases in the data. This is best explained due to the fact that the research was done in a live very fast moving context, where only limited time and resources were available. This for example meant that, although it should be preferably independent respondents, the respondents of the survey were for around 50% students that were only loosely affiliated with an SME and knew one of the founders. The other half consisted of real financial executives from SMEs that were approached by or did approach Advanon, which made a total of 16 respondents. Due to the limited resources the number of respondents could not be grown drastically. Within the analysis this has been taken into account.

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FINISHING PHASE

Evaluation

8. Summative evaluation of the design and theories

Even though this research might be written down as if it was a linear design process. The ADR research methodology prescribes, apart from the reflection and learning throughout the design cycle, a phase which is called the **formalization of learning** at the end of a cycle. In order to formalize the learnings from designing the theoretically informed design, the following question needs to be answered.

SQ7: To which degree did the state-of-the-art kernel theories inform the factoring platform design and was it useful?

In order to answer this question, first a design criteria evaluation of the platform artefact is done in order to see whether the design (including the concrete prototype) suffices to the design guidelines that have been derived from literature and whether this eventually made the design achieve the theoretical expectation. Second, a reflection on the kernel theories is described. Third, a reflection on the ADR method is done. Fourth and last, based on the learnings of using the guidelines in this design study, more general principles are formulated for the different design aspects of designing.

8.1. Design evaluation based on the theoretical criteria

From the literature review in Chapter 3, multiple conceptual design guidelines have been created that aimed at guiding the platform design in achieving up to its theoretical expectations. For this, three main design evaluation criteria on which the platform needs to be evaluated upon have been formulated from theory. Furthermore, five design evaluation criteria have been established, based on the theoretical opportunistic behaviour of sellers. In order to evaluate the sufficiency to which the artefact achieved the first criterion: the factoring platform should lower the overall transaction costs compared with traditional factoring, the formative evaluation that has been performed throughout the design cycle is taken into account to explain the 'score' of the artefact on the other design evaluation criteria. Only after that, the first design criterion is evaluated.

Platform scoring on mitigating the theoretical barriers

The assumptions that were established based on the first hunch, iterative interaction and the literature have been evaluated both with user interviews and a survey. From this evaluation it became clear that there the research and initial hunch was right in the fact that factoring was not yet used or accepted widely. However, it was difficult to pinpoint the exact need for liquidity within a market where people in the phone interviews did not easily provided insights on what their liquidity status was and they did not like to elaborate too much on the financing methods they used. Similar, in the survey, it could not be statistically proved that there was a majority of the SMEs of the group of respondents actually had a problem with their liquidity. As the main assumption from literature on liquidity suggested that liquidity really is a problem, the assumption had to be changed into a more subtle one that only *some* Swiss SMEs encounter this problem. Due to this insight, the focus of the design shifted a little bit more into a niche of SMEs that have a liquidity problem. The design requirements have been changed in order to focus more on the asset specific SMEs, which actually helped focussing the targeting market. In the structural specification the specification of the users have been performed more in detail. In the end, as in prototype design it later could be concluded out that the platform was indeed a solution to this specific market of companies that operated in more asset specific industries, Food production/Production of Metal Products/Architecture and engineering. This makes it arguable that the platform **scores high on design evaluation criterion 2**: the factoring platform should be able to serve sellers that have a higher asset specificity than with traditional factoring. With this, *design guideline 3* is evaluated to be **useful.**

As it was difficult to measure the information asymmetry of the sellers with their customer, it is also difficult to evaluate the design on design evaluation criterion 3. To understand if platform factoring is a better solution for sellers that have a lot of information on their customers, the data sharing on the platform needs to be understood. It was difficult to find out which data actually had to be provided to factoring companies. The questions in the domain survey on the data that SMEs had to provide gave insights in what kind of data they were sharing, but did not provide insights in the difficulties that they had with obtaining data on their own company and the data of their customers. In the structural specification phase, the specific data-points to do the credit rating have been established based on the empirical evaluations and literature. The prototype survey included questions on the ease of use of and usefulness of the data sharing feature and the potential added value for customers to export this data automatically from their accounting software. The results indicate that the current prototype made it already easier

to share data of their customers. This allows sellers that have a lot of information on their customers to be considering factoring in a platform setup, as it makes it very easy for them to share their data. For this reason, it can be argued that the current prototype **scores high on design evaluation criterion 3:** The factoring platform should be able to serve sellers that have less information asymmetry between them and their buyer than with traditional factoring. With this, *design guideline 3* is evaluated to be **useful**.

Platform scoring on mitigating the theoretical social constructs

Five types of social constructs have been identified to be in place in a factoring solution. To mitigate these on a factoring platform, they all have to be taken into account. They are therefore individually discussed. The current design scores as follows:

- *Medium* on **design evaluation criterion 4:** the platform setup should lower *moral hazard* compared to the traditional factoring setup. Traditional factoring platforms usually have very strict credit risk rules on which they decide if an SME is financed. On the current design of Advanon, more types of sellers can be applying for pre-financing. Due to the focus on easy information provisioning, the platform is aims to be able to still able to assess this risk. However, there is no evident reason why the current platform would perform better or worse than a traditional factoring. The platform is therefore evaluated to score medium on this criterion.

- *High* on **design evaluation criterion 5:** the platform setup should lower *adverse selection* compared to the traditional factoring setup. In order to prevent the seller from providing bad invoices only, multiple safeguards have been put in place. Traditional factoring companies sometimes force the seller to sell all its invoices. The current design of Advanon provides the possibility to only sell *one* invoice, but these invoices are sold *with recourse*, meaning that the seller is still partially responsible for it. Furthermore, they are not allowed to sell their invoices on other factoring providers. Assuming a seller holds to its contract as good as on traditional factoring, the platform is evaluated to score high on this criterion.

- *Medium* on **design evaluation criterion 6:** the platform setup should lower the chances of *distorting important business information* compared to the traditional factoring setup. Traditional factoring is usually more based on human assessment and provision of financial credit data. With the current version of Advanon all this information provision is much easier. The current version makes it easier to share data, but not better to control the validity of it. Only when automated links with accounting software would have been created, the chances on valid data is lower. Therefore it is recommended to focus on making an effort to integrate these systems, but for now the platform is evaluated as scoring medium on this criterion.

- *Low* on **design evaluation criterion 7:** the platform setup should lower *minimize shirking* compared to the traditional factoring setup. As the current version of the platform still uses manual signing in order to complete the transactions, there is no reason to explain to assume that the platform could do this better. Moreover, as "new" types of sellers are allowed on the platform and there is still little expertise on this, there is a risk to even be worse than a traditional factoring company. This should therefore be one of the highly priorities focus points for further development.

- *Medium* on **design evaluation criterion 8:** the platform setup should lower *reneging* compared to the traditional factoring setup. As the current version of the platform still uses manual signing in order to complete the transactions, there is no reason to explain to assume that the platform could do this better. However, by being careful for accepting first customers, the current version of the platform can be evaluated to score medium on this criterion.

Based on these evaluations, it is now possible to rate the **design evaluation criterion 1:** the factoring platform should lower the overall transaction costs compared with traditional factoring. By looking at the way the current version of the platform could mitigate the barriers of factoring and social constructs, shows that it did a good job on making sure that the effects that are created by having an *online* version of factoring, which creates more information asymmetry, have been coped with. The way the current version of platform handles different types of transaction costs are all quickly and roughly discussed.

- Search and information costs are not yet enough reduced with the platform, as it is still sometimes perceived difficult to understand the concept just from the website. Furthermore, the platform does not have a large enough volume to be more easily found than the traditional factoring solutions.
- Monitoring of the sellers on the platform will only become easier, when the accounting systems have been integrated and the social constructs that still score low have been improved. Also, when a certain critical

mass has been achieved, it will become easier to compare different SMEs cross-industry, while dynamically monitoring their and their customer's financial status. Only under these conditions the monitor costs can be expected to go down.

- There is no indication that the enforcement costs of the contracts is not lower than for traditional solutions.

Concluding on this evaluation, it cannot yet be concluded if the current version of the platform lowered the transaction costs compared to traditional factoring companies. However, the prototype evaluation did indicated that the trust that is created on the platform is already good, as most of factors from Wang et al. (2014) scored higher than the expected average.

As a lot the design decisions have been based on the premise that the platform would actually lower the transaction cost, it is of vital importance that the platform indeed (as Tan et al. (2015) indicates) should focus more on gaining momentum and getting to a critical mass in which these transaction costs are measurably lower than for traditional factoring. It will be interesting to follow the progress that Advanon will make in attaining this momentum. The success here-off will not be solely be dependent on the platform design, but it will definitely have a great impact on it.

8.2. Reflection on kernel theories

Doing a literature review on the theories that could inform the design of an online factoring platform was in the first place difficult, as there is currently a lack of publications about the concept of platform and ecosystem *design*. While platforms have been widely discussed in management and economic literature, the translation to design guidelines cannot be found in the state-of-the-art literature.

In order to fill this gap a certain research aimed at, while designing a platform for a specific domain, to gain fundamental knowledge on the problems barriers that currently exists for that solution that could be solved by introducing it in a platform setup. As the design focusses specifically on the design of the complex phenomenon factoring on an online platform, it helped to first investigate more traditional theories on transaction costs. By taking this fairly fundamental economical view on factoring, the theoretical barriers and constructs of opportunistic behaviour are explained that currently exist within the factoring solutions. It helped to understand the logic behind why factoring works or why it does not work in certain situations and what types of opportunistic behavior needs to be taken into account when designing the platform.

Platform theories helped to understand mainly why platforms can be beneficial from an economical or management point of view. There currently still is a gap in the publications for prescriptive design knowledge on platform design. The literature review on financial platforms showed that there are numerous platforms being created and more and more business models adopt certain elements of platforms. However, the IS design literature mainly described a technical definition of a platform being an extensible code-base. Although, a product platform like this has brought insights for the Advanon platform architecture, it did not provide enough knowledge on how platforms should be designed and developed for the purpose of growing out of the nascent phase.

While trying to synthesize the learnings from platform and transaction cost literature, two of the most useful (both for developing the design guidelines as well for structuring the evaluation questions) were the works of Tan et al. (2015) and Wang et al. (2014). The first provided insights in the main strategy that an early stage platform design should be taking. Obtaining trust and momentum were a useful insights to focus within the design process. Secondly, Wang et al. (2014) provided good inputs for the design guidelines and evaluation of the prototype. By using the factors that influence trust, a survey could be held that evaluated the platform trust in a more elaborate way.

8.3. Reflection on the design method and process

Although the report presents the results according to the setup of Verschuren and Hartog (2005), it actually followed the ADR method. This means that a certain abstraction has been done in order to present its results. Using the ADR approach has provided some insights in how design can be done in an action setting. However, they did not provide a clear view on how to present these.

Furthermore, while the ADR principles should have been guiding the process setting up the research and framing the problem in a design context, it did insufficiently give guidance to the way this could have been structured. As adding theoretical knowledge is of a complete different order activities than the design process itself, the separation of the formalizing of the learning and the reflection and learning of the phases, the formal separation in the ADR framework is indeed in place. However, from a practical point of view, it becomes unclear how these

things should be separated. Even if time is used to separate the both formulating the learnings can be difficult from within the context that the designer is. This means that there would need to be more guidance on how to set up the formalization of learnings. Especially guidance is needed on how a continuous literature review can be implemented within the design cycle. This case shows that learnings are often implicitly used, however the presentation of a literature review in a scientific paper is expected to have a more structured approach.

However this thesis produces guidelines for future practitioners, it should be mentioned that this study is only one case that was done in a specific context. The conclusions were made in a factoring setup, in Switzerland. As the literature has been the guiding force behind the design guidelines, the efforts to search for certain learnings in literature, is dependent on the view of the designer. Moreover, the research was influenced by the capacities of the researchers and practitioners. Meaning that a specific team, consisting of the founders and others, did provide a specific knowledge to the table that was all used during the design process.

Another more practical limitation to the design process was the fact that investment possibilities in the development of the artefact were limited due to the fact that financing was not available during the process. This could have also influenced the results. Last, but not least, the time frame in which the research has been performed has been extremely limited.

While performing this research some difficulties have been encountered that relate to the context of the research. For example the fact that the research has been partially performed abroad, in a location where the local language is German, created both some technical as well as some social difficulties. The practical difficulties arose from the fact that for example the survey I has been send out in German to SMEs, in order to make it more understandable for them. However, for the purpose of this thesis, these had to be translated back to English. Also, a second check, by having them translated back to German, caused a lot of extra work that did not per se contribute to either the research or the business.

8.4. Reflecting on the design guidelines

Using the design guidelines emanated from literature provided guidance to the design process throughout the thesis. However, the use of these design guidelines need to be reflected in order to fully understand their contribution. As a reflection on the design guidelines, some additional design principles from the learnings in practise as a recommendation for future practitioners and researchers to validate. It needs to be said that they still need to be further supported by theory.

The design guidelines used in this thesis have been mainly stemming from very fundamental transaction cost economics. While there is a lack of design guidelines in general for multi-sided platforms, especially in the financial domain, this fundamental approach is seen as valuable. Especially in determining the key focus points for the IS design (trust and momentum) and designing the organisational arrangements. By adjusting and simplifying the design guidelines, it is aimed to provide a clear view for practitioners on how to start the design process:

- Start with define a unique value proposition
- Check for continuously if all IT efforts either add trust or help obtain momentum
- Set goals for and measure your momentum by:
    a. piloting with prefixed number of early adopters (and do not stop until you have them)
- Set goals for and measure your trust by:
    a. the platform's perceived ease of use and perceived usefulness
    b. the platform's perceived structural assurance and perceived privacy protection
    c. the platform's positive reputation, links with trustworthy third parties and the social influence

However, it must be said that the fact that the principles mainly were concluded from transaction cost economics, the other economic effects underlying platforms, such as network effect and lock-ins, have come forward too little in the design guidelines. Furthermore, the design guidelines do incorporate enough the practicalities from an IS perspective.

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9. Discussion and conclusion

The main goal of this research was to design and prototype an online factoring platform to enable small and medium-sized enterprises to get liquidity financing by private Investors more directly. This design should aim at allowing small and medium-sized enterprises to gain easier access to cash which can be used to grow their businesses. In order to have a scalable platform, the design should be open and reusable for comparable problems. The research should provide an answer on the question of *how can an online multi-sided platform be designed as such that it enables financial investors to provide invoice financing to small and medium enterprises aimed to lower the overall transaction costs?*

The main findings, contribution to theory and method, the contribution to praxis, the limitations and suggestions for future research are presented in this chapter.

9.1. Main findings

This research has started because of the notion that there is a lack of financial alternatives for SMEs to improve their liquidity. One of the alternatives to obtain liquidity is invoice financing. The problem with the traditional invoice financing that it has a relatively high risk and information intensive transactions. This results that factoring is often considered as an expensive financing alternative, due to these high transaction cost.

It is though that a multi-sided platform setup is able to improve this situation due to the fact that it can directly link SMEs to private investors, with less transaction costs. However, there is still a lack of knowledge on what the implication of this premise of lower transaction costs should be on the design of MSPs and a lack of general -empirically proven- prescriptive knowledge on how digital MSPs can be designed. In order to solve this gap, the following question has to be answered.

How can an online multi-sided platform be designed as such that it enables financial investors to provide invoice financing to small and medium enterprises aimed to lower the overall transaction costs?

Justificatory knowledge on transaction cost economics can be used to understand the problem of traditional invoice financing better. By reviewing such a fundamental theory evaluation criteria for invoice financing on a platform can be derived. The main barriers and social constructs of opportunistic behaviour that hinder traditional invoicing can be used to focus the efforts of the platform design to. By viewing platform theories also from a transaction cost perspective and combining them with the earlier learnings, design guidelines can be established that can inform the design of the platform. The most important design guideline that can be used for the nascent phase of the platform design is to dedicate all IT efforts to 'building platform trust' and 'attain momentum'.

Design science literature provided insights in methods that could be used for the study in which the design challenges are solved in a live environment, while keeping its rigour. By following an Action Design Research approach, it was possible focus on the design of a functioning artefact in an action setting, while continuously learning and improving. At the end of the cycle the generalized learnings have been defined in this report. This learnings have been structured differently than the chronological order in which they took place.

Starting off with the verifying the theoretical assumptions, the problem can be further specified and the design requirements change. The change of these requirements can be an implicit step, but it helps to formalize these steps to better understand the impact of the verification study. By iteratively designing both the technical architecture and organisational arrangements of the platform, it can be made sure that an effort is put in solving the problem in practice. By using the design guidelines this design can be steered into a so-called "theory ingrained" artefact. On top of the architecture and organisational arrangements, a designing a prototype really helps to improve the main concepts and assumptions more rapidly.

The main problems of factoring in Switzerland that could be solved by a multi-sided platform were identified. The assumptions were based on the initial hunch or theory. The main assumptions, that there actually is a problem with the liquidity and credit risk management at Swiss SMEs. This indicates that the targeted user groups of the platform had to be more specifically defined. Those target groups have been depicted in the structural specification. On top of the assumptions are the design requirements for a multi-sided factoring platform defined. They represent the main goal, context and user requirements. The design should create value by enabling direct interactions between sellers and investors. The main functional requirements are: the design should provide invoice

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financing to SMEs; the design should provide an invoice investment vehicle for private investors; the design should be modular and allow third party modules to be connected to it.

By defining and evaluating the problem for SMEs, an architecture and structural arrangements on the platform could be constructed. As such that it enables financial investors to provide invoice financing to small and medium enterprises. Many things have been learned on the architecture of a platform. For this literature on modularity was really useful. Eventually, this practise seemed easier done than defining the organisational arrangements. The latter took a lot of time to iteratively define. This was due to the fact that they both have a large basis in social mechanisms and the way they are constructed had to be evaluated with the users and module providers.

On the seller side a survey and log evaluation showed that the trust in the platform on the seller side is good. The interest of using the platform on the investor side was already clear in the structural specification phase. This might be due to the fact that both user types have been involved in the design process at an earlier stage. With having a few investors ready to invest, the main focus should now be probably going to the adoption on the seller sides.

Concluding on the main aim of this research – *lower the transaction costs of invoice financing by re-introducing it on an online multi-sided platform* – could not directly be evaluated in the early stage development. The effects of the design on the transaction costs cannot be evaluated, because the number of users on the platform both 1) do not yet provide these transactional benefits and 2) are not yet measurable and comparable to traditional factoring, as the standards of how the platform is set up are still continuously evolving. However, in order to really solve the problem of traditional factoring, the use of the design guidelines and the evaluation of them showed that there still are things that can be done and measured to reduce these transaction costs. Concretely, by measuring the platform momentum and trust factors, it can be concluded that the designed artefact is on the right track of reaching its goal.

9.2. Contribution to theory and method

This research entailed the design of one artefact. It brought some specific contributions to theory. First, no previous work has shown the applicability of transaction cost economy in the design process of an artefact and its organisational arrangements. This study shows that the transaction cost economics can provide insights in the functioning of both a traditional market and the setup on of a multi-sided platform.

There is currently still no real list or criteria for multi-sided platform design, both in general as in the context of finance platforms. This research provides a set of guidelines and evaluation criteria for future researchers for multi-sided platform design in an action setting. These evaluation criteria and guidelines provide a contribution to the design knowledge of multi-sided platforms.

The contribution of this study towards the design science research methodology is that it combines both fundamental economic and platform theories in the more practical design of a multi-sided platform. Different sources suggested a need for more publications on praxis oriented design research, which this research fulfils. This research provides insights in how platforms can be designed, specifically using the Action Design Research method. This research provides primary data on the applicability of ADR it can be possible to follow this methodology. It also shows however that it is difficult to transform the theoretical principles of ADR into a design report which is structured. ADR should put more emphasis providing guidelines to solve this problem for future ADR work.

9.3. Contribution praxis

On top of the theoretical and methodological contribution, this research contributes to the design knowledge base for practitioners. For factoring providers this research provides insights in the usability of multi-sided platform elements in the setup of factoring. For entrepreneurs and platform owners this research can be used as inspiration and as a blueprint for the development of their own platform. For platform designers, the design criteria and guidelines as well as the research method can be used for guidance of other platform design projects. For business leaders within the financial industry, this research provides insight to the theoretical underpinnings of invoice financing and how these theories can help to solve a practical design problem.

9.4. Recommendation for future research

Some suggestions are done for future research on different topics. Within the topic of the applicability of transaction cost economics within design theory this thesis gave a first insights. In order to understand whether transaction cost economics can also be used in for other platform designs in the financial industry or even outside of it, more

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design research is needed. More specifically this should answer the question whether the design guidelines that were derived in this study, apply for all types of multi-sided platform designs.

Furthermore, as the conclusion also indicated, it was currently not possible to directly infer the effect of the multi-sided platform on the transaction costs. Although indirectly the indications are that the platform will, there will be more research needed into determining or even quantifying lower transaction costs on multi-sided platforms. Also, it is recommended that the ADR approach is further expanded. Especially guidance is needed on how a continuous literature review can be implemented within the design cycle. This case shows that learnings are often implicitly used, however the presentation of a literature review in a scientific paper is expected to have a more structured approach. The principles of ADR do not provide a solid answer for this.

9.5. Recommendation to practice

Apart from research recommendations, there are also recommendations to practitioners. Especially for the early stage of the design of a multi-sided platform the design guidelines can be used to focus the IT efforts. The main recommendation for early stage platform owners would be that all IT efforts must always be justify improving the unique value proposition, the platform trust and momentum. This can be achieved by following the design guidelines presented in this study. Furthermore, in order to not only incorporate a transaction cost perspective, *additional* design guidelines are suggested for practitioner use. They are leaning on the accumulated design experience and theoretical insights on for example network effects.

- Sharing more free data and insights on the topic to the user groups, as this might foster the user's involvement and could make use of the user groups as free consultancy.
- Implement network effect enhancing features in the design, such as recommender systems. These type of features help growing the value of the platform by each user that is added.
- Be pro-active on the guidance of certain standardisations (for example of business data exchange) in order to be able to become the leader in a certain ecosystem. Meaning: reach out to potential module providers.
- Make sure the platform uses open interfaces (with industry standards where possible), in order to foster interoperability with other systems in the long term.
- Make sure to engage not only the users, but all stakeholders in the design process, as this might drastically change the design of the module-interfaces.

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APPENDICES

Appendix I.   Responses in the semi-structured user interviews I

Company code	Biggest group of customers	What is the main financing resource?	Is Liquidity a big concern for the company?	Believe better offers are possible for direct investor contact
A	B2B with a couple of very big, important customers	Bank credits	Yes, from time to time	Yes
B	B2B with a couple of very big, important customers		Yes, from time to time	Don't believe in it
C	B2B with a couple of very big, important customers		No, never	Yes
D	B2B, highly diversified	Debt	Yes, from time to time	No
E	B2B, highly diversified		almost never	No
F	B2B, highly diversified	Debt	not a concern	No
G	B2B with a couple of very big, important customers		sometimes	Not really
H	B2B with a couple of very big, important customers	Didn't want to say	No	-
I	B2B, highly diversified		Yes sometimes	Yes, interesting
J	B2B, highly diversified	just equity	No	Depends
K	B2B with a couple of very big, important customers	no comment	Yes, from time to time	Yes
L	B2B, highly diversified	debt and equity	only with bad paying customers	No
M	B2B, highly diversified		No	Yes
O	B2B with a couple of very big, important customers		Yes sometimes	Yes
P	B2B, highly diversified	mostly debt	No	No
Q	B2B, highly diversified	Bank credits	No	No answer
R	B2B with a couple of very big, important customers	no comment	Yes sometimes	no comment
S	B2B, highly diversified	no comment	Yes	Yes
T	B2B with a couple of very big, important customers	no comment	No	No
U	B2b, highly diversified	no comment	yes sometimes	No
V	B2B, highly diversified	debt	Yes	Yes
W	B2B, highly diversified	debt	No	No
X	B2B, highly diversified	no comment	No	No

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Appendix I. Questions asked in the domain survey

Grüezi und herzlich willkommen

Herzlichen Dank, dass Sie an der Umfrage zum Thema "Factoring / Verkauf offener Rechnungen" teilnehmen. Unter allen Teilnehmern werden **zwei 50 CHF** Gutscheine von Swisscom verlost.

Advanon ist ein Start-Up mit dem Ziel, die Finanzierung für Schweizer Unternehmen zu vereinfachen. Die online-basierte Plattform ermöglicht es den Unternehmen, ihre offenen Debitoren Rechnungen direkt an Investoren zu verkaufen um so kurzfristige Liquidität sicherzustellen. Mit dieser Umfrage helfen Sie uns, unser Angebot möglichst Nutzerfreundlich umzusetzen. Herzlichen Dank!

Auf der Website www.advanon.com finden Sie mehr Informationen.

Wir freuen uns auf Ihr Feedback!

Beste Grüsse

Advanon in Zusammenarbeit mit Swisscom

Insert page break after this question ☐

Einleitung

Bitte bewerten Sie die Aussagen mit untenstehender Skala

Insert page break after this question ☐

Liquiditätsplanung ist sehr schwierig für unser Unternehmen

○ 1 = stimmt überhaupt nicht

○ 2

○ 3

○ 4

○ 5 = vollkommen einverstanden

Insert page break after this question ☐

Kreditbeschaffung ist sehr schwierig für unser Unternehmen

○ 1 = stimmt überhaupt nicht

○ 2

○ 3

○ 4

○ 5 = stimmt vollkommen

Insert page break after this question ☐

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Haben Sie bislang von Factoring Gebrauch gemacht?

○ Ja   ○ Nein

Insert page break after this question ☐

Zufriedenheit mit Factoring

	1 = vollkommen unzufrieden	2	3	4	5	6	7 = sehr zufrieden
Gesamterlebnis	○	○	○	○	○	○	○
Wartezeit	○	○	○	○	○	○	○
Preis	○	○	○	○	○	○	○
Service (Kundenorientierung)	○	○	○	○	○	○	○
Umgang mit unseren Kunden	○	○	○	○	○	○	○

Insert page break after this question ☐

Wie lange dauerte der Prozess vom Antrag bis zum Geldfluss?

○ < 3 Tage

○ 4 - 7 Tage

○ 8 - 14 Tage

○ > 14 Tage

Insert page break after this question ☐

Wie hoch waren die Kosten in Prozent des Rechnungsbetrages?

○ < 1%

○ 1 - 2.5%

○ 2.6 - 4 %

○ > 4%

Insert page break after this question ☐

Welche Daten mussten im Zuge der Bewerbung eingereicht werden?

☐ Bilanz und Erfolgsrechnung

☐ Jahresabschluss

☐ Handelsregister-Auszug

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☐ Übersicht sämtlicher Kunden

☐ Umsatz Übersicht

☐ Bestätigung vom Kunden

☐
Sonstiges:

Insert page break after this question ☐

Gibt es noch weitere Punkte, die Ihre Zufriedenheit nachhaltig beeinflusst haben?

Insert page break after this question ☐

Warum haben Sie bislang keinen Gebrauch davon gemacht?

☐ Nicht flexibel genug

☐ Zu teuer

☐ Schlechtes Image

☐ Wollten unsere Endkunden nicht verärgern

☐ Kennen keinen vertrauenswürdigen Anbieter

☐ Brauchen wir nicht

☐ Kenne Factoring gar nicht

☐
Sonstiges:

Insert page break after this question ☐

Könnten Sie sich grundsätzlich vorstellen, offene Debitoren Rechnungen zu verkaufen?

○ Ja

○ Nein

Insert page break after this question ☐

Wie wichtig wären Ihnen die folgenden Faktoren beim Verkauf von Rechnungen?

	1 = nicht wichtig	2	3	4	5	6	7 = sehr wichtig
Ausfallrisiko-Abtretung	○	○	○	○	○	○	○
Kosten	○	○	○	○	○	○	○
Outsourcing des Debitoren-Managements	○	○	○	○	○	○	○
Flexibilität bei der Rechnungsauswahl	○	○	○	○	○	○	○
Geschwindigkeit der Geldbeschaffung	○	○	○	○	○	○	○
Planungssicherheit des Cash Flows	○	○	○	○	○	○	○

Insert page break after this question ☐

Wären Sie bereit, eine Online-Plattform zum Verkauf offener Debitoren-Rechnungen zu testen?

○ Ja

○ Nein

Insert page break after this question ☐

Name des Unternehmens

Insert page break after this question ☐

Wie lange ist Ihr Unternehmen bereits geschäftstätig?

○ < 3 Jahre

○ 3 - 10 Jahre

○ > 10 Jahre

Insert page break after this question ☑

Wie viele Mitarbeiter beschäftigt Ihr Unternehmen?

○ < 10

○ 10 - 49

○ 50 - 250

○ > 250

Insert page break after this question ☐

Name des Erfassers

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Insert page break after this question ☐

E-Mail des Erfassers

Insert page break after this question ☐

Telefonnummer

Insert page break after this question ☐

Haben Sie weitere Anmerkungen zum Thema Verkauf offener Rechnungen?

Insert page break after this question ☐

Ende

Vielen Dank für die Teilnahme. Die Gewinner des Wettbewerbs werden per E-Mail informiert.

Wir freuen uns, Sie schon bald auf unserer Website www.advanon.com mit einer funktionierenden Plattform begrüssen zu dürfen.

Gerne können Sie uns bei Fragen oder Anmerkungen kontaktieren:

Advanon GmbH
info@advanon.com
+41 79 726 06 16

Danke vielmals und beste Grüsse

Ihre Advanon

Appendix II.   Responses of the domain survey

	Liquidity planning	Refinancing generally	Use factoring	overall experience	Latency
N Valid	42	51	51	6	6
Missing	24	15	15	60	60
Mean	2.21	2.37	1.53	1.33	2.50
Median	2.00	3.00	2.00	1.00	2.50
Mode	0	3	2	0	0[a]
Range	5	5	2	3	5
Minimum	0	0	0	0	0
Maximum	5	5	2	3	5

Statistics

	Price	Service (customer orientation)	Dealing with our customers	Process time	Costs Factoring
N Valid	6	6	6	10	16
Missing	60	60	60	56	50
Mean	.67	1.83	1.67	1.10	1.63
Median	.50	1.00	.50	1.00	2.00
Mode	0	0	0	0	0
Range	2	6	7	3	4
Minimum	0	0	0	0	0
Maximum	2	6	7	3	4

Statistics

	Balance Sheet	Financial Statements	Trade Register extract	Overview of all customers	Sales overview
N Valid	10	10	10	10	10
Missing	56	56	56	56	56
Mean	.30	.30	.30	.20	.20
Median	.00	.00	.00	.00	.00
Mode	0	0	0	0	0
Range	1	1	1	1	1
Minimum	0	0	0	0	0
Maximum	1	1	1	1	1

Statistics

	Confirmation by the customer	Not flexible enough	Overpriced	Bad image
N Valid	10	34	34	34
Missing	56	32	32	32
Mean	.10	.21	.15	.15
Median	.00	.00	.00	.00
Mode	0	0	0	0
Range	1	1	1	1
Minimum	0	0	0	0
Maximum	1	1	1	1

Statistics

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		Did not want to upset our end customers	Do not know a trusted provider	We don't need it	I do not know factoring	Else:
N	Valid	34	34	30	34	27
	Missing	32	32	36	32	39
Mean		.09	.24	.23	.38	.00
Median		.00	.00	.00	.00	.00
Mode		0	0	0	0	0
Range		1	1	1	1	0
Minimum		0	0	0	0	0
Maximum		1	1	1	1	0

Statistics

		Rechnungen verkaufen	Ausfallrisiko-Abtretung	Kosten	Outsourcing des Debitoren-Managements	Flexibilität bei der Rechnungsauswahl
N	Valid	38	38	38	38	38
	Missing	28	28	28	28	28
Mean		.79	3.61	4.16	2.26	3.37
Median		1.00	3.50	6.00	2.00	4.00
Mode		1	0ª	0	0	0
Range		2	7	7	7	7
Minimum		0	0	0	0	0
Maximum		2	7	7	7	7

Statistics
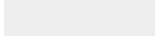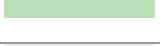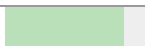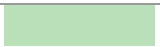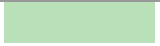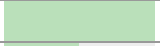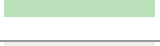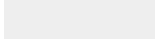
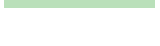|		Rate of money supply	Planning security of the cash flow	Planning security of the cash flow <1%	Planning security of the cash flow 1%-2.5%	Planning security of the cash flow 2.5%-4%
N	Valid	38	38	38	38	38
	Missing	28	28	28	28	28
Mean		4.03	4.08	.13	.42	.21
Median		5.00	5.00	.00	.00	.00
Mode		0ª	0	0	0	0
Range		7	7	1	1	1
Minimum		0	0	0	0	0
Maximum		7	7	1	1	1

Statistics
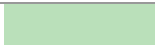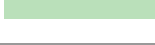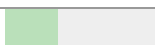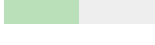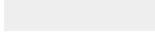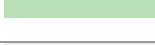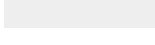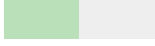
		Planning security of the cash flow >4%	Willingsness to test the platform	Age of enterprise	Number of employees	Banche
N	Valid	38	38	26	26	26
	Missing	28	28	40	40	40
Mean		.08	1.18	1.50	1.38	N/A
Median		.00	1.00	2.00	1.00	N/A
Mode		0	1	2	1	N/A
Range		1	2	3	4	N/A
Minimum		0	0	0	0	N/A
Maximum		1	2	3	4	N/A

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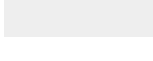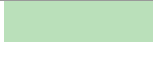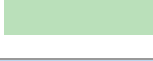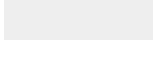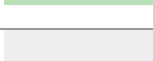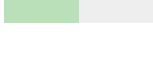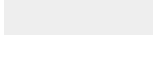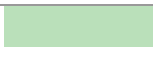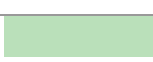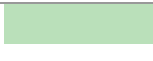
Appendix III. User story specifications

Story	Percentage done	Story Points (complexity)	Status
Sprint 1: Start of project			
As a developer I want to move the flash and alert messages into the application layout.			Closed
As a developer I want to implement the comments on the PR "Feature/investor side v1"			Closed
As a visitor I want the text at upload process changed in order to better be able to understand it			Closed
[Spike] I need some input on how we would be able to fully decouple the homepage with the WebApp and making it easier for marketing managers to edit the homepage (CMSs?)			Closed
As a developer I want to setup RSpec as the testing framework			Closed
Set up Stage server			Closed
As a seller I want to have 1 flash message after acceptance on the platform showing me how to upload my financial data and forcing me to do so.		2	Closed
As an Investor I want to login		2	Rejected
As a seller I want to have the dead links on the homepage and the latinbrain logo deleted		1	Closed
As a seller I want a dropdown menu when uploading an invoice with the reason of selling an invoice		2	Closed
As a developer I want to know the flow/status of an invoice		0	Closed
As a seller I should be having two sliders when uploading an invoice. 1) an advancement (60%-90%) 2) maximum fee of the complete invoice value (1%-10%)		3	Closed
As an investor I want to view a list of my currently invested invoices on the dashboard after login (1.3)		3	Rejected
As a seller I want to add financial company information and upload financial data		5	Closed
As a developer I want to be able to use Jenkins integrated with GitHub in order to have the code tested before deployment		1	Closed
Sprint 2 Finish Investor-side			
As an investor I want to see a sticky message when my profile is not completed			Closed
Bug: Wrong day count in error message, when the finish date is less than 30 days before the due date.			Rejected
As a developer I want that the migrations run automatically when the auto deploy to heroku is executed.		2	Closed
As an investor I want to add my banking details in the investor settings part before I can buy invoices		1	Closed
As admin I want to receive an email, that a seller has completed seller information		2	Closed
As a developer I want to replace the current status for invoice status with a statemachine		2	Closed
As an investor I want to browse for investment opportunities / current invoices for sale		0	Closed
As a developer I want to have a different branch structure with a master and a staging branch, which allows fast updates		1	Closed

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As a seller all types of financial datafiles should be able to be uploaded		0	Closed
As a seller there should be no translation error in the reasons for selling an invoice		0	Closed
As a seller 30 days instead of 7 (as it is now) have to be between the selling and due date when uploading an invoice		1	Closed
As a seller after adding my information, I should get a warning-message for confirmation, which says: you will be able to change this data with the help of customer support		2	Closed
As a seller I want to add my banking details in the seller settings part before I can upload invoices		3	Closed
As a seller the Turnover per year should be consecutive		3	Closed
As an admin I want to view, approve and edit the usual financial information of the seller and the end-customer			Closed
As I developer I want to have seed data in order to directly be able to test 1 admin account, 1 seller account and 1 investor account.			Closed
As a developer I want to use namespaces in the routes file (seller, investor).		1	Closed
As a developer I want the database to store the history of all entities for later analytics		2	Closed
As an admin I want to be able to view edit and upload financial information		2	Closed
As an investor I want view an invoice in order to see more details on the seller and the end-customer		3	Closed
As an investor I want to view outstanding invoices in the dashboard in order to browse the invoices I am currently invested in			Closed
Sprint 3 Finish Full-workflow			
As a seller I want to have my sold invoices listed at the bottom of my overview page with some more details on the transaction		1	Closed
As a seller the country input should be properly set		3	Closed
As a seller I don't want to enter two e-mails in a customer information		2	Closed
As an investor I want get an email and confirm on the platform, that I payed my invoice, the seller repayed		1	Closed
As a seller I want to have a working dashboard.		1	Closed
As a developer I want to include the seeddata of the invoice overview on the investorside		1	Closed
As a developer I want to see in the wiki how the "history of the database" works, can be accessed and analyzed.		1	Closed
As a seller I want to have the close button on the same line as the uploads		1	Closed
As a seller I want to see the status of my customer in the dropdown when uploading an invoice			Closed
As an investor I want to have a basic tab/page with an explaination text-box on the process (like it is on the seller-side)		2	Closed
Bug: as an investor I want to get rid of the bug that is shown in the details of the invoice (industry list)		0	Closed

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As an admin I want invoices to have the status of their customer as initial status and change it to approved/denied when the customer gets approved/denied.		1	Closed
As a developer I want to understand the full workflow both seller, investor and admin		2	Rejected
As an investor I should NOT be able to buy invoices (or anything at all) when my profile (currently only payment details) is not yet completed		1	Closed
As an admin I want to be able to approve/disapprove end-customers		1	Closed
As a seller I want to have a nice looking, personal email after signing up that will explain the concept of the plaftform and the next steps.		2	Closed
As an investor I want to have a nice looking, personal email after signing up that will explain the concept of the plaftform and the next steps.		2	Closed
As a seller I want to confirm, that an investor paid my invoice			Closed
As an investor I want view a list of bought invoices after the checkout			Closed
As a developer I want to resolve pending investor account specs and update account factory (-> seller_account / investor_account).			Rejected
As a developer I want to use link_to with blocks instead of raw		1	Rejected
As a developer I want to fix the layout/styling on all the customer pages (index, new, edit)		3	Rejected
As a developer I want to refactor the country select which sets the legal form. (drop the dependency)			Rejected
As a developer I want to protect all controller actions with authentication and authorization		2	Closed
As an investor I would like to export a file that I can import into ebanking system (DTA format) [Spike 2h]		5	Closed
As an investor I want to see the history of the sellers repayments in Advanon when browsing through the detailed information of the invoice		0	Closed
As an investor I want buy an invoice			Closed
As a developer I want to have a test coverage of min. 95% of the current code in order to make the use of CI possible			Closed
Sprint 4 Finish MVP			
As a seller I want to be able to change my password in the profile		2	Closed
As an admin, when I approve a customer all invoices of this customer should also go to approved. Similar so for denying a customer		1	Closed
Bug: As an investor I should not be able to access every invoice by just changing the ID in the URL			In Progress

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As a developer I want to set up a new CI integration Semafore CI		1	Closed
As an admin I want to have the uniques refference numbers in the admin interface		2	Closed
As a user the URL should not include user ids on the seller settings/user settings.		5	Closed
As an investor I want to see the reference invoice numbers showed when looking at the detailed invoice			Closed
As an admin I want to be able to approve and deny an end-customer at all times (not only once) and the lock show go away		2	Closed
As a developer/admin I want my user events synchronized with Intercom.io		2	Closed
As a user I want to be able to click on the invoices on the whole row of the table instead of only on the number.		1	In Progress
As a developer I need to have all customer data up-to-date in Intercom.io.		1	Closed
As an investor I would like to see the Number of days of the invoice in both the open invoice and the closed invoice tables on the overview page (right after the Investment fee in %)		1	Closed
As an investor I want the Investment fee on my dashboard in % and thus they should be multiplied with 100 in both tables (should be 5% rather than 0.05%)		2	Closed
As an investor I would like to see the custom entered reason of selling the invoice at the invoice specific pages when a seller selected "other" while uploading the invoice		2	Closed
As an seller I want to see the reference invoice numbers showed when open invoices		2	Closed
As an admin I want to be able to approve and deny a seller at all times (not only once) and the lock show go away			Closed
As a seller uploading an invoice should not be locked when a end-customer is not accepted nor when the financial statements are under review			Closed
As a visitor I need to enter my title while signing up (anrede) (just male/female)		3	Closed
As a developer I want to have documentation on the yml files and a consistent use of all the variables.		1	Rejected
If an admin changes the invoice status (transaction payed) the same emails should go out as from the button on the seller and investor side			Rejected
As an admin I want to have a readable overview of the all planned transaction of every day (future and history - all)			Closed
Bug: As a seller in "Upload new invoice" I want to see the status [in review] directly for newly created customers when uploading an invoice			Closed
As an admin I want to be able to download a csv file of all the planned transactions from investors->sellers that should be made every day [4:00pm-4:00pm] in Swiss-bank format in the admin interface [Spike 7hours]		1	Rejected
As an admin I would like to be able to change an invoice date without the restriction of it needing to be less than 200 days away from today, but also change it to history dates		2	Closed
As a developer I want to have a functioning CI server [spike 1h]		1	Rejected

As an investor I want to be able to download the financial statements etc on the seller details [in staging]		2	In Progress
As a seller I should not be able to change the customer anymore once it is on status approved			Closed
As an admin I want to add/edit the extra information of the seller (e.g. Net-debt ratio)			Closed
As a developer I want to make sure the binary data in all input forms is kept <<switch to carrierwave>>			Closed
As a seller and investor I want to have an information box about the particular tabs with basic explanations (initially empty)			In Progress
Fastlane Ongoing			
As an investor I want to have less prerequisite fields when signing up.			Closed
As an investor I want on the overviewpage 2 tables: 1) open invoices 2) close invoices			Resolved
As a seller I want to have 1 invoice tab with sub-tabs			Closed
As a seller I want on the overviewpage 2 tables: 1) open invoices 2) close invoices as defined in the mockup			Closed
As a seller I don't want to be "locked-in" with the error 1 that I have to add my customer information and error 2 that it is in review.			Closed
Bug: As an admin I want to be able to delete accounts without getting an error.			Closed
As an investor I also want to see the outstanding invoices in the seller history in order for the invoices to add up to the total nr of sold invoices, see: https://gist.github.com/exul/c406ab708074a76080e2			Closed
Bug: as an admin I dont want to get this error http://www.clipular.com/c/5376141012500480.png?k=I-fVIKVVBiX71ginmNhGIpOLmZM			Closed
As a seller I want to have a automatically generated reference number for each invoice on top of the user-defined number			Closed
As a developer I want to be able to deploy and have the database automatically updated			Closed
As an admin I would like to create a new admins in the production server without the bugs that currently come up			Closed
As a visitor I want to have a way to leave my email address directly on the homepage as this will lower the entry barrier.		2	Closed
As advanon I want to have all the missing translations translated			Closed
As an investor I want to set up my profile in order to receive updates on newly uploaded invoices that are of my interest [1hour PR][1 hour comments]			Closed
As a developer I would like to have an Advanon API on a public GitHub that allows for data integrate by for example accounting softwares.			Closed
As a seller I want to be able to apply and login to Advanon with the Oauth of SAGE accounting software in order to speed up that process and link my data easily		3	Closed
Bug: buying an invoice doesnt work anymore (check intercom.io events as well), probably active admin			Rejected

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As a seller, I want to have secure that my invoice-copy is not downloadable on the investor-side (remove the button for the time being)			Closed
As an investor, having bought but not payed (an) invoice(s), I should get a reminder 2 days before the closing date which tells me to transfer the money and leads me to the page of story 19840			Closed
As a developer I want to refactor the localization.		3	Closed
Undefined or future sprint			
As a developer I would like to have an Advanon API on a public GitHub that allows for data integrate by for example accounting softwares.		5	New
As a seller I want to be able to apply and login to Advanon with the Oauth of SAGE accounting software in order to speed up that process and link my data easily			New
Bug: buying an invoice doesnt work anymore (check intercom.io events as well), probably active admin			New
As a seller, I want to have secure that my invoice-copy is not downloadable on the investor-side (remove the button for the time being)			New
As an investor, having bought but not payed (an) invoice(s), I should get a reminder 2 days before the closing date which tells me to transfer the money and leads me to the page of story 19840			New
As a developer I want to refactor the localization.			New
As advanon I want to be able track who clicked on the invoice-received confirmation link			New
As a seller I want to show the "delivery-confirmation" screen to sellers after they upload an invoice			New
As a seller and investor I would like to have the half of the page only loaded when clicking on a menu button, as specified in http://stackoverflow.com/questions/6771612/update-only-div-panel-on-button-click-in-ruby-on-rails			New
As a developer I need a language model in the yml files that has a difference in male and female language words.			New
As a developer I want a copy of the current RedMine running on a by Advanon hosted webservice			New
As seller I want to have a "delivery-confirmation"-link generated, in order for my customers to confirm the validity of the invoice			New
As a developer I want to properly authenticate the seller and the investor dashboard.			New
As a seller I should only be able to send for review if I filled it in correctly and it removes the error 1.			Rejected
As an investor I want to have a wallet that keeps track of my prepayed money to Advanon (only editable by admin)			New
As new customer I want to be able to select the country and see the depending legal forms in the next dropdown			New
Bug: As a developer I want to have S3 bucket work. Document download on staging not working			Rejected
As an investor I want to have the invoices showing "days overdue" on the dashboard to only count the days 24hours after the due date.			New

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As a seller and investor I want to have some more explanation on some specific words with a small 'i' that will help me understand some wordings.			New
As an investor I want to get an email of the batch of invoices that are still buyable and recently added. (Once a day at 7:00AM, only if new)			New
As advanon I want to send out German emails as well			New
As a developer I want to make sure the attributes are not called differently depending on where they are shown, but are consistent.			New
As a seller the Financial Information per year should be consecutive per category.			New
As a admin I want to have a CMS intergated with the homepage			New
Investorside invoice overview table when empty			New
As an admin I want to be able to approve customers and have invoices from sellers directly approved from these customers (This should also be clear on sellers side: v after approved customers, t.b.d. further)			Rejected
As a seller I should only be able to enter VAT numbers that are correct (see specs) during sign-up and not be able to edit VAT or CompanyName anylonger after sign-up.			New
As an admin I want edit which information (e.g. ratios) about the sellers and customers is visible to the investor			New
As an admin I want edit which information (e.g. ratios) about the sellers and customers can be edited in the seller interface - MVP?			New
As a seller I want to choose from CHF and EURs when selling an invoice			New
As a investor I want to choose from CHF and EURs when buying an invoice (conversion?)			New
As advanon I want to add content for pricing, terms, privacy, help on the homepage			New
As advanon I want a production server located in Switzerland			New
As an investor I would like to land as first page in some statistics that contains the history of investments (1.3)			New
As a seller I want to add financial company information during the welcome tour			In Progress
As an investor I want to be able to see a detail overview of the buying process (1.3.1)			New
As a new visiting seller of the landingpage I want to be able to see an estimated price of using the platform based on the invoice value, company credit rating and customer credit rating			New
[Spike] Find a Transaction API where an investor can transfer the money cheap after buying (ask Swisscom) or standard banking file.			New

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Appendix IV.   Mock-ups

Initial mock-ups

Mock-ups on Seller side after set of user iterations (semi-structured interviews)

Mock-ups on investor side after set of user iterations (semi-structured interviews)
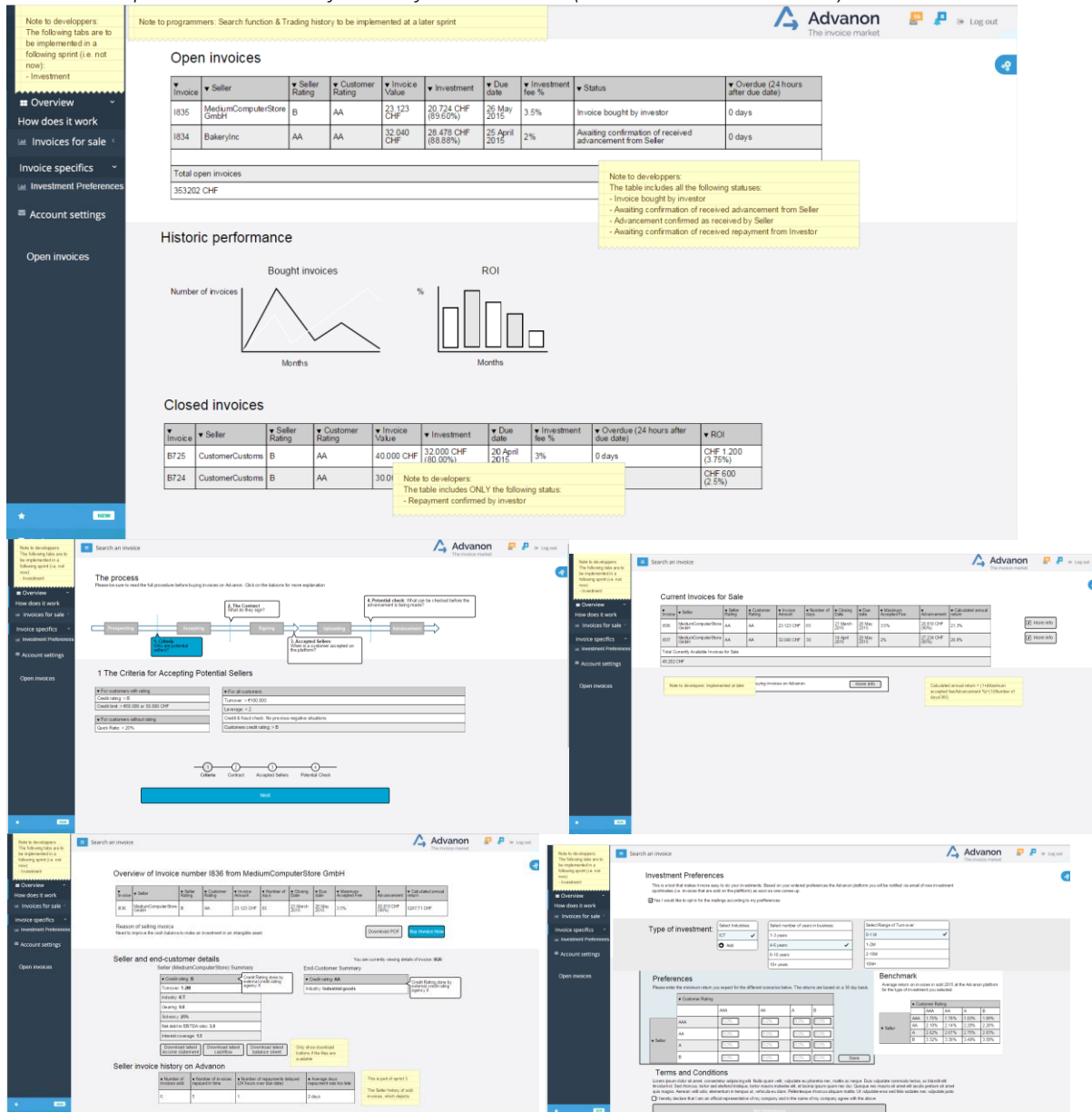
Appendix V.   Results semi-structured user interview II

Results on the seller side

Interview 1

Questions	Summarized Answers
<<Few questions in advance>> Did you already know about the principle factoring? Did you know places where you can use factoring? What kind of accounting software are you using?	No, I did not know factoring before No Easysys
<<Login with own chosen login details>> Explain the platform Do you think the login is easy to find? What can be improved?	During explanation the question was raised: what it would cost Yes, was fine (although the mockup was slow) A more automated sign-up, not everything manual
<<provide financial details>> Are you be able to provide these details? Would you be willing to provide the cash balance and other financial information? Would you provide it of different years? Suggestions to improve?	Most of it, however, it would be stored in the accounting system Yes, depending on how long that would take No, not if it is not specified to be needed. Also, not sure if this is possible. Improvements: Why would it be needed? If the full risk is taken over, why does my own financial information matter so much?
<<Adding customers>> How many would you plan to add and sell invoices from? Would you be able to provide all details easily? Do you know if you would be able to export these datapoints from your accounting software? How much would you value an integration with your accounting software on a scale from 1-5? Suggestions to improve this process?	None, at the moment Yes, but it would take me a lot of time to do this for all customers Not sure, but I think so 5 Make it more understandable what the purpose and process is
<<Sell invoice>> Would you be willing to accept a price per invoice between 3-5%? What would you feel would be a fair price? How would you decide which invoices to sell?	<Many questions were asked on the price> 3-5% would be too high 1-2% Only when I need it and rather the bad paying customers
How many invoices would you be willing to upload? Would you understand that you would still be responsible for the risk? What questions would you have furthermore on selling invoices?	1, to try it out No, I did not understand that before <Had to be separately explained> No

Interview 2

Questions	Summarized Answers
<<Few questions in advance>> Did you already know about the principle factoring? Did you know places where you can use factoring? What kind of accounting software are you using?	Yes. Yes, post-finance for example. Sap Finanzmanagement
<<Login with own chosen login details>> Explain the platform Do you think the login is easy to find?	<Basic idea was easily understood>

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What can be improved?	Yes. Nice website. Better explain your USP on the website
<<provide financial details>> Are you be able to provide these details? Would you be willing to provide the cash balance and other financial information? Would you provide it of different years? Suggestions to improve?	 Yes Yes, that is usual the case for Factoring <didn't understand the question> No
<<Adding customers>> How many would you plan to add and sell invoices from? Would you be able to provide all details easily? Do you know if you would be able to export these datapoints from your accounting software? How much would you value an integration with your accounting software on a scale from 1-5? Suggestions to improve this process?	3, 3 invoices each This always costs time, and it is more of a mental barrier, but when you really need cash you will do it anyway 3, not really needed in my opinion No
<<Sell invoice>> Would you be willing to accept a price per invoice between 3-5%? What would you feel would be a fair price? How would you decide which invoices to sell?	 Depends on which invoice Same answer
How many invoices would you be willing to upload? Would you understand that you would still be responsible for the risk? What questions would you have furthermore on selling invoices?	<already asked> Yes, depending on the contract you will create, this will be ok or not What is your revenue model?

Interview 3-6

Due to time constraints no structured summary could be presented of interview 3-6.

Results on the investor side

Interview 1

Questions	Answers
Usability: How easy was it to sign up	5
Any comments on the signup details fields?	OK from my point of view if you have all the information that you need.
Risk estimation: If invested in two invoices, does the table showing the overview provide enough information to keep track of the risk on the current investments?	Yes
Usability: "The overview provides a good overview to keep track of the investments"	4
What can be improved?	The mockup looks ok. When I used the link, the mockup looked different from the one above.
Usability: "The explanation page provides enough information to understand the process of invoice financing"	4
Risk Estimation: "The explanation page is a clear process and I would be willing to invest in invoices of this structure"	3
Risk Estimation: What can be improved to the process?	You should always get "Strafregister- und Betreibungsregisterauszug" for the key persons at the

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	seller (CEO, Chairman). For financial robustness, you should show the usual ratios: Net debt to EBITDA ratio Interest coverage etc.
Usability: What can be improved to the representation of the process?	
Usability: How easy was it to find details on the invoices?	4
Risk estimation: Would you agree that the following variables are sufficient to evaluate the risk of an investment in an invoice?	2
Risk estimation: If not, what additional variables are an absolute must?	I would always want to know the name of the customer as well. I do not understand the graph "Sold history..."
Risk estimation: If not, what additional variables would be nice to have?	Customer name = must have
Pricing: Assuming that invoices are sold with recourse, do you think that the following return to you as an investor on a 30 day basis is attractive (after paying all transaction fees)?	8
Pricing: Which information do you need more in order to better estimate the attractiveness?	I would not invest purely based on ratings. I would want to have access to the financial information (Jahresbericht) of both seller and customer.
Pricing: Would you prefer to bid with other investors for an invoice or accept a fixed price?	Choose for a fixed price
Usability: Would you appreciate an auto-buying tool as depicted in the mock-up for making purchases of invoices for you?	No
Usability: If yes, to what extend would you appreciate an auto-buying tool as depicted in the mock-up for making purchases of invoices for you?	1
Usability: If yes, would the following parameters be good enough for you to define your preferences of what invoices to invest in: Industry, Age of company, Turnover (as a range), and a table similar to the one above?	No
Usability: To what extend would you prefer the auto-bidding to the manual buying of the invoices?	1
Usability: What can be improved to the auto-bidding function?	I would not use auto-bidding as I want to analyze the attractiveness of each invoice/deal individually
Any generic feedback?	As an Investor, I would always analyze each individual invoice (unless I already know both the seller and the buyer from a previous investment). Therefore, I want access to the full financial information of both seller and customer (audited annual report)

Questions	Answers
<<Login with own chosen login details>> Explain the platform Do you think the login is easy to find? What can be improved?	No specific comments Less information to fill in and more specifics on the terms of the investments

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<<Risk estimation>> How would you improve this process?	The way of presenting it can be more structured
<<Buy invoice>> Would you be willing to accept a price per invoice between 3-5%? What would you feel would be a fair price? How would you decide which invoices to sell?	That would be dependent per invoice. I would need more details on the seller and customer in order to make that judgement.

Follow up questions and one specified answer

Investing in factoring
How do you do your normal investments? Through private bank with low transaction costs. If he didn't have that good deal he would use a competitor.
How much time do you spend before buying any of the investments? Normally 3hrs per product. He estimated that he would spend 12 hrs per invoice on our platform in the beginning and once it is up and running it would be able to go down to 3hrs. If it would be invoices that he has financed before, i.e. recurring between a Seller and a End-customer, it would go much faster.
Would the factoring option through a platform work for you, looking at the normal time spending? *Yes, depending if you can provide the right information on the platform.*

Our offering
Would you agree/disagree that the following points make our offering attractive?
- Limited correlation to stock market (diversification opportunity)
- High return-to-risk ratio?
- It is a short-term investment
- Ability to invest in non-noted companies?
Yes, I agree

Bank Set-up
Would you be willing to open a bank account with a partner bank in order for us to carry out the transactions for you? Views on written signature for account?
OK with opening a new bank account at a private bank and do all the signing it requires. Also, he would give us the power of attorney to do the transactions, but only with a third-party supervisor (such as the bank itself) limiting us to only do transactions to certain accepted accounts.

Currencies – invoices in both CHF/EUR? Currency conversion? Insurance?
Would be open to invest in euro in the beginning but would strongly prefer CHF.

Legal set-up
1. Not owning the right to an invoice, and similarly not the risk. Using the invoice as a proof that the customer will get a cash in-flow
2. **Owning the full right of an invoice, and similarly the risk.** He answered that he wants kind of factoring set-up where he takes over some certain transactions
3. Recourse – ok with having a partial right to an invoice, but not carrying the risk.

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Appendix VI.   Initiated survey to investors preceding the semi-structured interview II

As explained in the report in section 6.4.1 on page 74, the investor interviews were first intended to be held through an online survey. This appendix lists the questions that were asked in this survey. The same questions were used in the later phone calls with other investors.

The survey has been presented on:
 https://docs.google.com/forms/d/13t45sJp4MNaZSZh2-wTrvWNMoVe93j6mmt_7pnNWRSc/viewform

Investor Advanon Mockup Test
Thank you for joining us in creating the newest easy-to-use platform invoice market, which will allow SMBs to improve their cash balance instantly. Financial investors, on the other hand, will get access to an alternative type of short-term investments.
On http://goo.gl/k1ctrO you can access the mockup of the platform. We want you, as a potential investor, to be involved in the process of designing the platform. Therefore we created a small test which will allow you to provide us with feedback and will allow us to improve the development of the platform.
The total test will take approximately 20 minutes. And consists of a number of tasks.

Basic Tasks
Task 1: Basic Information (0.5 min)
Please provide your details.
1. Full Name and Title 2. Company Name 3. Email address
Task 2: Creating an account (1 min)
You are asked to create an account on the mockup (http://goo.gl/k1ctrO). By clicking anywhere on the mockup you are able to see where you can click. Typing is not possible. 1. Find where you can create an account on the website 2. Click on "sign up now" 3. Check the details you have to provide to us. 4. Click on "Imagine I am an investor and I am accepted"

Usability: How easy was it to sign up

	1	2	3	4	5	
Couldn't find it	○	○	○	○	○	Easy to find

Any comments on the signup details fields?
Did you miss any signup fields or would it be too complicated to fill it in?

Overview and functionality
Task 3: Checking overview (3 min)
You are asked to look around on the overview / landingpage for the investors. 1. Imagine that you have currently invested in two invoices: I835 from MediumComputerStore GmbH and I834 BakeryInc. 2. Furthermore, the site provides you with an overview of the portfolio performance.
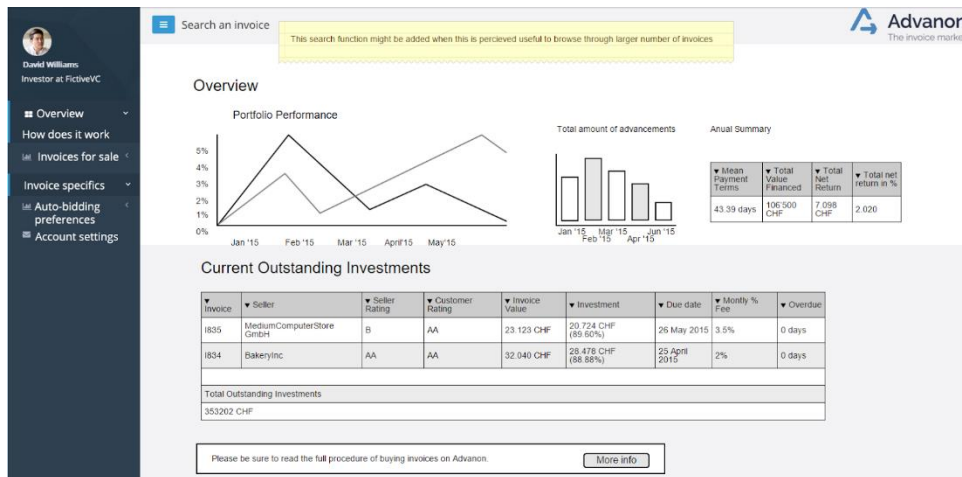
Risk estimation: If invested in two invoices, does the table showing the overview provide enough information to keep track of the risk on the current investments?
The table contains: Seller Rating, Customer Rating, Invoice Value, Investment, Due Date, Monthly Fee, Days Overdue

○ Yes

○ No

Usability: "The overview provides a good overview to keep track of the investments"
To what extend do you agree?

	1	2	3	4	5	
Fully disagree	○	○	○	○	○	Fully Agree

Task 4: How does it work

You are asked to look around on "How does it work" page 1. Click around in order for the website to explain the process of invoice financing on Advanon.
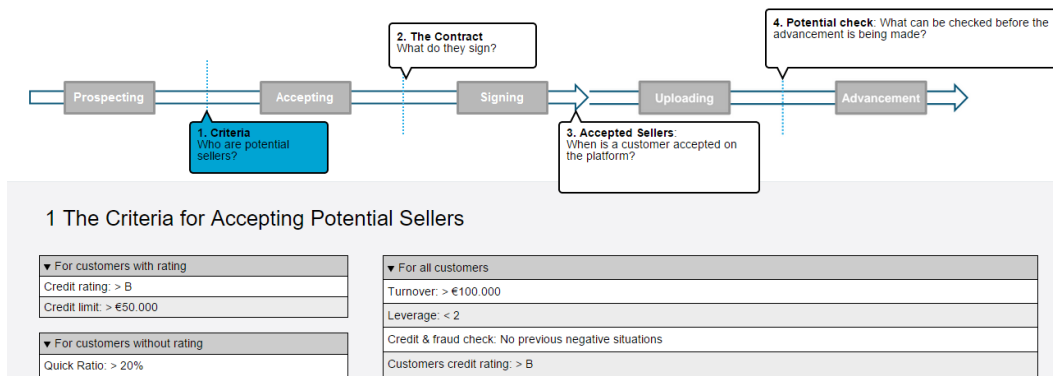
Usability: "The explanation page provides enough information to understand the process of invoice financing"
To what extend do you agree?

	1	2	3	4	5	
Fully disagree	○	○	○	○	○	Fully Agree

Risk Estimation: "The explanation page is a clear process and I would be willing to invest in invoices of this structure"
To what extend do you agree?

	1	2	3	4	5

Fully disagree ⊙ ⊙ ⊙ ⊙ ⊙ Fully Agree

Risk Estimation: What can be improved to the process?

Usability: What can be improved to the representation of the process?

Buying an Invoice (Risk and Pricing)
Does the platform provide enough risk indicators to make an investment?

Task 5 : Buy an invoice (7 min)

Try to find where the list of invoices for sale are showed and try to select one for more information. Furthermore, click on buy now.

Overview of Invoice number I836 from MediumComputerStore GmbH

▼ Invoice	▼ Seller	▼ Seller Rating	▼ Customer Rating	▼ Invoice Amount	▼ Number of days	▼ Closing Date	▼ Due date	▼ Maximum Accepted Fee	▼ Advancement	▼ Calculated annual return
I836	MediumComputerStore GmbH	B	AA	23.123 CHF	65	21 March 2015	26 May 2015	3.5%	20.810 CHF (90%)	5287.71 CHF

Reason of selling invoice

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nulla quam velit, vulputate eu pharetra nec, mattis ac neque. Duis vulputate commodo lectus, ac blandit elit tincidunt id. Sed rhoncus, tortor sed eleifend tristique, tortor mauris molestie elit, et lacinia ipsum quam nec dui.

Buy Invoice Now

Invoice details

You are currently viewing details of invoice: I826

Download PDF

Seller (MediumComputerStore) Summary

| ▼ Credit rating: **B** | Credit Rating done by external credit rating agency X |
| Turnover: **1-2M** |
| Industry: **ICT** |
| Gearing: **0.8** |
| Solvency: **25%** |
| Industry: **Industrial goods** |

End-Customer Summary

| ▼ Credit rating: **AA** | Credit Rating done by external credit rating agency X |
| Industry: **Industrial goods** |

Sold history of MediumComputerStore GmbH

Yearly Analytics
⊞ 2014
⊞ 2015

Came in late

Came in on time

Jan '15 Feb '15 Mar '15 April'15 May'15

Buy Invoice Now

Usability: How easy was it to find details on the invoices?

1   2   3   4   5

Couldn't find it ⊙ ⊙ ⊙ ⊙ ⊙ Easy to find

Risk estimation: Would you agree that the following variables are sufficient to evaluate the risk of an investment in an invoice?
Seller: Company name, Industry, Credit rating (from Dunn & Bradstreet), Turnover (as a range), Gearing, Solvency.
End-customer: Credit rating (from Dunn & Bradstreet), Industry, Age of company

1   2   3   4   5

Fully dissagree ⊙ ⊙ ⊙ ⊙ ⊙ Fully agree

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Pricing: Assuming that invoices are sold with recourse, do you think that the following return to you as an investor on a 30 day basis is attractive (after paying all transaction fees)?

	1	2	3	4	5	6	7	8	9	10	
Not attractive	○	○	○	○	○	○	○	○	○	○	Attractive

		Customer			
		AAA	AA	A	B
Seller	AAA	1,17%	1,19%	1,22%	1,26%
	AA	1,40%	1,43%	1,47%	1,51%
	A	1,75%	1,78%	1,83%	1,89%
	B	2,21%	2,26%	2,33%	2,39%

Pricing: Assuming the prices above, in which of the following types of invoices would you be mostly interested?

	Customer AAA	Customer AA	Customer A	Customer B
Seller AAA	○	○	○	○
Seller AA	○	○	○	○
Seller A	○	○	○	○
Seller B	○	○	○	○

Pricing: Would you prefer to bid with other investors for an invoice or accept a fixed price?

○ Bid with other investors

○ Choose for a fixed price

Auto-bidding

Would an auto-bidding function be of preference? **Please note that it is not sure if we will be implementing the auto-bidding in the first product**

Task 6: Look at the auto-bidding option (5 min)
Try to navigate to the auto bidding option on the platform. 2. Click "Yes I would like to activate the automated bidding function on Advanon with the following preferences" 3. Try to set your preferences to invest in the following: Industry: ICT Years in business: 4-6 Turn-over: 0-1 M

Type of investment:

Select Industries:
| ICT | ✔ |
| ⊕ Add | |

Select number of years in business:
1-3 years	
4-6 years	✔
6-10 years	
10+ years	

Select Range of Turn-over:
0-1 M	✔
1-2M	
2-10M	
10M+	

Preferences
Please enter the minimum return you expect for the different scenarios below. The returns are based on a 30 day basis.

▼ Customer Rating

▼ Seller		AAA	AA	A	B
	AAA	0,0%	0,0%	0,0%	0,0%
	AA	0,0%	0,0%	0,0%	0,0%
	A	0,0%	0,0%	0,0%	0,0%
	B	0,0%	0,0%	0,0%	0,0%

Save

Benchmark
Average return on invoices in sold 2015 at the Advanon platform for the type of investment you selected.

▼ Customer Rating

▼ Seller		AAA	AA	A	B
	AAA	1.75%	1.78%	1.83%	1.89%
	AA	2.10%	2.14%	2.20%	2.26%
	A	2.62%	2.67%	2.75%	2.83%
	B	3.32%	3.39%	3.49%	3.58%

Usability: Would you appreciate an auto-buying tool as depicted in the mock-up for making purchases of invoices for you?

○ Yes

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○ No

Usability: If yes, to what extend would you appreciate an auto-buying tool as depicted in the mock-up for making purchases of invoices for you?

	1	2	3	4	5	
Limited appreciate	○	○	○	○	○	Highly appreciate

Usability: If yes, would the following parameters be good enough for you to define your preferences of what invoices to invest in: Industry, Age of company, Turnover (as a range), and a table similar to the one above?

○ Yes

○ No

Usability: To what extend would you prefer the auto-bidding to the manual buying of the invoices?

	1	2	3	4	5	
Manual buying	○	○	○	○	○	Auto-bidding

Usability: What can be improved to the auto-bidding function

Any generic feedback?

<<End of questionnaire>>

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Appendix VII.   Descriptive statistics prototype evaluation

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
The login screen was easy to find	15	5	7	6.33	.816
The login screen was easy to use	14	2	7	6.07	1.328
It was easy to find the place where I have to provide the financial information	11	5	7	6.09	.701
It was easy for me to provide these details	13	3	7	5.62	1.261
I am willing to provide the cash balance and other financial information on the platform	13	2	6	4.00	1.472
I was able to provide all details of my customer easily	13	1	7	5.38	1.609
How many customers will you add and sell invoices from if Advanon would be live?	9	0	50	6.78	16.292
The "upload invoice" functionality was easy to use	12	1	7	5.50	1.679
The manual upload of invoices and providing of data is a big barrier for me to use the platform	12	2	6	3.92	1.564
I think it will be better to upload customer data in integration with my accounting software on the platform.	11	2	6	4.73	1.348
A full integration with my accounting software would be valuable for me	13	2	7	5.08	1.801
I am willing to ask my customer to send a delivery notification	13	4	7	4.77	.832
Letting my customers know that I have sold their outstanding invoices on Advanon is a problem for me	10	1	6	3.70	1.418
Please rate the following statements [I believe it is easy to get Advanon to do what I want it to do]	13	4	7	5.62	.870
Please rate the following statements [Learning to operate Advanon is easy for me]	13	3	7	5.85	1.214
Please rate the following statements [Overall, I believe that the platform is easy to use]	13	4	7	5.85	.801
Please rate the following statements [Using this platform would make it easier to gain liquidity]	13	4	7	5.69	1.032
Please rate the following statements [Using this platform will enhance my effectiveness in improving my cash balance]	12	3	7	5.58	1.165
Please rate the following statements [Overall, I find Advanon useful]	13	3	7	5.62	1.121

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Please rate the following statements [I do not think that Advanon is collecting too much personal information about my company]	13	3	6	5.08	.954
Please rate the following statements on the internet [I feel confident that encryption and other technological advances on the Internet make it safe for me to do business there]	13	3	7	5.15	1.281
Please rate the following statements on the internet [In my opinion, the Internet is now a robust and safe environment in which to transact business.]	13	3	7	5.15	1.144
Please rate the following statements [My tendency to trust a person/thing is high]	13	4	7	5.62	.768
Please rate the following statements [Personally, I get the feeling Advanon is genuinely concerned about me]	13	3	7	5.46	1.266
Please rate the following statements [Overall, I trust Advanon]	12	4	7	5.58	.793
Please rate the following questions [I believe that Advanon has the necessary technology knowledge to carry out online lending]	13	3	7	5.46	1.198
Please rate the following questions [I believe the chance of having a technical failure on Advanon is quite small]	13	3	6	4.77	1.092
Please rate the following statements [If I were to use Advanon, I will not be concerned about whether it will take care of lending security (e.g. the Lending Agreement)]	13	1	7	4.15	1.519
Please rate the following statements [I am concerned about whether Advanon will prevent fraudulent users from undertaking lending activities]	13	4	7	5.00	.913

Independent sample t-test over the two user groups

Independent Samples Test								
	Levene's Test for Equality of Variances		t-test for Equality of Means					
	F	Sig.	t	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper

Please rate the following statements [I believe it is easy to get Advanon to do what I want it to do]	Equal variances assumed	.025	.877	.612	.552	.2857	.4666	-.7309	1.3023
	Equal variances not assumed			.612	.552	.2857	.4666	-.7348	1.3063
Please rate the following statements [Learning to operate Advanon is easy for me]	Equal variances assumed	.157	.699	.910	.381	.5714	.6281	-.7972	1.9400
	Equal variances not assumed			.910	.381	.5714	.6281	-.8017	1.9446
Please rate the following statements [Overall, I believe that the platform is easy to use]	Equal variances assumed	.553	.473	1.520	.157	.6429	.4229	-.2880	1.5737
	Equal variances not assumed			1.496	.166	.6429	.4298	-.3179	1.6036
Please rate the following statements [Using this platform would make it easier to gain liquidity]	Equal variances assumed	.160	.696	1.549	.147	.8571	.5533	-.3484	2.0626
	Equal variances not assumed			1.549	.149	.8571	.5533	-.3564	2.0707
Please rate the following statements [Using this platform will enhance my effectiveness in improving my cash balance]	Equal variances assumed	.087	.773	.829	.425	.5238	.6319	-.8670	1.9146
	Equal variances not assumed			.820	.431	.5238	.6385	-.8962	1.9439
Please rate the following statements [Overall, I find Advanon useful]	Equal variances assumed	.382	.549	1.387	.193	.8333	.6009	-.4893	2.1560
	Equal variances not assumed			1.369	.201	.8333	.6088	-.5237	2.1904
Please rate the following statements [I do not think that Advanon is collecting too much personal information about my company]	Equal variances assumed	.051	.825	-.240	.814	-.1429	.5948	-1.4387	1.1530
	Equal variances not assumed			-.240	.814	-.1429	.5948	-1.4396	1.1539
Please rate the following statements on the internet [I feel confident that encryption and other technological advances on the Internet make it	Equal variances assumed	1.333	.271	4.099	.001	2.0000	.4880	.9368	3.0632
	Equal variances not assumed			4.099	.002	2.0000	.4880	.9321	3.0679

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safe for me to do business there]								
Please rate the following statements on the internet [In my opinion, the Internet is now a robust and safe environment in which to transact business.]	Equal variances assumed	.136	.719	1.493	.164	.9048	.6059	-.4289	2.2384
	Equal variances not assumed			1.505	.161	.9048	.6012	-.4194	2.2289
Please rate the following statements [My tendency to trust a person/thing is high]	Equal variances assumed	.282	.605	.302	.768	.1429	.4738	-.8895	1.1752
	Equal variances not assumed			.302	.768	.1429	.4738	-.8946	1.1804
Please rate the following statements [Personally, I get the feeling Advanon is genuinely concerned about me]	Equal variances assumed	.269	.614	1.245	.239	.8571	.6887	-.6587	2.3730
	Equal variances not assumed			1.216	.254	.8571	.7047	-.7305	2.4448
Please rate the following statements [Overall, I trust Advanon]	Equal variances assumed	3.616	.086	1.103	.296	.5000	.4534	-.5102	1.5102
	Equal variances not assumed			1.103	.309	.5000	.4534	-.5881	1.5881
Please rate the following questions [I believe that Advanon has the necessary technology knowledge to carry out online lending]	Equal variances assumed	.051	.825	1.441	.175	.8571	.5948	-.4387	2.1530
	Equal variances not assumed			1.441	.175	.8571	.5948	-.4396	2.1539
Please rate the following questions [I believe the chance of having a technical failure on Advanon is quite small]	Equal variances assumed	.064	.804	.750	.468	.4286	.5714	-.8165	1.6736
	Equal variances not assumed			.750	.468	.4286	.5714	-.8203	1.6775
Please rate the following statements [If I were to use Advanon, I will not be concerned about whether it will take care of lending security (e.g. the Lending Agreement)]	Equal variances assumed	.469	.506	.528	.607	.4286	.8123	-1.3413	2.1985
	Equal variances not assumed			.528	.608	.4286	.8123	-1.3449	2.2020

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Please rate the following statements [I am concerned about whether Advanon will prevent fraudulent users from undertaking lending activities]	Equal variances assumed	5.568	.036	.660	.522	.4286	.6494	-.9864	1.8436
	Equal variances not assumed			.660	.529	.4286	.6494	-1.0865	1.9436

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The median of It was easy to find the place where I have to provide the financial information equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.010	Reject the null hypothesis.
2	The median of It was easy for me to provide these details equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.014	Reject the null hypothesis.
3	The median of I am willing to provide the cash balance and other financial information on the platform equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.589	Retain the null hypothesis.
4	The median of I was able to provide all details of my customer easily equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.017	Reject the null hypothesis.
5	The median of How many customers will you add and sell invoices from if Advanon would be live? equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.340	Retain the null hypothesis.
6	The median of The "upload invoice" functionality was easy to use equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.102	Retain the null hypothesis.
7	The median of The manual upload of invoices and providing of data is a big barrier for me to use the platform equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.470	Retain the null hypothesis.
8	The median of A full integration with my accounting software would be valuable for me equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.293	Retain the null hypothesis.
9	The median of I am willing to ask my customer to send a delivery notification equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.046	Reject the null hypothesis.
10	The median of Letting my customers that I have sold their outstanding invoices on Advanon is a problem for me equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.414	Retain the null hypothesis.
11	The median of The login screen was easy to find equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.010	Reject the null hypothesis.
12	The median of The login screen was easy to use equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.009	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 43 Outcome of the on-sample wilcoxon signed rank test on the feature questions on the significance of the outcome

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Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The median of Please rate the following statements [I believe it is easy to get Advanon to do what I want it to doÅ] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.005	Reject the null hypothesis.
2	The median of Please rate the following statements [Learning to operate Advanon is easy for me] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.003	Reject the null hypothesis.
3	The median of Please rate the following statements [Overall, I believe that the platform is easy to use] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.002	Reject the null hypothesis.
4	The median of Please rate the following statements [Using this platform would make it easier to gain liquidity] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.007	Reject the null hypothesis.
5	The median of Please rate the following statements [Using this platform will enhance my effectiveness in improving my cash balanceÅ] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.008	Reject the null hypothesis.
6	The median of Please rate the following statements [Overall, I find Advanon useful] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.006	Reject the null hypothesis.
7	The median of Please rate the following statements [I do not think that Advanon is collecting too much personal information about my company] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.015	Reject the null hypothesis.
8	The median of Please rate the following statements on the internet [I feel confident that encryption and other technological advances on the Internet make it safe for me to do business there] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.012	Reject the null hypothesis.
9	The median of Please rate the following statements on the internet [In my opinion, the Internet is now a robust and safe environment in which to transact business.] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.010	Reject the null hypothesis.
10	The median of Please rate the following statements [My tendency to trust a person/thing is high] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.004	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 44 Outcome of the one-sample wilcoxon signed rank test on the questions on the significance of the outcome (1/2)

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Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
11	The median of Please rate the following statements [Personally, I get the feeling Advanon is genuinely concerned about meÂ] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.016	Reject the null hypothesis.
12	The median of Please rate the following statements [Overall, I trust AdvanonÂ] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.004	Reject the null hypothesis.
13	The median of Please rate the following questions [I believe that Advanon has the necessary technology knowledge to carry out online lendingÂ] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.013	Reject the null hypothesis.
14	The median of Please rate the following questions [I believe the chance of having a technical failure on Advanon is quite small] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.057	Retain the null hypothesis.
15	The median of Please rate the following statements [If I were to use Advanon, I will not be concerned about whether it will take care of lending security (e.g. the Lending Agreement)] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.829	Retain the null hypothesis.
16	The median of Please rate the following statements [I am concerned about whether Advanon will prevent fraudulent users from undertaking lending activities] equals 4.000.	One-Sample Wilcoxon Signed Rank Test	.014	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure 45 Outcome of the one-sample wilcoxon signed rank test on the feature questions on the significance of the outcome (2/2)

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Appendix VIII.   Logged user platform data

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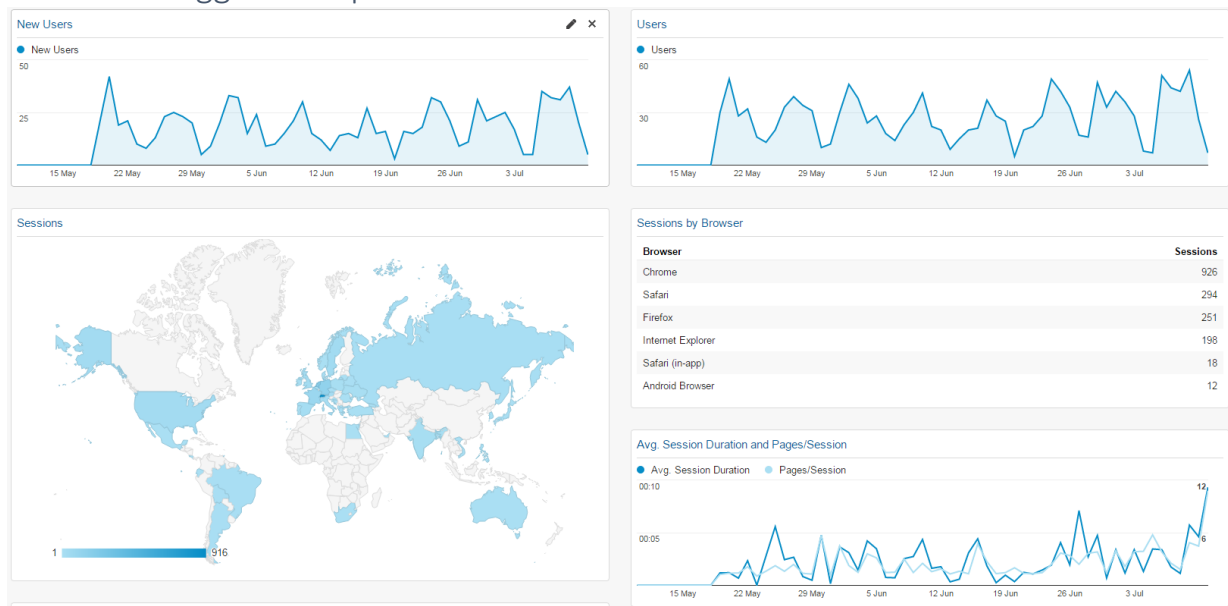
Appendix IX. Collected feedback from Sprints

Feedback for Sprint 1

Date added?	Investor/Seller side?	Page?	Feedback?	Done?	Comment?
3/5/2015	Seller	Overview	Change the text 'Minimum accepted price' to 'Advancement (amount to be received'	implemented	
3/5/2015	Seller	Overview	When clicking on the PDF sign next to an outstanding invoice the following message appear: This XML file does not appear to have any style information associated with it. The document tree is shown below.	reported	this is only the case in the staging server
3/5/2015	Seller	Overview	Change the text 'Total receivables' to 'Total potential receivables'	implemented	
3/5/2015	Seller	Overview	Change the text 'Created invoices' to 'Uploaded invoices'	implemented	
3/5/2015	Seller	Overview	Change the text 'You don't have any Sold Invoice.' to 'You have not sold any invoices yet'	implemented	
3/5/2015	Seller	Upload an invoice	Change the text 'Fee' to 'Accepted financing fee'	implemented	
3/5/2015	Seller	Upload an invoice	2nd option for selling an invoice says 'translation_missing'	rejected	already fixed
3/5/2015	Seller	Customer	Remove one of the e-mail options when adding a customer	reported	
3/5/2015	Seller	Customer	Would be nice to add a small note when adding a new customer that says 'Please note that we will not contact your customer directly without your approval. These	reported	we'll add that when writing all text

			details are only required as a part of our verification-process.'		
12/5/2015	Investor	Invoice	Download the invoice in pdf will be a problem as we basically show everything (also to potential competitors) - I'd say we only publish aggregated information	rejected	needs to be tested by real customers
12/5/2015	Investor	Invoice	I think we should have two invoice numbers. One is the one from the customer, but then we should also have an automatically generated ID-number from Advanon. This one should always have the same structure (i.e. 1'000'000 numbers for CH invoices, 2'000'000 numbers for German invoices etc.)	reported	good one. good for refferencing changed it to in https://pm.panter.ch/issues/20229
12/5/2015	Investor	Invoices for sale	I made it:	implemented	changed it to Payment term [days]
12/5/2015	all of them	all of them ;-)	Just as an Input (not prio #1). It would be cool to have a small "i" beside specific words with a more detailed explanation. For example, "customer rating" and then with a rollover-button that would say customer means endcustomer of the seller or something like that. Just to make it a bit more understandable	reported	good one. it's in the back-log: meaning it will be taken care of at some point in time :)
12/5/2015	Seller	Dashboard	Total amount of AdvancementEs is a bit Spanish ;-)	implemented	
12/5/2015	Seller	Seller Settings	Maybe we can include another remark there,	reported	will be done as soon as we added the information boxes

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			that they have to tell the truth otherwise they're in legal troubles. It's already in the terms, but just to be sure		

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Feedback and action for Sprint 3

Date added?	Investor/Seller side?	Page?	Feedback?	Done?
23/5/2015	all of them	-	Change the status 'Awaiting confirmation of received advancement from investor' to 'Awaiting confirmation of received advancement from seller'	implemented
23/5/2015	Investor	Invoice specifics	If a Seller has specified 'Other (specify)' as reason for selling invoice, that is shown rather than the text they write	reported
29/5/2015	Investor	Dashboard	Investment fee % should be multiplied with 100 in both tables (should be 5% rather than 0.05%)	reported
29/5/2015	Investor	Dashboard	I know that I didn't add it in the mockup, but it would be good to have the 'Number of days' in both tables in the dashboard so the investors can get an overview on what ROI they are making over what period	reported
8/6/2015	Investor	Invoice specifics	Remove download button of Invoice (easier for our legal contracts and something that we can add later if necessary)	reported
23/5/2015	Seller	Dashboard	Total amount of Advancements doesn't show in the graph	rejected
4/6/2015	Seller	Create account	It's not Verkäufter, it's Verkäufer on the create account page (in german)	implemented
4/6/2015	Seller	Adding a customer	Customer needs to be guided after he created a new customer. We should have something like a pop-up notification that he has to wait until we could have checked the enduser	reported
11/6/2015	Seller	Seller settings	Explain confirmation process better	reported
4/6/2015	Seller confirmation	E-Mail confirmation	We need a title (Anrede in german) when a customer signs up. Because right now it's grammatically wrong in the german version => there's a difference between the male and female welcome message.	reported
5/6/2015	Seller confirmation	E-Mail confirmation	German Welcome email should be changed: https://mail.google.com/mail/u/0/#inbox/14dc304e823e7ed5	implemented

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Feedback for Sprint 4

Date added?	Investor/Seller side?	Page?	Feedback?	Done?
29/06/15	Seller	Upload invoice	Change the $ to CHF and explain why EUR is not yet possible	reported
29/06/15	Seller	Upload invoice	Explain what type of file needs to be uploaded	reported
29/06/15	Seller	Upload invoice	Show feedback why file is not acceepted	rejected
29/06/15	Seller	Upload invoice	Explain what the amount and bars mean + why the dates need to be appart from eachother	
29/06/15	Seller	How it works	Insert explanation at: how it works	
29/06/15	Seller	-	Change animations: make them more calm	implemented
29/06/15	Seller	Seller information	Make more clear that the Seller information needs to be send for review.	
29/06/15	Seller	Notification bar	when the seller info needs to be changed: make more clear	reported
29/06/15	Seller	Add customer	Change the legal forms!!!! German and Swiss are changed.	reported
29/06/15	Investor/Seller side?	Sign-up	Aktivierungsmail habe ich auch nicht erhalten. --> make clear there is none	
29/06/16	Investor/Seller side?	Sign-up	Type: Fell insteaed of feel	
1/7/2015	Investor/Seller side?	Investor/Seller Settings	When typing in the IBAN, it doesnt recognize it if you fill it in with spaces; like on the card. It only accepts it if you fill it without spaces	reported
1/7/2015	Seller	Open Invoices	The first invoice (99-88-33); The column which is named "Buyer" has Johnny Appleseed put in in this case. Further in the column "Status" it says "Invoice bought by investor". As far as I understand it the terms "buyer" and "investor" are the same person. Maybe we should then use only one term for it?	reported
1/7/2015	Seller	Open Invoices	The second row, for the invoice 99-88-11, before I confirmed the advancement it said "Awaiting confirmation of received advancement by seller", however the actual status, therefore that the investor has paid the advancement, which needs to be confirmed, is the same as in the first invoice, however the description of the status of the first invoice says "Invoice bought by investor". Maybe we can unify here the descriptions?	
1/7/2015	Seller	Open Invoices	Suggestion: For the column "status" we could maybe use some sort of a color code depending on the different status of the payment. So one can see more clearly what the status is.	rejected
1/7/2015	Seller	Open Invoices	"Closing date" column: Can we make this column a bit more broader? And maybe highlight in a way "in 4 days", or put it in a second row, so ti stands out	reported

1/7/2015	Seller	Open Invoices	Concerning the "customer" and "buyer" columns; are the indivduals of both categories going to have profiles? So, would I be able to click on it, or when the mouse goes over their names, that the core infromation on them shows up in form of a small pop-up?	reported
1/7/2015	Seller	Open Invoices	Maybe we should make the buttons on the right side of the table in two rows and a bit more narrow so it doesnt take in so much space.	rejected
1/7/2015	Seller	Upload new invoice	Is there a reason why the minimal amount you want to receive can not go under 60%?	rejected
1/7/2015	Seller	Upload new invoice	In the german version, if you add a new end customer: The MwSt Nr. in Switzerland is called UID (Unternehmens-Identifikationsnummer) - There have been some changes in Switzerland two years ago --> http://www.estv.admin.ch/mwst/themen/00154/00589/01107/	reported
2/7/2015	Seller	Open Invoices	Benchmark of how we can improve our overview (see image on the right)	reported
2/7/2015	Seller	Dashboard	Should we on top also include a short profile of the company that is selling? On top now it starts now with simply open invoices - Would it be possible to integrate the logo of the company as well?	reported
2/7/2015	Seller	Account Settings	Is it possible to make a EN/DE Switch on the bottom of the page or on top, so one doesnt always have to go to the settings? Does it make sense?	reported
2/7/2015	Investor		Worst case scneario after T+30, we have to build in a system of how to sell the unpaid invoice to an external agency for the investor to have it as easy and fast as possible	rejected
2/7/2015	General		When signing up as an SME - Benchmark Number 26	reported
2/7/2015	Seller	Purchase information for Invoice	Design + maybe we should put in a bit more content? So some more overview info of the seller and the invoice	rejected
3/7/2015	Seller	Account settings	Delete account should be possible	implemented
6/7/2015	Investor	Registration	When putting in the birth date the year and month of 2015 pops up, especially if the investors are older it takes a bit to scroll down to the respective year - maybe we change the way it is displayed.	reported
6/7/2015	Seller	Registration	When registering, we have to specify when it says MwStr Nr, that it is the UID - Unternehmensidentifikationsnummer	reported
6/7/2015	Seller	Registration	Zuerst heisst es .....Du hast dich erfolgreich angemeldet..... und dann wird in der SIE Sprache weitergeschrieben. Müsste meiner Meinung nach alles in SIE sein..... Präsentation mit den einschiebenden Elementen finde ich nicht optimal.	
6/7/2015	Seller	Registration	No, it's fine like this!	implemented
6/7/2015	Seller	Registration	Account was locked, because my e-mail adress was known already?	rejected

6/7/2015	Seller	Registration	Feld "Name": unklar ob Vor- und Nachname oder nur der Nachname eigegeben werden soll. Feld "VAT": Hier ist wohl die VAT-Id(entnummer) gemeint - oder? Account-Activation: "we will contact you soon..." In den nächsten Sekunden?, Minuten?, Stunden?, Tagen?...Ist zu undefiniert! Erfolgt der Kontakt per E-Mail? Muss sonst noch etwas getan werden um den Account zu aktivieren...?	reported
6/7/2015	Seller	Registration	I might separate it from the regular menu-items (e.g. right corner, vs. left corner menu-items) to emphasize that it is inherently different and make it easy to find.	rejected
6/7/2015	Seller	Registration	Login button is now the same as the other buttons in the upper menu, maybe highlight to express importance.	reported
6/7/2015	Seller	Registration	No, however I am not able to login because I get the mention that the site is in beta version and my account is not yet enabled.	rejected
6/7/2015	Seller	Registration	When your account is not yet enables, you receive a message with a grammar error. Ffel instead of feel	implemented
6/7/2015	Seller	Registration	The account I created personally was not yet enables yet after 10 minutes.	rejected
6/7/2015	Seller	Sell invoice	Terms and conditions - when they upload an invoice	reported
6/7/2015	Seller	Sign-up	ID identification	reported
6/7/2015	Seller	-	Change Financial information to company information	rejected
7/7/2015	Seller	Seller information	Welche Informationen sind das? Warum werden die benötigt? Der Schweizer ist zurückhaltend mit Zahlen und wenn möglich würde ich das auf ein absolutes Minimum zu beschränken versuchen.	rejected
7/7/2015	Seller	Seller information	1. It was not clear to me whether it was a necessity to send my details to admin for a review, I first thought it was something optional to help you guys or as a "favour" from your side for costumor friendeliness or something. But I afterwards understood that it is needed to upload invoices. Try to state that more clear! 2. Also the choices("yes" and "not yet,....") made it more unclear to me. Try to make it really simple for the customer! 3. I would change the 'update seller' buttom to something like 'update my profile'	reported
7/7/2015	Seller	Seller information	Maybe add a 'help' button with a more detailed intstruction as an example of the financial data of a imaginary company.	reported
7/7/2015	Seller	Seller information	When you scroll over the page you get the text in clouds too quick. Irritating	reported
7/7/2015	Seller	Seller information	Is the financial data disclosed with investors as well? In this case, if it would be my company, I might object to revealing those to the world. I know Mendix was alway quite secretive	My tips

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			about this, they published relative numbers (such as triple digit growth) but never absolute numbers. Also do you guys plan to implement KYC? I can imagine that this is important from risk / legal perspective.	
7/7/2015	Seller	Seller information	Maybe adding tip from the system what still needs to be filled in. (eg: dont forget to upload your balance sheet or income statement)	My tips
7/7/2015	Seller	Seller information	It is easy because you do not have fill in that much detail, however I do not know how willing companies are to fill in their cash balances.	
7/7/2015	Seller	Seller information	My company was founded in 1988.... Can't fill that in. Maybe you could show what kind of documents are supported under Financial Information.	reported
7/7/2015	Seller	Seller information	- Only companies founded after 1999 can be inserted. - Under 'Industry' I could not find something like Advisory/Consulting.	reported
7/7/2015	Seller	Seller information	I'm not sure if this would be too inconvenient for users, but setting some format requirements for the financial documents could make the platform more transparent. In the sense that with approximately equal formats, it is easier to compare the financial status of companies on the platform. On the other hand you don't want to force companies to spend their precious time on re-formatting their financial documents. Maybe a short explanation about what happens when your profile is in the review creates more trust at the client. What are you doing with the uploaded information? and what requirements do you use in the review?	My tips
7/7/2015	Seller	Seller information	Account haven't been enabled yet, can't continue the test.	rejected
7/7/2015	Seller	Add customer	Es kommt immer die Meldung ......Sie müssen zuerst Ihre Kontodetails vervollständigen, bevor Sie Rechnungen verkaufen können. Bitte klicken Sie auf Verkauf Einstellungen. Und ohne Dokument hochzuladen kommt man nicht weiter..... Verstehe untere Frage nicht......	rejected
7/7/2015	Seller	Add customer	No	rejected
7/7/2015	Seller	Add customer	Bovenaan: Create customer, onderaan: add (net andersom!)	rejected
7/7/2015	Seller	Add customer	Start with typing Firm name instead of country. Specify which adress you are requesting (HQ, R&C, Visitor adress?)	reported
7/7/2015	Seller	Add customer		
7/7/2015	Seller	Add customer	Maybe autofill instead of dropdown if there are expected to be many customers.	rejected

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			With regard to uploading invoices and adding customers combined. I think it is a good first version, however one idea for the future to keep in mind: From my time as YES!Delft treasurer, I was always frustrated (or at least I thought it could be done better) by the unhandy Exact Online interface. If sellers are expected to upload multiple invoices at once I would suggest an interface in which you upload a batch of pdf's and use this as starting point, for instance show the pdf invoice on the left so that on the right all the details can be copied in the specific fields and then scroll down for the next invoice.	
7/7/2015	Seller	Add customer	Provide suggestions to think of which customers of my business I could add.	reported
7/7/2015	Seller	Add customer	- I do now know how many customers I would add - In the country field only germany, austria and switzerland are available, should there not be a field with other?	rejected
7/7/2015	Seller	Add customer	Can customers be only from those three countries? .	rejected
7/7/2015	Seller	Add customer	- Only countries Germany, Swiss and Austria could be selected - In fist instance I filled in all info for the Financial Information, but I kept on receive the comment that I could not leave any field unfilled. After I filled in the same information again, my profile was updated successfully.. - The upload function of invoices was very clear and easy to use, but I received an application error when I tried to create the invoice.	rejected
7/7/2015	Seller	Add customer		
7/7/2015	Seller	Add customer	Again, maybe nice to add more countries to the list. Could be interesting to ask as well for the type of product or service provided to the customer.	rejected
7/7/2015	Seller	Generic	Etwas langer feedback Bogen.... Wenn dieser nur in englisch geschickt wird müssten die Fragen vielleicht etwas verständlich geschrieben werden.. Meiner Meinung nach muss vom "einfachen Mann" ausgegangen werden, dass er auch auf der Plattform zurechtkommt. Da ich offensichtlich die Seite "Verkauf Einstellungen" nicht richtig ausgefüllt habe bzw. nicht konnte, konnte ich auch nicht weiterfahren und fertig testen.... Aber grundsätzlich ist die Seite sehr ansprechend dargestellt und übersichtlich.	rejected
7/7/2015	Seller	Generic	Looks cool!	rejected
7/7/2015	Seller	Generic		
7/7/2015	Seller	Generic	I allready have sent e-mails Bovenstaande vraag kan alleen als 1Euro=1 CHF	rejected
7/7/2015	Seller	Generic	Good luck! It would provide a lot convinience and trust factor if you	reported

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			could provide a list of exisiting firms (perhaps export from official records) that users can choose directly from when uploading customers. This would at least give me an ensuring feeling that Advanon is a serious service associated to multiple SMB firms (thus providing a fake social prof of concept).	
7/7/2015	Seller	Generic	NACHDEM MEIN ACCOUNT NICHT INNERT NÜTZLICHER FRIST AKTIVIERT WURDE, HABE ICH DEN TEST ABGEBROCHEN...SORRY	rejected
7/7/2015	Seller	Generic	Impressed by the platform so far. Wonder how the financial part will be implemented. Have you looked at how MarketInvoice has implemented this? Keep it up!	implemented
7/7/2015	Seller	Generic	Keep up the good work!	implemented
7/7/2015	Seller	Generic	The sentence "When would you like the sale to finished?" in creating an invoice, should that not be When would you like the sale to be finished?	implemented
7/7/2015	Seller	Generic	This survey is set up for potential investors or companies using your platform. I will not, so some questions were irrelevant. In those cases, I picked the average answer.	rejected
7/7/2015	Seller	Generic	Difficult to fill out since I dont have a company, invoices or clients Website does seem easy to use	rejected
7/7/2015	Seller	Generic	The website looks very structured and easy to use. I have a few main concerns: 1. I think more information can be provided on every page about why it is necessary and useful to provide certain information. And what my advantage as Advanon's customer is to provide this information. Providing information creates more trust when it is done in a considerate way. 2. Maybe adding privacy settings to profiles helps creating trust in the website as well. Who is allowed to see my uploaded invoices and financial information? Or even my profile as a whole? If I don't want my own customers to see I'm active on Advenon, this should be made possible. 3. For a company with a large customer base and a lot of invoices it might be inconvenient to upload everything manually. It is very easy to upload documents manually, but uploading them one by one can cost too much time. A link with a company's financial software can improve the user friendliness of the website enormously. At least when it works smoothly enough.	reported
7/7/2015	Seller	Generic	Account haven't been enabled yet, can't continue the test.	rejected
7/7/2015	Investor	Generic	1. Investor details page - it may be helpful to have a help icon or something explaining what "Receive IBAN" actually is. For	

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			example is this the IBAN Advanon expects to get money from the Investor, or is it the IBAN I expect to receive funds on?	
7/7/2015	Investor	Generic	2. Terms and Conditions - I appreciate these are under development, it would be helpful to be informed when these get activated as these will be critical to understand what I am signing up for!	
7/7/2015	Investor	Generic	3. Investor details - This is linked to the T&C, however other than my name and birth date, Advanon does not capture my personal correspondance details. I am thinking in the context of Anti Money Laundering regulation - how does Advanon ensure the funds are coming from me?	

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