UNIVERSITY OF GOTHENBURG

Digital entrepreneurship in online communities

A study of knowledge sharing

Digitalt entreprenörskap inom online communities

En studie om kunskapsdelning

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Abstract

In this paper we have studied the different dimensions of knowledge that are shared regarding digital entrepreneurship. This study builds on the knowledge in the field of digital entrepreneurship and presents a tentative taxonomy of its ever changing pool of knowledge. Ventures in the digital economy require increasing amounts of knowledge to be able to compete. To get access to knowledge they need to interact with communities that engage in knowledge sharing, these communities can exist online or offline. The dimensions/structures of knowledge that the ventures can gain access to in online communities lacks studies. We ask ourselves:

What subjects of knowledge does digital entrepreneurs share in online communities?

The research setting was an online community governed by a Swedish non-profit organization. The community encouraged entrepreneurial activities in Sweden by organizing online innovation contests. Conventional divisions of subjects of knowledge were found to be incapable of covering the knowledge shared to digital platform ventures. In this study we have seen indications of three dimensions of knowledge; *Scalability*, *Morphability*, and *Complementarity*, that could not be fully explained by conventional knowledge theories. These dimensions covered sociomaterial attributes of digital platforms and as such they differed from conventional knowledge theories in entrepreneurship.

Keywords; Digital entrepreneurship, Digital platforms, Online communities, Knowledge sharing

Abstrakt

I denna studie har vi undersökt de olika kunskapsdimensioner som delas gällande digitalt entreprenörskap. Studien bygger på kunskapen inom fältet digitalt entreprenörskap och presenterar en tentativ taxonomi över dess ständigt föränderliga kunskapsdomän. Företag inom den digitala ekonomin kräver allt mer kunskap för att kunna konkurrera på marknaden. För att få tillgång till denna kunskap krävs det att företagen engagerar sig i online communities som aktivt utövar kunskapsdelning, dessa communities kan existera både online och offline. Studier gällande dimensionerna och strukturen av kunskap som företag kan få tillgång till från online communities är bristfällig och vi ställer oss därför frågan:

"Vilken typ av kunskap delar digitala entreprenörer inom online communities?"

Denna studie genomfördes i en online community kontrollerad av en svensk ideell organisation. Communityn uppmuntrade entreprenöriella aktiviteter i Sverige genom att organisera innovationstävlingar. Traditionella kunskapsindelningar befanns vara otillräckliga för att kunna förklara all kunskap som delades till digitala plattformsföretag. I denna studie så har vi sett indikationer på tre dimensioner av kunskap; *Scalability*, *Morphability* och *Complementarity*, som inte kunde fullt ut förklaras av konventionella kunskapsteorier inom entreprenörskap. I dessa dimensioner diskuterades sociomateriella attribut hos digitala plattformar och därför skiljde de sig från konventionella kunskapsteorier inom entreprenörskap.

Nyckelord; Digitalt entreprenörsskap, Digitala plattformar, Online communities, Kunskapsdelning

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1 Introduction

The act of generating new ideas and conducting entrepreneurial activities have been key drivers in the economic growth of modern society (Baumol, 1986). The disruptive technologies of the digital era have increased the speed of innovation and created new ways of performing entrepreneurial activities (Thukral et al., 2008; Yoo et al., 2012). Digitalization has allowed digital entrepreneurship to emerge. Digital entrepreneurship has changed the way in which we view entrepreneurship. It is less bounded and less predefined (Nambisan, 2017). Digital entrepreneurship creates ventures that pursue opportunities presented by new media and internet technologies. Digital entrepreneurships are sociomaterial by nature which makes it hard to apply conventional approaches (Davidson & Vaast, 2010). Entrepreneurs have a need for knowledge in the early stages of the venture. Knowledge helps the entrepreneur to refine the venture and enhance the performance (De Clercq & Arenius, 2006; Wang et al., 2015). Possession of knowledge is also considered as a major competitive advantage of a venture (De Clercq & Arenius, 2006; Oviatt et al., 1995; Tsoukas, 2009; Burns et al., 2010; Davidson & Vaast, 2010). The conventional ways of dividing subjects of knowledge are no longer sufficient to cater to the needs of digital ventures (Gawer, 2014). The entrepreneurial knowledge shared to digital ventures in online communities is an area of study that has been neglected by academia (Miralles et al., 2016; Steils & Hanine, 2016; Nambisan, 2017).

In this study we aimed to fill this knowledge gap by asking ourselves the following question:

What subjects of knowledge does digital entrepreneurs share in online communities?

To answer this question, we began by analysing how applicable conventional divisions of knowledge were when the knowledge was shared to digital ventures. We found indications of three differing dimensions of knowledge that were shared in the online community; *Scalability, Morphability* and *Complementarity*. These dimensions of knowledge discussed sociomaterial attributes of digital

entrepreneurship. The dimensions of knowledge could not be fully understood through conventional theories.

The remainder of the paper is structured as follows. Section 2 reviews the existing literature on traditional entrepreneurship and conventional entrepreneurial knowledge theories. Section 3 describes digital entrepreneurship, the digital platform and concepts that are closely related to these. Section 4 describes the methodological approach used in the study. Section 5 presents the new dimensions of knowledge that were observed. Section 6 relates the three dimensions of knowledge to the concepts and theories described in section 3 and contains concluding remarks.

2 Entrepreneurial knowledge

Within academia there has been a lack of consensus on the definition of entrepreneurship, but the most common definitions are the creation of business (Busenitz et al., 2003) and the pursuit of opportunities by individuals and organizations (Gumpert & Stevenson, 1985). However, these definitions have been criticised for failing to capture the full width of the concept of entrepreneurship (Ahmetoglu et al., 2011). Studies on traditional entrepreneurship have been divided between the sources of entrepreneurial opportunities, the entrepreneur's process of discovering, evaluating and exploiting these opportunities and the entrepreneurs who discover, evaluate and exploit these opportunities (Shane & Venkataraman, 2000). In this chapter we will describe the role that knowledge plays in traditional entrepreneurship and review the existing theories that divide knowledge into subjects.

2.1 The role of knowledge in entrepreneurship

Knowledge has been found to have a large impact on the performance of start-ups, the confidence of the entrepreneur and the probability of the creation of a venture (De Clercq & Arenius, 2006). Entrepreneurs possession of knowledge is considered as a major competitive advantage of a venture (De Clercq & Arenius, 2006; Oviatt et al., 1995; Tsoukas, 2009; Burns et al., 2011; Davidson & Vaast, 2010). Knowledge allows individuals to identify new market opportunities and create competitive advantages (Dew et al., 2004). Research has shown that two primary sources of knowledge are education and work experience (De Clercq & Arenius, 2006; Miralles et al., 2016). The knowledge an entrepreneur possesses affects how opportunities are perceived (Corbett, 2007). Knowledge increases the probability of individuals taking part in entrepreneurial activities (Miralles et al., 2016). A greater amount of knowledge enhances the entrepreneur's confidence which is an important factor during the creation and development process of a venture. Knowledge factors can enhance employee and venture performance (De Clercq & Arenius, 2006).

Entrepreneurs can use knowledge in an early phase of the venture to learn about potentials for their product or service and what markets they can explore (Collinson, 2000). Gaining knowledge through human resources is important for start-ups (Oviatt et al., 1995). However, ventures often lack the resources and network to recruit the necessary experts which are vital for success (Collinson, 2000). There are several ways in which exposure to external knowledge can contribute to ventures. One way is to reinforce the entrepreneur's ideas with confirmation and encouragement. Another way knowledge can contribute is by criticising the entrepreneur's ideas and refining them in the process (Bullinger et al., 2010). A third way is to contribute with new information previously unknown to the venture that in turn makes it possible to overcome business-related obstacles. Knowledge does not have to be new to the recipient to be valuable (Collinson, 2000; De Clercq & Arenius, 2006).

2.2 Subjects of knowledge in entrepreneurship

Knowledge can be divided into subjects; a subject of knowledge is a cluster of knowledge that connects to a specific factual knowledge. Below follows a short review of different subjects of knowledge found in the entrepreneurial literature.

There have been very few studies on the subjects of knowledge shared in online communities (Miralles et al. 2016; Steils & Hanine, 2016). Wang et al. (2015) studied feedback given, or knowledge shared, in online communities. They divided the data into three categories depending on the receiver's perceived usefulness of the knowledge; *solution*, *helpful* and *unhelpful.* Hew and Hara (2007) identified two subjects of knowledge shared in online environments: *Book knowledge* and *Practical knowledge*. Practical knowledge was further split into three subtypes: *Personal opinion, personal suggestion* and *Institutional practice.*

De Jong and Ferguson-Hessler (1996) presented four types of knowledge that relates to problem solving: *situational knowledge*, *conceptual knowledge*, *procedural knowledge*, and *strategic or meta-knowledge.* Steils and Haninec (2016) studied how knowledge was generated and shared in communities engaged in creative contests. In addition to the subjects of knowledge presented by De Jong and

Ferguson-Hessler (1996), they found that actors needed to possess social and creative skills to be able to solve innovation challenges.

Shane (2000) described three subjects of prior knowledge that the entrepreneur needed to possess in the discovery step of entrepreneurship: *knowledge of markets*, *knowledge of ways to serve markets*, and *knowledge of customer problems*. Roxas et al. (2008) claimed that the studies on entrepreneurial knowledge have been highlighting two subjects of knowledge: The first was *functional-oriented knowledge* such as marketing, sales, production and human resource management. The second subject was strategic *management-oriented knowledge* such as strategies, competitive analysis, managing growth and opportunities. Orhei et al. (2012) presented several subjects of knowledge relevant to social entrepreneurship most prominently knowledge about *business models* and *team dynamics*.

Han and Afolabi (2014) and Jones et al. (2011) presented several subjects of knowledge which were necessary for new ventures that expanded globally; *Technical knowledge, Foreign institutional knowledge, Foreign business knowledge* (Han & Afolabi, 2014), *Market knowledge* and *Experiential knowledge* (Jones et al., 2011). Knowledge about potential foreign markets is an important driver for growth (Presutti et al., 2007). Lack of knowledge about foreign markets is one of the largest obstacles for international growth in start-ups (Bell et al., 2003). Mckelvey and Lassen (2013) presented a comprehensive theory of three major subjects of entrepreneurial knowledge in what they defined as knowledge intensive entrepreneurship (KIE). *Technological, Market* and *Business knowledge,* are vital for identifying and pursuing entrepreneurial opportunities. *Technological* refers to scientific knowledge, usually derived from experience or education. Technological experiences are commonly gathered over a longer period of time through trials and studies. This knowledge is vital when developing new products and services with regards to technical specifications. *Market knowledge* is information received from the market and potential buyers. *Market knowledge* is needed in order to understand what the market wants and how to package a service or product for the buyers. *Market knowledge* also covers how business models should be designed in order to match the entrepreneurial activity and its surroundings. *Business knowledge* refers to the organizational structure and

governance of the venture. This domain of knowledge focuses on how to design and structure the internal and to some extent the external environment. It defines the management aspect and suggests how the organization should be governed. Knowledge intensive entrepreneurship is considered to be ventures in which knowledge have a crucial competitive role (Mckelvey & Lassen, 2013).

3 Digital entrepreneurship

In this chapter we initially describe digital entrepreneurship. This is followed by a description of some of the online environments that facilitate digital entrepreneurship. Finally, we present the digital platform concept and its central properties as presented by the emerging literature on digital entrepreneurship.

3.1 Digital entrepreneurship and online communities

Digital entrepreneurship is the practice of pursuing new venture opportunities presented by new media and internet technologies. They are sociomaterial by nature which makes it hard to apply conventional perspectives of entrepreneurship (Davidson & Vaast, 2010). The sociomaterial perspective highlights that technology has a kind of agency that shapes and is being shaped by the social dimension, thus it appreciates the ongoing interaction between technological and social factors. The sociomaterial perspective considers two types of agency, human agency (e.g., the ability to act with intentionality, motivation, and rationality) and technological agency (e.g., "the capacity for nonhuman entities to act on their own, apart from human intervention" and these form the building blocks of practice (Orlikowski & Scott, 2008).

Many traditional entrepreneurial concepts have changed when they are applied to digital entrepreneurship, among them economies of scale. After the initial development, it is very cheap to scale the venture because the marginal costs incurred are negligible (Huang et al., 2017).

In the digital economy, entrepreneurs and ventures need to possess a sufficient amount of knowledge to be able to capture the value of the knowledge provided by external sources (Davidson & Vaast, 2010). The amount of knowledge that an entrepreneur possess is limited to education and previous experience (De Clercq & Arenius, 2006). In order to increase their knowledge capital, the entrepreneurs have to interact with external sources of information. This external knowledge can be achieved by participating in (online) social networks, e.g. online communities (Davidson & Vaast, 2010; Faraj et al, 2011; Tedjamulia et al., 2005).

In online communities, people with common interests and goals share information and knowledge through social interactions enabled by technology (Chiu et al, 2006; Phang et al. 2009; Faraj et al, 2011). Online communities relate closely to innovation communities. von Hippel (2005) defined innovation communities as: *"nodes consisting of individuals or firms interconnected by information transfer links which may involve face-to-face, electronic, or other communication. These can, but need not, exist within the boundaries of a membership group."* - von Hippel, 2005;96. In an innovation community, actors contribute in generating, elaborating and evaluating ideas. Through this process the community may generate value (Gebauer et al., 2013), resolve problems, construct knowledge (Mathwick et al., 2008) and improve innovation performance (Liu et al., 2015). The type of value generated is affected by the different actors in the community (Ritter & Gemünden, 2003).

Online communities can be combined with innovation contests, creating a competitive online community that allows the participants to engage in knowledge sharing. These types of communities can appear in different forms such as innovation mobs (Bullinger et al., 2009), digital innovation contests (Hjalmarsson & Rudmark, 2012) and online innovation contests (Hallerstede & Bullinger, 2010). In online communities with an innovation contest there is often a paradox as the users are both competitors and collaborators. The most productive online communities appear when there is a high or a low degree of collaboration between the participants. A medium degree of collaboration is the least productive alternative (Bullinger et al., 2010).

3.2 The digital platform

Digital platforms have taken a dominant role in digital entrepreneurship as foundations for digital artefacts to build on, and as multi-sided markets bringing together users that benefit from each other (Gawer, 2014). These multi-sided markets differ from the conventional value chain where the value moves in a straight line from one side to the other. The value in a multi-sided market moves in several directions and benefits multiple sides (Gawer, 2014; Cusumano, 2010; Eisenman et al. 2006). Firms that do business on digital platforms can engage in

multiple platforms to reach a wider range of users or choose to prioritize one platform to focus their resources and efforts. Establishing a firm on multiple platforms is often expensive as it requires adjustments of the software developed by the firm (Armstrong, 2006). The benefit of accessing multiple platforms is that the firm can gain access to a larger User base.

User base has become increasingly important for the success of digital ventures such as digital platforms (Prasad et al., 2010). Huang et al., (2017) argue that scaling digital ventures differs from scaling traditional ventures. Digital ventures marginal costs are lower than traditional ventures which makes them less expensive to scale (Brynjolfsson, 2011). The value of the digital platform closely relates on the amount of users that are accessible through the platform. Therefore, the value of the platform increase with every new user. When the value consequently increases, more users are attracted and the speed of growth increases. This phenomenon can be described as a positive feedback-loop where users attracts more users. The effects generated by a growing user base, such as network effects and economy of scale, is an important tool in the competitive landscape (Oliva et al., 2003). Because of the significant role of user base in the success of the digital venture, the early stages of growth have become increasingly important. If a digital venture manages to establish a large user base before any competition emerges they have a much stronger position on the market in the later stages of maturity (David, 1985). Ventures can also become dominant on the market or even create new markets by developing a superior platform (Brynjolfsson, 2011).

A platform's architecture can be structured in several different ways. Bodreau and Lakhani (2009) created a model of three different types models of platform architectures, *Integrated, Product,* and *Multi-sided platform.* The *integrated* platform is designed to give the platform owner full control over what content is developed by third parties and delivered to the customers. The *product* platform is designed to allow the third party to develop more freely to the customers, but they are still constrained to the platform owner's rules and architecture. The *multi-sided* platform is the most open architecture where the platform owners allows third parties to freely develop on specific parts of the platform and distribute directly

to the customer (Bodreau & Lakhani, 2009). Wareham et al. (2014) states that a digital platform needs to be both evolvable and stable in order to be successful. It has to be able to evolve in order to meet new market- and customer demands and at the same time stable in order to guarantee quality and value for its users (Wareham et al, 2014). The architectures of digital platforms are often modular in design. They are built in separate modules which allows for development of new features while keeping the reliability of the core technology in the platform (Baldwin & Clark, 2003; Ulrich, 1995). In addition to being modular, digital platforms often take on the characteristics of digital objects. They are *editable* in that they can easily be changed and altered. Digital objects are also *interactive* as they offer the possibility to activate functions embedded in the object or explore the underlying information structure. Thirdly, digital objects are *open* in the sense that they can be altered through other digital objects. Finally, a digital object is *distributed,* it rarely exists in one single space (Kallinikos et al., 2010). The characteristics of digital objects have allowed agile methods to become a popular way of platform development. By developing iteratively, the platform can be introduced on the market faster. It can also be adjusted to changing circumstances and incorporate new information that was not available at the early stages of development. This information can be sourced from use of the platform by customer groups (Coleman, 2016). Going to market early with a business concept and experimenting with different business concepts has become easier in the multi-sided markets of the digital economy (Brynjolfsson, 2011).

Rochet and Tirole (2006) explained the structure of a multi-sided market by using a gaming console as an example. Sony owns the platform PlayStation, the game developers (third-party developers) pays Sony a royalty fee in order to gain access to the platform. The consumer buys the PlayStation from Sony and the games from the developers which generates profit for both Sony and the developers. This results in a co-dependent relationship where all parties receive some amount of value.

The relations between actors on a market are sometimes described as an ecosystem. An ecosystem can be a traditional value chain or a more advanced system of one or several platforms that are interdependent (Schilling, 2000). den

Hartigh and van Asseldonk (2004) described business ecosystems as networks of actors that rely on a core technology, usually a platform. The actors need to interact with each other and the platform. They depend on each other for their success and survival (Schilling, 2000). The success of a platform is closely related to the health and success of the ecosystem that it acts within (Iansiti & Levien, 2004). The actors in an ecosystem engage in collaborative innovation, usually orchestrated by a platform leader (Nambisan & Sawhney 2011). Eisenmann et al. (2006) stated that the majority of "blockbuster" products and services that have revolutionized the digital era have all connected different actors and generated valuable ecosystems.

Actors in an ecosystem can be seen as both competitors and/or partners depending on the context (Brandenburger & Nalebuff, 1997; Afuah, 2000). The actors involved in ecosystems can play different roles such as dominator, niche player and keystone depending on their relations and position inside the ecosystem. Most actors take on the role of niche players that target a smaller segment of the market. Niche players usually position themselves in an ecosystem that contains a keystone firm. They compete and collaborate with other niche players, the platform and the keystone firm. In some ecosystems the keystone takes the form of a dominator that supplant niche players and force them out of the ecosystem (Iansiti & Levien, 2004).

4 Method

In this section, we present the setting of the study followed by a description of the research design, data collection and data analysis.

4.1 Setting

This study has been conducted as a single case study on an online community. The community was based on a digital platform in the form of a website. The platform owner was a non-profit organization (NPO) with the purpose of encouraging and supporting entrepreneurial activities in Sweden. The NPOs key-activity was arranging online innovation contests where entrepreneurs competed against each other with entrepreneurial ideas The entrepreneurs submitted ideas on the website with a pitch and a business model.

During the contest the website was open to the public, anyone that fulfilled the NPOs requirements could compete. It was possible for anyone to view the submissions, but only registered users could give feedback, like and rate the submissions. On the website there were also recruited expert users that were designated as coach and jury members by the NPO. Competitors had the possibility to select certain parts of their submission as "hidden" and those parts were only revealed to the coach and jury members.

The competition was open for two months and during that time the entrepreneurs were able to refine their ventures with new experience and feedback given from the community. When the contest was concluded the submissions were reviewed by the jury and 20 winners were selected based on the community's ratings, feedback and the jury's judgement. The winners were awarded a monetary reward by the NPO and encouraged to further develop their ideas.

4.2 Research design

In this study we wanted to examine the knowledge shared to digital platform concepts to see if there was a need of a new taxonomy for this knowledge and potentially create a tentative taxonomy.

The first step in doing this was to examine if the conventional theories of knowledge division presented in 2.2 were capable of explaining the knowledge that was shared with digital platform concepts. To test the capacity of the conventional theories, we applied them to the knowledge that was shared to 29 digital platform concepts of varying size and quality through the online community. The theories were found to be unable to explain all the knowledge that was shared to these ventures. Knowledge that was not addressed by the conventional theories of knowledge division was considered as indicators of the need for a new taxonomy and thus gained the focus of the study.

We have conducted an explorative study to find an answer to our research question. In this study we have used Romano et al (2003) three-step model for analysing internet-based qualitative data. The model has been chosen due to its ability to explore the community's feedback which exists only as comments on the website. The model is divided into the steps *Elicitation (1), Reduction (2)* and *Visualization (3).* The first step (1) is to collect primary and/or secondary data. The second step (2) is to generate categories, develop code schemes and cluster the data and applying the code. To do this we were inspired by Braun and Clarks (2006) six phase method for conducting a thematic analysis (see section 4.4 Data analysis). Thematic analysis is a useful method for conducting qualitative studies, especially when summarizing features in large bodies of data, looking for unanticipated insights and creating policy development suggestions (Braun & Clark, 2006). The last step (3) in the process is to generate graphs and tables that visualize the data (Romano et al, 2003). The method is limited to only collect and analyse already existing primary and secondary data. This eliminates the possibility of extracting additional data which does not exist on the website.

We argue that the study has a high reliability and validity based on the criteria; credibility, dependability, confirmability, and transferability (Guba & Lincoln, 1985). The feedback was collected after the competition was over which made it independent from the time it was posted on the website. Due to the fact that the data was collected from a closed competition, it was guaranteed that the data would not change or disappear during the time that the study was conducted. We performed the clustering of data as double-blind coding to increase the

confirmability of the study (Shaw & Holland, 2014). The data collected in this study can only represent knowledge dimensions of digital platform ventures. The raw data can however be used to further study other types of ventures.

4.3 Data collection

The data has been collected by gathering the feedback given to the ventures in the online community. Communication in the community has been conducted in an asynchronous way. Asynchronous communication in the form of written comments and feedback is observable, relatively easy to use, accessible, and safe (Im & Chee, 2006). In the Elicitation (1) step we collected written comments from the community. These comments were written as feedback to individual ventures. The comments were recorded into excel sheets. The authors of each comment was also registered. This was done for every venture in the selection.

The criteria for data selection was that it had to be given to a digital platform venture and it could not be explained by the conventional theories of knowledge presented in 2.2. The first step was to list all digital platform ventures that had received feedback from the community. The selected ventures were structured into separate spreadsheets and their feedback was categorized into three conventional subjects of knowledge, *Market, Technology* and *Business* based on Mckelvey and Lassens (2013) KIE-model. The second step was to identify feedback given by the entrepreneurs that did not conform to the KIE-model. This feedback was the data analysed in the later stages. Some of the analysed ventures had more comments and therefore provided a proportionally larger part of the data.

4.4 Data analysis

The data was analysed through an iterative qualitative data analysis method as presented by Braun and Clarke (2006). Figure 1 illustrates the process of analysis.
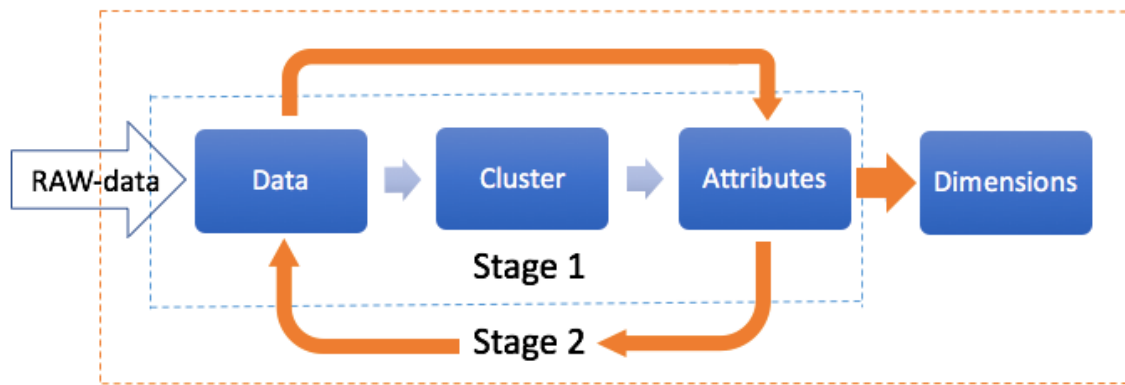
Figure 1. Method of analysis

The data analysis was divided into two stages. The first stage was divided into four sub-steps in order to generate themes from the data. The second stage was divided into two sub-steps with the purpose of validating the themes presence in the data.

Firstly we read through the data several times to accustom ourselves with it. Through this we gained a holistic view of the data. We realised that the data was centred around sociomateriality of digital platforms. Secondly we started coding the data through double blind coding (Shaw & Holland, 2014). Thirdly we thematised the codes and clustered the data into five primary clusters of knowledge that was shared in the community (See Appendix A). Fourthly we reviewed the five clusters we had generated and found that at the core of the clusters were three sociomaterial attributes of the digital platforms.

These attributes were given names that reflected their properties, *Scalability*, *Morphability* and *Complementarity*. Fifthly we went back to the data with the attributes and reviewed the validity of them to guarantee their quality and finalize their structure. Sixthly and lastly, from these attributes we could then define three dimensions of knowledge in the data and build these in the empirical section.

5 Results

The knowledge shared in the community was clustered around sociomaterial attributes of the digital ventures. We identified three such attributes in the empirical data. These three attributes were the cores of three different dimensions of knowledge that were shared in the community. The following sections (5.1-3) will first contain a definition of the core attributes; *Scalability, Morphability* and *Complementarity*, and then present in-depth descriptions of the dimensions combined with quotes from the data.

5.1 Scalability

The scalability attribute of the digital platform relates to its need of, and ability to expand rapidly and effortlessly through technical architectures and market strategies.

In the comments the users discussed growth of the venture. The users focused on how central the amount of users would be for the venture's success. *"The difficult part is that it requires critical mass of people subscribing to your particular service."* - *Venture A.* A common conception was that the value of the venture would grow with every added user.

The speed at which the venture could grow was considered as an important success factor. *"How do you scale the idea fast enough?"* - *Venture A.* Different approaches were suggested for rapidly attracting users to the platform. Some of the comments suggested that a collaboration with a few partners could help the venture get the initial users to the platform. These first users would push the value and attractiveness of the platform over the first critical level and draw in more users which would turn into a positive loop, resulting in a continuously increasing user group. *"If you could find one interesting target player in the market to cooperate with, that would be beneficial."* - *Venture B.*

Another approach that was suggested was to integrate the platform with existing external platforms that already possessed a large amount of users and by this

lower the threshold to join the ventures platform. *"The faster option is that you tie into to all major social media platforms." - Venture A.*

There were some users that discussed how the technical architectures of the platforms would allow growth. The community presented two primary aspects of technical scalability. One was the more fundamental aspect of technical capacity for growth, how the inner workings of the platform would have the capacity to accommodate an increasing amount of users. *"scaling our app should not be a problem, because it works as a decentralized type of network" - Venture A.* The other aspect was how the venture would adapt the technical architecture to be able to reach different markets. Different digital markets would require alterations in the technical architecture of the platform in order to function on the market. *"Since the mobile market covers different platforms, we want to offer the app to every phone owner, regardless of their brand." - Venture A.* This was not considered a necessity for success, but rather as a way to reach multiple markets. *"I hope it will be available for Android too in the near future." - Venture A.*

5.2 Morphability

The morphability attribute of the digital platform relates to its need of, and ability to adapt and develop the platform before and after the point of sale.

The users discussed the possibilities of adapting a digital platform. They suggested that the platform should exist in different versions that could target different user groups and markets. It was discussed that a globally used platform would require versatility to be able to act in different markets, language e.g. was discussed. *"Just think about the enormous obesity problems in Mexico and the potential to use your platform in all languages" - Venture C.*

The community discussed that digital platforms allowed the ventures to develop several versions with the users' willingness to pay in mind. Some of the user groups were prepared to pay more for advanced features. Meanwhile it was considered important to cater to the users that didn't want to pay for the platform. A suggestion was to create a free version of the platform with a minimum amount

of features and provide more features in a paid version. *"Maybe you could construct some freemium model, charging for some extra features?" - Venture D.*

Users discussed the possibility of conducting pilot studies in an early stage in order to get feedback which could ease further product development. In return, the users involved in the pilot would receive a discount on the platform. *"As a pilot case you can also perhaps offer the first 1-3 customers to receive a lower fee in return of customer driven feedback of your product." - Venture A.* The community also discussed that the venture should try to go to market with the earliest viable platform. *"I'd recommend starting with the minimum viable service people will pay for" - Venture A.*

The community discussed that digital platforms could create new business models that incorporated early sales of unfinished platforms to create an early source of revenue while maintaining control of the platform even after launch. Due to the possibility of altering the platform after launch the venture could adjust the platform to customer feedback and correct any potential errors. *"Develop services further, using revenues and based on your customer's input and desires. Stay in touch at all times to maintain your head start." - Venture A.*

The user feedback generated from going to the market early was considered important for product development and any consecutive feedback should be incorporated into the further development of the platform *"we will continuously survey users and improve the app." - Venture A.* However, it was stated that there was a significant risk in going to market early as an incomplete and unusable platform could quickly have gained a bad reputation which could severely hurt the venture *"it is so important to have a smoothly [sic] running app in the early stage. Mouth to mouth marketing could sink it or market itself!" - Venture B.*

5.3 Complementarity

The complementarity attribute of the digital platform relates to the ventures need of and ability to interact and integrate with external technical architectures and actors.

There were several comments on the topic regarding the actors and technologies in the markets that the ventures were planning to enter. Many users discussed the

actors on the market from a competitive viewpoint and gave the venture feedback about how they did or did not differentiate from the already established actors. *"What is the value you are giving to costumers [sic] that differentiates your product from similar apps?" - Venture A.* Users suggested other platforms similar to the ventures as sources of inspiration for further development. *"Do you use an app called ShareIt on andriod [sic] which helps share photos, songs,apps [sic] and files without internet connectivity or bluetooth. Thought it would be interesting to check it out!" - Venture A.*

The community discussed the possibility of accelerated product development and decreased time to market from co-development with incumbent key players on the market. *"Perhaps a collaboration with one of the largest suppliers of refrigerators can help accelerate development/validation of this idea." - Venture E.*

Some users in the community proposed an approach where ventures would design the venture in a way that considered what was already on the market. The ventures should aim to generate value by offering new differentiated services. *"We defined our service in such a way, that it would minimize potential duplicate features popular services are already offering." - Venture A.*

A frequently discussed topic was how the venture should integrate and link to already existing architectures and technologies controlled by third parties into their platform. The community suggested that this could be done in two ways.

Firstly, the venture could integrate external technology into their platform, for example using an Artificial Intelligence developed by a third party. By integrating technology developed by third parties the venture could build a more attractive platform. The third party technology could be more advanced than what the venture could create themselves. *"you may need a 3rd party AI component to make sense of the input." - Venture F.* The ventures could also integrate external components by linking existing communities to the platform to get the users of those communities to start using the platform via Facebook identity e.g. The community considered this as a way to complement the venture. It was also considered a way to gain users as they would be more inclined to use the platform if it related to something that they were already using. *"I would try to evaluate using*

Yammer Microsoft identity so that you have an enterprise community at your disposal" - Venture A.

Secondly the platforms could be built as add-on features to existing technologies controlled by third parties. If the venture could adapt their platform to be compatible with existing technologies, they could reach more users and become more successful. *"See this more as a service that could ba [sic] an add-on to existing sites, and your customers are the already established players in the field." - Venture F.* This could be done without competing with the third parties. Instead it would add value to those parties. *"I believe that the key for the success of this solution might be related to: easy to use, add- on feature to current apps more than one more app." - Venture A.*

While partnerships were considered important in the early stages of the venture there were some comments that discussed how the venture could avoid becoming too dependent of these partners. The solutions suggested were both technical workarounds that would cut out the middleman and market strategies that could manage these partnerships to the ventures benefit. *"we want to offer flexibility to users, so that people can use it independently (without subscribing to an event in advance) without the need for organizers to be involved in setting up the events for the application" - Venture A.*

There were also concerns from some of the users that developing platforms that were dependent on third parties would increase costs and create technical limitations. *"When it comes to developing for iOS, Android or Windows it also comes with a lot of limitations and extra costs." - Venture G.* A more ambitious approach was suggested. The venture could aim to create a platform that would become an architecture for other platforms. *"If possible, maybe make it as a hub, and enabling widgets/ apps from different vendors, even Google." - Venture H.*

6 Discussion

The dimensions of knowledge presented in section five cover sociomaterial attributes of digital platform ventures. These attributes are central to our demarcations of knowledge dimensions. To strengthen our dimensions, we will further develop our definitions of these attributes by discussing the attributes relations with emerging theories on digital entrepreneurship and digital platforms.

6.1 Growth of digital platforms

The scalability attribute of the digital platform relates to its need of, and ability to expand rapidly and effortlessly through technical architectures and market strategies.

Reaching a certain amount of users to be able to succeed is very closely related to the concept of Network effects. Value derived from the amount of users of a platform has become the number one measure of success (Prasad et al., 2010) and as such the knowledge of how to attract and retain users of the platform would be important (Huang et al., 2017).

The community frequently suggested growth as a factor of the ventures success. Attracting users and expanding rapidly and globally was discussed often. This relates closely to the importance of growing quickly on a digital market. By being first the ventures have the opportunity to build a user base before any competition enters the same market segment. This could start a feedback loop which would increase the platforms value and attract more users (Huang et al., 2017). By establishing the platform as the most valuable option to the users and keeping that position the venture could elevate the platforms position to the dominant design of the market which would significantly strengthen the ventures position (David, 1985).

Attracting the first users was approached much in the same way that a multi-sided market work where indirect network effects between different sides of the market are crucial (Eisenman et al. 2006; Cusumano, 2010). The suggested strategy from

the community was to attract a few large users to one side that would increase the value to the other side. Another suggested way to obtain early users was to tap in on an existing user base, especially the user base of a digital platform. To be able to do this, the venture would have to design the platform to be compatible with a specific digital platform which architecture allows integration (Boudreau & Lakhani, 2009).

The ventures were suggested to grow as fast as possible and on as many markets as possible. The ventures could scale more easily than traditional ventures as their product or service were digital platforms. With digital platforms, growth would be comparatively cheap to achieve due to low marginal costs (Huang et al., 2017).

6.2 Dynamics of digital platforms

The morphability attribute of the digital platform relates to its need of, and ability to adapt and develop the platform before and after the point of sale.

The community discussed the ventures possibility of entering a wide range of potential markets and engaging different user segments. The modularity inherent in the architecture of digital platforms makes it possible for digital ventures to accommodate a wide scope of users and markets while maintaining the core architecture (Baldwin & Clark, 2003; Ulrich, 1995).

By having a modular platform, the venture could create different versions of the digital platform that could be sold at different costs. Thereby meeting market demand in several market segments while requiring very little effort in the form of further development (Wareham et al, 2014). This would also allow the ventures to maintain a free version of the platforms to attract a large user base and at the same time create a revenue stream which was frequently suggested as a strategy for growth by the community.

Digital objects, such as digital platforms, allows the venture to decrease time to market due to its ability to transform and change its properties after deploying the platform on the market (Kallinikos, 2010). Getting a viable platform as quickly as possible and releasing it to the market was suggested several times by the community. The venture was suggested to release a platform that was not

complete and then continue development. Digital ventures maintain control over the platform, even after sale which allows them to implement post-sale changes to the platform. This can be done according to Huang et al, (2017) because of the separation between a digital platforms form and function. The community did warn the ventures that there is a risk in releasing a platform that is not finished as it could harm the reputation of the venture.

The community thought that customer feedback was a good way to learn in which direction to develop the platform. Due to the possibility of adjusting a digital platform after point of sale, the ventures can implement iterative product development. By receiving feedback from users, the venture can continuously develop the platform based on their ideas and needs. Coleman (2016) argues that iterative product development is a successful concept to deal with rapid changing market needs.

6.3 Interactions of digital platforms

The complementarity attribute of the digital platform relates to the ventures need of and ability to interact and integrate with external technical architectures and actors.

The ecosystem approach to the entrepreneurial market occurred often in the feedback. The community discussed interactions and actors in the ventures surroundings in a way that resembled ecosystems. By thinking of the market as an ecosystem the ventures can identify their position on the market and what actors that exist in the same ecosystem. Ventures have to make an early decision on what niche they aim to fulfil or if they aim to create a new ecosystem with themselves as the keystone and what risks they face in the ecosystem (Iansiti & Levien, 2004).

The keystones in ecosystems can often be platform leaders that control and govern a platform architecture central to the ecosystem. Niche players need to develop and adapt themselves to be compatible with the platform (Bodreau & Lakhani, 2009; Rochet & Tirole, 2006) The ventures, as being start-ups, rarely considered this as a strategy.

In ecosystems actors can take on both the role of competitor and collaborator depending on the situation (Brandenburger & Nalebuff, 1997; Afuah, 2000). This requires a flexible approach from the venture towards other actors as today's main competitor can be the most important collaborator tomorrow and vice versa. The community realised this and discussed among other things ways in which the ventures could remove their dependence of early partners.

Ventures can collaborate and integrate external architecture into their own platform. This allows them to generate value from already established technology while remaining control over their own platform and reducing dependency on other platforms (Bodreau & Lakhani, 2009). The community argued that integration of already existing technology would allow the ventures to use more advanced technology than what they could develop on their own. This would both generate a higher quality of the platform and an increased value for its users.

Digital platforms in the forms of technical architectures are foundations that all digital ventures need to adapt to. Digital ventures need to interact with each other and the platform. This creates an interdependency between the firms in the ecosystem (Schilling, 2000). Ventures that develops their platforms as niches can gain a lot by building upon an already existing multi-sided platform. By developing a platform as an add-on, the ventures have to adapt their own platforms to the external platforms architecture and rules. However, they also gain the benefits of attaching themselves to a larger, already established platform (Bodreau & Lakhani, 2009). As even operating systems are considered to be platforms it would be hard to build a platform that isn't based upon an external architecture.

6.4 Conclusions

The question that we asked ourselves in the beginning of the study was;

What knowledge does digital entrepreneurs share in online communities?

As a result of this study, we have identified indications of three new dimensions of knowledge that relate to ventures based on digital platforms. The three

dimensions of knowledge; *Scalability, Morphability,* and *Complementarity* address attributes of digital platform ventures.

What characterized the new dimensions were their sociomaterial nature. The dimensions that were found integrated existing theories on digital platforms and created new subjects of knowledge. The dimensions overlapped in a few areas. The theories on digital platforms sometimes occurred in more than one of the attributes. User base e.g. was discussed from a technical and growth strategy perspective in scalability, it was also discussed from a relationship perspective in complementarity.

The dimensions of knowledge that we found seem to cover attributes of digital ventures that are relatively well known to the community's users. As the digital industry has become such a large part of our everyday lives it is probable that most people have experience of digital platforms. Some aspects of digital platforms are more inductive and easier to discuss. It is e.g. fairly common knowledge that growth of user base is important in a digital platforms and that digital platforms can integrate with each other technically. Figure 2 illustrates a visualisation of how the knowledge dimensions interact with the digital platform concept and each other.
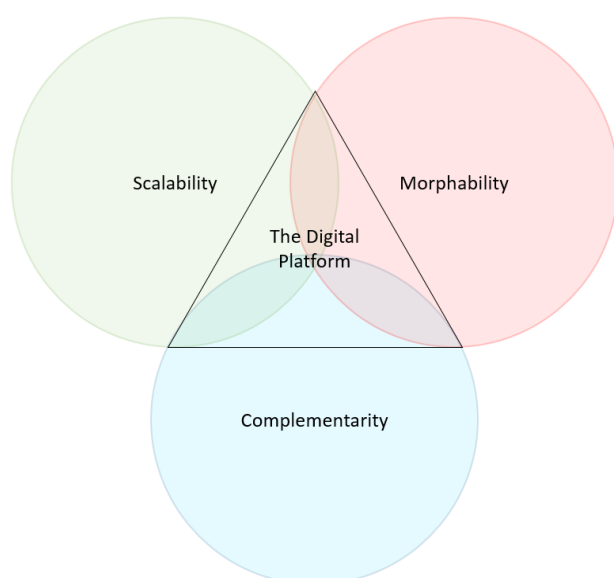

Figure 2. Knowledge dimensions of digital platforms

Limitations of study

This study was conducted in only one type of community. The feedback analysed was given over a short period of time (2 months) by a very mixed crowd of users. The crowd contained professional entrepreneurs, amateur enthusiasts, contestants, friends of contestants and judges. Different motives could affect the feedback that users were giving, a contestant might have kept some comments to themselves as helping another contestant could ultimately harm their chances of winning e.g. It was not possible to collect communication between the users that was not conducted within the online community. Any form of feedback given through another medium could not be analysed. Communicating in the online community was conducted through written comments that were visible to all users of the community. Written word can be hard to de-code for users. Because of the lack of privacy in the communication the users might have kept some feedback to themselves or communicated them through other mediums. As the study only selected data related to digital platform ventures there was no comparison with unqualified ventures. The attributes found could therefore be present in other venture types, not included in the study. The ventures studied were in a very early stage, some of them had not left the idea stage. Therefore, the knowledge shared in the community was directed to entrepreneurs in these stages. How relevant these dimensions are for incumbent firms was beyond the scope of the study.

Implications for practice

This study provides digital entrepreneurs with a tentative taxonomy of the knowledge dimensions available in online communities regarding digital platform ventures. The attributes presented reflects aspects of digital platform ventures that require new types of knowledge, entrepreneurs that work with digital platforms should consider this.

Future research

The study has presented indications of three dimensions of knowledge (*scalability, morphability, complementarity*) which have only begun to be examined. To further

study knowledge dimensions in digital entrepreneurship, scholars can aim at developing both a deeper and a broader understanding of the sociomaterial nature of these knowledge dimensions. We encourage scholars to conduct a more thorough in-depth analysis on the presented dimensions in order to develop a better understanding of each dimension. We also suggest that a broader study on different communities should be conducted to strengthen the dimensions by adding different types of empirical data from various research settings. Future research on entrepreneurial knowledge could also be done by applying the three dimensions on non-platform ventures in order to evaluate if/how these dimensions are applicable on traditional non-platform ventures. There could be other, less inductive, attributes of digital platforms that aren't discussed because of their complex nature. We therefore suggest that in order to find these attributes a study of a professional community of digital entrepreneurs would be a suitable option. The way practitioners integrate existing theories could indicate that academia need to consider how theories are integrated when they are applied to business development of digital platforms.

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Appendix

Appendix A: 5 clusters of knowledge

Reach Featurns	Features/Reachable markets/Distribution channels, Implications
Value proposition	1. Pricing, market penetration and modularity of product 2. Technical features and brand
Product development	Product development, time to market, product ownership, customer relation and modularity, digital object
Entrepreneurial Ecosystems	Partners, function, Competitive information
Scaling	Technology/Business strategy