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Yngve Dahle

The Design and Implementation of an Entrepreneurship Management System

Capturing Activity System Data from
Entrepreneurship Support Programmes

NTNU
Norwegian University of Science and Technology
Thesis for the Degree of
Philosophiae Doctor
Faculty of Engineering
Department of Mechanical and Industrial
Engineering



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Science and Technology

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I Abbreviations and Definitions

Entrepreneurship	
<p>We use Shane and Venkataraman’s (2000) definition of entrepreneurship: “the scholarly examination of how, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated, and exploited”. This is in line with Gartner’s (1988) view that entrepreneurial studies should focus on activities or processes rather than on the personal traits of the entrepreneur. This also means that the establishment of companies is not a necessary precondition for entrepreneurship.</p>	
EAS	Entrepreneurship activity system
<p>Zott and Amit (2010) describe an <i>activity</i> as “the engagement of human, physical and/or capital resources of the focal firm, end customers, vendors, etc. to serve a specific purpose toward the fulfilment of the overall objective.” An activity system is thus “a set of interdependent organizational activities centred on a focal firm, including those conducted by the focal firm, its partners, vendors or customers, etc.” In this thesis, the term “activity system” is not reserved for only the business model. I am including purpose, resources, business idea, objectives, tasks, and forecast as well. To separate the specific activity system, I am using from any other, I term it the <i>entrepreneurship activity system</i> or EAS.</p>	
Elements	
<p>I call the different categories of activities in the EAS “elements”. This term comes from the business model and system literature and relates to a category of similar activities that together constitute an activity system. An element can be described using three variables: <i>Content</i> describes what activities the individual element contains. <i>Structure</i> describes the way the elements relate to each other, and <i>governance</i> describes who performs the activities (Zott and Amit 2010).</p>	
EP	Entrepreneurship project
<p>In the entrepreneurship literature, the concept of the entrepreneur, the company, and the EP are often used interchangeably. In this thesis, the EP is treated separately from both the entrepreneur or entrepreneurs (describing one or many individuals) and the entrepreneurial company or firm (describing the formally registered legal entity of business). The EP is the concept containing all the activities structured around the business ideas of one</p>	

<p>entrepreneurial initiative. An EP may be linked to a company, but it may also be in the pre-registration phase, or it may never end up becoming a company. An entrepreneurship project can also be an entrepreneurial sub-initiative within a larger company – often known as <i>intrapreneurship</i> (Antoncic 2003, Antoncic and Hisrich 2001).</p>	
EEP	Entrepreneurship education programme
<p>Entrepreneurship <i>education</i> programmes aim at offering entrepreneurial skills training to individuals and are often run by universities. EEPs are defined as “any pedagogical programme or process of education for entrepreneurial attitudes and skills, which involves developing personal qualities” (Fayolle 2006). Lackéus and Williams Middleton (2015) widens the description of the term to include “growth programmes for business owners”, which have somewhat more of a project focus.</p>	
ESP	Entrepreneurship support programme
<p>Entrepreneurship <i>support</i> programmes are a combination of some level of mentoring, training, incubation, and financial subsidies of actual EPs, and they are often directly or indirectly financed by different levels of the government. Compared with Fayolle’s (2006) definition of an EEP, the education part of the ESP is more project-specific. An ESP is a tool that answers Acs and Szerb’s (2007) question: “How can policy makers maintain – and ideally accelerate – the continuing transition toward a more entrepreneurial economy?”</p>	
MIS	Management information system
<p>“Information systems are combinations of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute useful data, typically in organizational settings” (Laudon and Laudon 1999). <i>Management</i> information systems are information systems typically used to make decisions and to coordinate and analyse information in an organization. Types of tasks handled in different MIS’s can be; enterprise resource planning, decision support, customer relationship management, accounting, office automation, human resource management, marketing information analysis, and executive information.</p>	

EMS	Entrepreneurship management system
<p>This is a concept that is developed for this thesis. The entrepreneurship management system is a specific type of MIS designed to manage the process of entrepreneurial business development. The EMS focus on managing and documenting activities both within an EP and in the entrepreneurial ecosystem, in particular the communication between an EP and the ESP mentors.</p> <p>The EMS consists of three main modules. The first is the <i>entrepreneurship activity system</i>. This is the logical construct that contains specifically designed sub-processes or elements that constitute an activity system and are founded upon normative entrepreneurial theory (Autio 2017). The second module is the user interface of the system. This is a web-based platform made available to EPs and ESPs. The third module of the EMS is an analytics database structure or data warehouse where the information from the EMS is optimized for research purposes. This database is designed to store all changes in the data, while the EMS system as such is optimized to present the current version of every data field. I will refer to this research database as the <i>Analytics database</i>.</p>	
MOOC	Massive online open course
<p>MOOCs are “open-access online courses that allow for unlimited participation” (Kaplan and Haenlein 2016). They typically consist of an internet platform containing video-based education material combined with assignments and examinations that are evaluated within the system. MOOCs are cornerstones of the “reverse” or “flipped” classroom philosophy (Bishop and Verleger 2013), where the students’ time in school is used for discussions and clarifications instead of passively listening to lectures, and they prepare for this by watching videos.</p>	

II Abstract

Entrepreneurs are an important source of innovation for transformation of the industrial landscape and thus future sustainable economic growth. The relevance for top policy makers is the great effort and large investments used to build entrepreneurship support programmes (ESPs) supporting entrepreneurship projects (EPs). The ESPs consist of education, grants, mentoring, incubation, and investments. There is a lack of empirical evidence on the activities in EPs and on how the ESPs impact EPs in a positive way. For traditional economic ventures, a major source of such empirical evidence comes from analysing the data gathered in companies' management information systems (MIS). This is, however, rarely an option for entrepreneurial ventures, as these usually do not have the resources to have a MIS.

The main scientific contribution of this PhD is to offer a way to gather such empirical data on the activities in EPs and on the effect of ESPs on EPs. The way in which this will be achieved is to combine a selection of entrepreneurship theory with practical experience to develop an *entrepreneurship activity system* (EAS), which again is used to build a specialised *entrepreneurship management system* (EMS). The EMS is then made available to as many ESPs and EPs as possible. The data from the entrepreneurship management system will then be loaded into an analytics database for hybrid (quantitative and qualitative) analysis. The data will be used for a set of empirical papers casting light on different entrepreneurial sub-processes. These data will again be used to improve the EAS, the EMS and the selection of theories in a circle of iterative plan-do-check-act cycles.

The thesis is built around two research questions: (RQ1) How does the EMS need to be designed to secure adaptation by both EPs and ESPs and allow for effective analysis of their activity data?; and (RQ2) To what degree does the EMS data provide observation of EP activity and the impact of the ESPs? Furthermore, the thesis has four research objectives: (RO1) design an entrepreneurship management system (EMS) for describing and capturing activities within EPs and between EPs and ESPs in their whole granularity; (RO2) populate that system with a significant sample size of real entrepreneurial activity, ranging over a significant number of ESPs; (RO3) identify potential research methods and strategies deployable using this data; and (RO4) make a proof of concept for the individual methods.

Since the fall of 2013, I have been the main force behind developing such an EMS, including an activity system containing seven steps and 28 elements. I have also been principally involved in optimizing the EMS data for research purposes.

Since its introduction, different developmental versions of the EMS have been introduced to more than 17.000 EPs. There has been collaboration with more than 30 incubators, universities, banks, venture capitalists, and other ESPs in distributing the EMS. Based on the experiences and data gathered, the nine papers (C1–C9) that are the bases for this PhD were written. Eight of them has been published while the last (C2) is currently pending review.

The main conclusions of the thesis are that an EMS can be built in such a way that it provides value to EPs and ESPs and thus will be used by them. To be valuable without the support of an ESP, the EMS should contain a massive online open course (MOOC) covering both the tutorial on how to use the EMS and the entrepreneurial theory supporting it. Another conclusion is that an EMS can provide observation on EP activity and the impact of ESPs. The final contribution will be the distribution of the production version of the EMS starting 2020. The main effort in utilising the EMS has yet to come, as it will be made generally available for research purposes.

” Most of what you hear about entrepreneurship is all wrong.

It’s not magic; it’s not mysterious and it has nothing to do with genes.

It’s a discipline and, like any discipline, it can be learned.”

Peter Drucker

III Preface

This thesis has been submitted to the Norwegian University of Science and Technology (NTNU) for the degree of Philosophiae Doctor (PhD). The PhD project has been conducted at TrollLABS, a research group within the Department of Mechanical and Industrial Engineering (MTP), Faculty of Engineering Science (IV), NTNU. This research was funded by the Research Council of Norway (RCN) in collaboration with Entreprenedy AS through its Industrial PhD scheme, project number 241351.

IV Acknowledgements

I want to start by thanking professor Martin Steinert for making me believe that this project is feasible and for creating such a unique environment as TrollLabs. In addition, thanks to professor Sjur Dagestad for pointing me in the right direction and to the staff at the Research Council of Norway, to Professor Magne Supphellen and Dr. Anders Haugland for continuous and insightful mentoring; and my co-writers Kevin Reuther, Ben Toscher, Anh Nguyen-Duc, Pekka Abrahamson, and Henrikke Dybvik. Thanks to all members of TrollLabs - for taking me in. Many thanks to my colleague Erlend Bang Abelsen and to the rest of the Entrepreneers. I also thank my colleagues in Cerum and Skysoft.

Specific thanks go to the first entrepreneurship management system pilot customers who took a chance on supporting this project: Anders and Hilde in VIS; Bård, Mette Nora and Katrin in Vestland Fylke; May Britt and Malene in HoppID; Alison in UCL; Roland and Henrik in Grant Thornton; Margit, Hjørdis, Claus, Lise, and Bjørn in Innovation Norway; Charlotte in the Department of Culture; Susanne, Roger, and Lisa in Coompanion; Mikkel in Bestseller; Bodil in the Cultural Council; Ole in Skåppå; Gunnar in USN; Jonathan and Trine in Hi5; Erik, Gunnar, and Ståle in KPMG; Maria and Joachim in Argentum; and Rune in Investinor. Finally, thanks to my parents, my daughter Pernille, my son Jonathan and all my friends and family.

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1 Introduction

1.1 Background and motivation

Entrepreneurship is a very important part of economic growth in the world. Mueller (2007) claims that “an increase in innovative start-up activity is more effective than an increase in general entrepreneurship¹ for economic growth”. Stel et al. (2005) show that the total entrepreneurial activity rate (TEA) correlates positively with economic growth in developed countries. Shane (2009) qualifies this statement by pointing out that this growth comes from a small percentage of “high-growth startups”. Acs and Szerb (2007) partly attribute the acceleration of productivity growth in twentieth-century USA to a “decades-long transition from managerial to entrepreneurial capitalism”.

Studies also reveal that self-employed individuals are more satisfied with their jobs than employees (Bradley and Roberts 2004, Katz 1993, Benz and Frey 2008). In addition, many individuals are unable to obtain regular employment due to where they live, or due to the nature of their qualifications. Thus, they have no possible way of earning money other than self-employment in the form of entrepreneurship. This may be particularly true in emerging economies or for people with skill sets that typically are needed in a freelance market, such as arts entrepreneurs (Gangi 2015). Thus, entrepreneurship is generally considered to be beneficial for individuals, organizations, and for society as a whole. One indication of this is the fact that many countries have included entrepreneurship education programmes in the public-school system. Norway, among other countries, includes entrepreneurship as an obligatory part of the school curriculum for youth from the age of fifteen (Johansen 2018).

To be able to facilitate these benefits, policy makers on all levels have created a wide range of entrepreneurship support programmes (ESPs) seeking to use education, grants, mentoring, incubation, and investments to enhance both the number of, and the success rate of, entrepreneurial initiatives. In the Republic of South Africa, all companies with a revenue of more than 51 million South African Rand² are obliged to allocate at least 2% of their net profit after tax to funding ESPs as a part of the broad-based black economic empowerment programme (Department of Trade and Industry RSA 2014). In the small Scandinavian country of Denmark, 216 public organizations managed by 110 different branches of the government

¹ Entrepreneurship is used as a term for general commercial activities.

² Approximately 3 million Euros.

are tasked with creating and managing ESPs that give advice and support to EPs (Forenklingsudvalget for Erhvervsfremme 2018).

Existing literature offer no clear distinction between entrepreneurship *education* programmes (EEPs), which aim to offer entrepreneurial skills training to individuals (often run by universities), and entrepreneurship support programmes (ESPs), which are structured initiatives for the mentoring, training, incubation, and financial subsidization of actual EPs (often directly or indirectly financed by different levels of the government). While EEPs are defined as “any pedagogical programme or process of education for entrepreneurial attitudes and skills, which involves developing personal qualities” (Fayolle 2006), the education part of the ESPs are more project-specific. Whereas the EEPs have been more thoroughly researched, the ESPs have been somewhat neglected.

Given the importance of the entrepreneurial economy and the amount of resources used on ESPs, understanding the actual effect the ESPs have on the EPs would most likely be of value. Acs and Szerb (2007) state that: “policy makers across all levels of government should not only have a strong interest in promoting entrepreneurship directly, but should also consider the impact their decisions on a range of issues are likely to have on entrepreneurial activity”. However, measuring the effectiveness of the ESPs has been hampered by the lack of objective empirical data describing the effect of the different programmes.

One way of trying to understand the value creation process of EPs and the impact on them by ESPs is by analysing the *input* offered by the ESPs in the form of course programmes, funding, etc., and then correlating it with some form of *success* in the EPs. Success could be operationalised as revenue growth, profit margin, number of employees or other parameters. I will argue that it is vital to find a way to understand the intermediate mechanisms connecting ESP input with the impact on EPs. Just to correlate the participation in an ESP with the selected success indicator will not generate much knowledge regarding what part of the ESP activity actually generated the observed impact. To understand this, I will use the concept of the *entrepreneurship activity system (EAS)* (Dahle, Supphellen et al. 2019, Zott and Amit 2010, Halecker and Hartmann 2013) as presented in Figure 1:

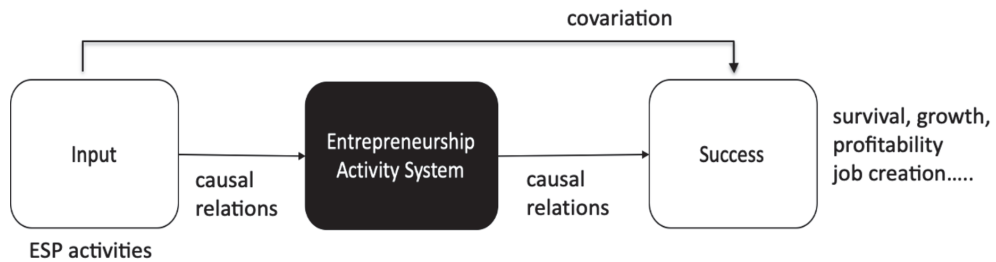


Figure 1: Analysing the impact of ESPs, using the entrepreneurship activity system

This thesis is based on the assumption that the different areas of the ESP, such as education, mentoring, grants, finance, and incubation, have impacts on specific activities taking place in an EP. These activities constitute the influence factors on the different success indicators I want to measure. I will treat these activities as interconnected and interrelated elements in an activity system.

To be able to do this, a uniform terminology describing the different activities will be needed, and the content, structure, and governance (Zott and Amit 2010) of the activities must be defined in a systemic perspective. The different EPs then have to be incentivised to document how they perform these activities by using this terminology. Further, the different ESPs need to be incentivised to enable such a documenting effort.

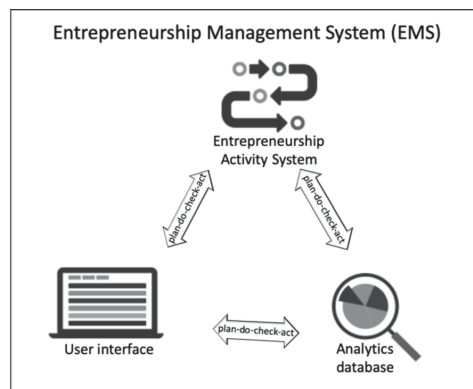


Figure 2: Iterative development of the modules of the EMS

To do this, a support system resembling an *entrepreneurship management system (EMS)* needs to be used by the EPs and ESPs. This EMS needs to be built on the *EAS*, have an easy-to-understand *user interface* that gives value to both EPs and ESPs, and contain an *analytics database* that enables research and gradual improvement through learning (see Figure 2). This setup constitutes a new method for capturing documentation of EP activity and for getting it adapted throughout a large number of EPs. Furthermore, it aims to verify that this method actually captures variations in entrepreneurial behaviour and variations between ESPs. The improvements in the entrepreneurship activity system, the user interface, and the analytics database will take place through a set of plan-do-check-act iterations according to the logic of the Deming cycle (Ries 2011) (See Figure 2).

This thesis is addressed to the entrepreneurship researcher who intends to study activities in EPs and the effect that ESPs have on them. The thesis iteratively develops a methodological model for capturing behaviour data from participants in EPs attending different ESPs by giving them access to a tailored entrepreneurship management system (EMS) and analysing the data coming from the system. The project started in 2012 when the first prototypes of the EMS were developed. Between 2012 and 2019, three different prototype versions were used by more than 17.000 EPs. Some of the EPs participated in an ESP, while others were given direct access to the EMS without any kind of support. Based on the experiences from these prototypes, the production version of the EMS was launched in November 2019. This version will gradually be made available for researchers.

1.2 Research objectives and research questions

Aiming to develop a new method to capture activity data from EPs and ESPs, four research objectives were established to evaluate the method:

- RO1 Design an entrepreneurship management system for describing activities within EPs and between EPs and ESPs in their whole granularity (EMS)
- RO2 Populate the EMS with a significant sample size of real entrepreneur activity, ranging over a significant number of ESPs (data)
- RO3 Identify potential research methods and strategies deployable using these data (research methods)
- RO4 Make a proof of concept for the individual methods (proof of concept)

The PhD will be structured around two research questions – RQ1 that supports RO1 and RO2 and RQ2 that supports RO3 and RO4:

- RQ1 How does the EMS need to be designed to secure adaptation by both EPs and ESPs, as well as allow for effective analysis of their activity data? (design)
- RQ2 To what degree does the EMS data provide observation of EP activity and the impact of the ESPs? (system validity)

1.3 Academic contributions

This thesis is built on a total of nine papers: two that support only RQ1, five that support only RQ2, and two that support both RQs:

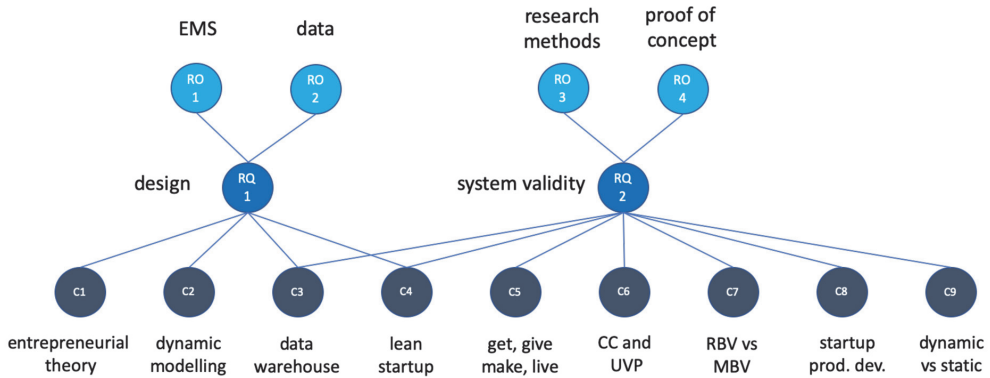


Figure 3: Graphic figure of the ROs, RQs and papers

C1 Dahle, Yngve; Nguyen-Duc, Anh; Steinert, Martin; Reuther, Kevin. (2019) Six pillars of modern entrepreneurial theory and how to use them (entrepreneurial theory). Fundamentals of Software Startups Concepts, Methods and Case Studies: 1st ed., Springer, New York, NY.

This paper presents a set of entrepreneurial theories that are particularly relevant within the practical entrepreneurial ecosystem. Thus, it serves as a good theoretical foundation for the EAS and the EMS. We selected six groups of theories that might be particularly relevant for the entrepreneurial population, namely (1) core competence and resource-based view, (2) effectuation, (3) the fulfilment of entrepreneurial opportunities, (4) bricolage, (5) business model innovation, and (6) lean startup. In this paper, we explain these theories, including the ongoing research around them, the connections among the theories, and how they can be applied in a real case study.

C2 Dahle, Yngve; Supphellen, Magne; Steinert, Martin; Reuther, Kevin. (2019) Extending the Business Model concept towards a holistic and dynamic entrepreneurship activity system (dynamic modelling). International Review of Entrepreneurship (under review).

This paper describes the design of the entrepreneurship activity system consisting of seven steps and 28 elements. This is the starting point of a hypothesis for how potential sub-processes of entrepreneurship may be organized. The EAS is based on six groups of entrepreneurial

theory particularly popular amongst practical entrepreneurs and in ESPs. It is the starting point for the order of the elements in the EMS and has been incrementally improved as the use of the elements has been empirically tested.

C3 Dahle, Yngve; Steinert, Martin; Nguyen-Duc, Anh; Abrahamsson, Pekka. (2017) Building an entrepreneurship data warehouse (data warehouse). *2017 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)*, Madeira.

This paper describes how the first prototypes of the entrepreneurship management system were designed to gather empirical data from EPs and to store these data together with demographical and financial data. I end the paper by documenting a test run of the setup to verify that I am actually able to populate the EMS with relevant data.

C4 Dahle, Yngve; Steinert, Martin. (2016) Does lean startup really work – foundation for an empirical study (lean startup). *2016 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)*, Trondheim.

This paper contains the initial description of a possible EMS. It describes the setup of initial elements in an early iteration of the EAS and the early EMS prototype used to distribute them. The actual use of the EMS prototype in seven pilot EPs was then monitored, indicating that it is actually possible to incentivise EPs to use an EMS over time.

C5 Toscher, Ben; Dahle, Yngve; Steinert, Martin. (2019) Get Give Make Live: An Empirical Comparative Study of Motivations for Technology, Youth, and Arts Entrepreneurship. *Social Enterprise Journal*.

The purpose of this paper is to analyse four EAS elements related to the motivation and business ideation processes of 776 EPs from three diverse ESPs catering to technology, youth, and arts EPs. We inductively derived four motivation types – “Get, give, make, live” – and found significant variations among these in general and also among the three ESPs. We also found that most EP participants have more than one type of motivation. During the ideation process, 74% of the EP participants began defining their business ideas with their core competence while 26% started with defining the key market or key contribution.

C6 Dahle, Yngve; Nguyen-Duc, Anh; Steinert, Martin; Chizhevskiy, Roman. (2018) Resource and Competence view vs. Environment and Market view when defining a business (RBV vs. MBV). *2018 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)*, Stuttgart.

This paper uses the EMS to analyse the differences between a resource-based view and a market-based view when defining a business. Seven hundred and one EPs defined nine resource elements and three business idea elements of their projects. We found a tendency to favour the resource-based view. This tendency seems to be clearer in stable economies (Europe) than in emerging economies (South Africa).

C7 Dahle, Yngve; Steinert, Martin; Toscher, Ben; Reuther, Kevin; Nguyen-Duc, Anh. (2019) An analysis of core competence and unique value proposition as normative entrepreneurship elements (CC and UVP). *2019 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)*, Nice.

This paper uses the EMS to empirically investigate the ways 756 EPs from three different ESPs conceptualise the two EAS elements of “core competence” and “unique value proposition”. Our main finding is that the EPs seem to struggle to differentiate the two concepts from each other and settle on a “unique” statement for each of the two elements. Higher education and more experience seem to make it easier to differentiate between core competence and unique value proposition.

C8 Nguyen-Duc, Anh; Dahle, Yngve; Steinert, Martin; Abrahamsson, Pekka. (2017) Towards understanding startup product development as effectual entrepreneurial behaviours (startup prod. dev.). In: Ojala, Holmström Olsson, Werder (eds.), *Software Business*. “: 8th International Conference, IC SOB 2017, Essen, Germany. Lecture Notes on Business Information Processing, vol. 304. Springer.

In this paper, we applied a behavioural theory of entrepreneurial firms to understand six common challenges related to prototyping and product development. This was done by performing a case study of 20 software startups using behavioural theory as a theoretical lens. Our findings are that software startups emphasise short-run feedback rather than long-run strategies. This results in vague prototype planning, paradox of demonstration, and evolving

throw-away prototypes. The findings imply that effective entrepreneurial processes might require a more suitable product development approach than the current practices.

C9 Dahle, Yngve; Dybvik, Henrikke; Steinert, Martin. (2019) A dynamic and a static approach to the business model – investigating the potential difference in business model focus (dynamic vs. static): *2019 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)*, Nice.

This paper used the EMS data from 34 different EPs, separated into two different samples, to begin to understand differences between EPs using business modelling in a static way (17 EPs) and in a dynamic way (17 EPs). Based on the two samples, a distinction in focus on the different business model elements between a dynamic and a static approach could not be found. However, statistical testing of quantitative data represents an important step towards understanding entrepreneurship.

1.4 Research methods

Methodologically, this thesis is empirically motivated. It is a combination of the iterations between the theoretical review and practical experiments that has led to the design of the EAS, and the information technology methods that have led to the design and distribution of the EMS. As examples of the latter, we mention the agile methods and scrum concepts used in the development of the software (Beedle et al. 2001).

Furthermore, the methods chosen in this thesis are to a certain degree selected by the nature of the data in the EMS. The main distinction of the EMS is that it structures the activities of the EPs into the 28 clearly defined elements of the EAS. This means that the content of each element should be comparable among EPs, ESPs, languages, vertical industries, countries, etc. The purpose is to increase the ecological validity (Schmuckler 2001) of the analysis without regressing on the statistical power. The presence and order of the 28 elements are of course influencing the activities of both the EPs and the ESPs. Therefore, the analytical possibilities lie in researching the different activities within the boundaries of the model and then gradually improving the model according to the knowledge accrued.

The nature of the EMS data is that each data registration comes in the form of a time-stamped object containing a wide range of metadata in addition to text content. This object is called a *card*. Since these objects can be quantitatively analysed at the same time as the text content is

well suited for qualitative studies, the concept of mixed methodologies (Creswell 2003) is used throughout the thesis. The flexibility of having such objects structured in an analytics database makes it unnecessary to limit the analysis to a specific methodology and instead use what is most suitable for the specific situation. Throughout the thesis, the activity systems (Zott and Amit 2010, Aversa 2015) and systems-thinking perspectives have been inspirations as “holistic lens to evaluate business processes” (O’Donnell 2005).

In our studies, we used grounded theory (Charmaz and Belgrave 2007, Glaser and Strauss 2009) and behavioural theory of the entrepreneurial firm (BTEF) (Dew et al. 2008). A selection of software tools and platforms were also used. For IT development, among others, PostgreSQL, Angular, and Material design were used. For analytics, we used Kibana, Elasticsearch, PostgreSQL, SPSS, NVivo, Leximancer, and Orange.

1.5 Core research activities

1.5.1 Industrial PhD programme

I was accepted into an Industrial PhD programme in the autumn of 2014. The PhD is a collaboration between the Research Council of Norway, The Department of Mechanical and Industrial Engineering at NTNU, and Entrepreneurdy AS. Between 2014 and 2018, I had two 12-month sabbaticals to focus on my employment in Entrepreneurdy AS and to wait for the EMS to be populated by EPs.

1.5.2 Developing and distributing the EAS and the EMS

The main focus of the thesis has been the design of the EMS, including the development of the Entrepreneurial Activity System it is built upon. This has been developed in three main iterations of prototypes from the beginning in 2012 to the production version launch in 2019. The structure of the EAS is built on a platform of six theoretical pillars that were iteratively selected based on the experiences during the testing of the different prototypes of the EMS.

1.5.3 Academic courses

In this section, the courses taken as part of the PhD are summarised together with the institutions where the courses were taken, the credits for each course, and the years (and semesters) when they were taken:

Courses at the PhD level			
<i>Course title</i>	<i>Institution</i>	<i>Credits</i>	<i>Year</i>
MM8101, Product development research and scientific methods	NTNU	7,5	2014A
IFEL8000, Research methodology, science theory and ethics	NTNU	4	2018S
NiTiM Summer School	Université de Lorraine	6	2019S
MET501A, Research design and methodological choices	NHH	5	2019A
MET501B, Research design and methodological choices, research proposal	NHH	2,5	2019A
Data warehouse for agility in entrepreneurship	IEEE TEMS	2	2018S
Courses on MSC level			
<i>Course title</i>	<i>Institution</i>	<i>Credits</i>	<i>Year</i>
DIXL01, Individual syllable 1 for PhD-students	NTNU	7,5	2019S

Figure 4: Academic courses taken as part of the PhD

1.5.4 Teaching entrepreneurship courses

While working on this PhD, I taught entrepreneurship both in academic institutions and for practical entrepreneurs. At academic institutions, I taught full entrepreneurship courses both at Kristiania University College and at Hauge School of Management, in addition to guest lecturing at the Norwegian School of Economics, University College of London, BI Norwegian Business School, University of South-Eastern Norway, and the University of Konstanz. In addition, I lectured in courses for practical entrepreneurs arranged by Innovation Norway, The norwegian culture council, Coompanion AB, Folkeuniversitetet, The University of Bloemfontein, and the norwegian regions of Møre/Romsdal, Agder, Vestland, Viken, Rogaland, Innlandet, Telemark/Vestfold, and Nordland.

1.6 Thesis structure

The nine papers summarised in this section are referenced throughout the paper as they contribute to addressing the two research questions. Papers C1 and C2 mainly support RQ1, papers C3 and C4 support both RQs while papers C5–C9 mainly support RQ2. The thesis is organized into six chapters: four main chapters and two chapters containing supplementary material. Chapter 1 is the introduction to the thesis, while the main body of the thesis is in chapters 2–4.

Chapter 2 addresses the way the EMS has been designed during the period 2012–2019, what theories it has been built upon, the knowledge that has been gained, and the improvements that have been made. Furthermore, the chapter covers how the EMS has been distributed to different ESPs and EPs and in what ways it is being used.

Chapter 3 describes the knowledge acquired from the design and distribution of the EMS, in addition to findings from seven examples of empirical research done on selected EMS elements and addressing questions regarding 14 of the 28 elements from four of the seven steps.

Chapter 4 outlines the contributions made through the academic papers by answering the research questions, addressing the research objectives, and building on the findings from chapter 3. The supplementary chapters contain the references and the full texts of the academic publications.

2 The design of the entrepreneurship management system

This chapter explains the rationale behind designing and distributing the EMS. It describes the research done to answer RQ1: “How does the EMS need to be designed to secure adaptation by both EPs and ESPs, as well as allow for effective analysis of their activity data?” This chapter also addresses the first two research objectives: (RO1) “Design an entrepreneurship management system for describing activities within EPs and between EPs and ESPs in their whole granularity”; and (RO2) “populate the EMS with a significant sample size of real entrepreneurial activity, ranging over a significant number of ESPs”. This chapter is structured in four parts. First the theoretical foundation for the entrepreneurship activity system is described. Then the design of the EAS is presented before the user interface of the EMS is described in part 2.3. Finally, the design of the analytics database is presented in section 2.4.

2.1 The theoretical foundation for the entrepreneurship activity system

2.1.1 Systems thinking and activity systems

The theoretical core of the EMS is an *entrepreneurship activity system* (Amit et al. 1993, Zott and Amit 2010, Halecker and Hartmann 2013). Logically, we would assume that there are some main building blocks involved in the development of most EPs. These building blocks come in the form of activities performed by different individuals within the EP or the supporting ESP. It is furthermore argued that it makes sense for these building blocks to appear in a certain logical, sequential order. If you develop an EP, you would typically try to define your business

idea before developing the business model, you would try to set your objectives before worrying about what to do to reach those objectives, and the last thing you would do is develop the financial forecast. After creating your first draft, you would go through several rounds of iterative improvements similar to a set of interrelated Deming cycles or PDCA cycles (Ries 2011) or a finite state machine (McCulloch and Pitts 1943). This means that you would have to go back through the sequence and adapt what you have done. This does not change the fact that there is such an order to begin with.

Zott and Amit (2010) define an activity system in this context as “a set of *interdependent organizational activities* centred on a focal firm, including those conducted by the focal firm, its partners, vendors or customers, etc”. Although they do not explicitly refer to it, one could infer that these thoughts are based on the developments around systems theory and systems thinking (Bertalanffy 1951, Johnson et al. 1964, Luhmann 1984, Parsons 1970) that have also previously been applied to innovation and entrepreneurship research (Galanakis 2006, Halecker and Hartmann 2013). In particular, action systems have already been discussed in depth by Parsons (1937, 1951) in relation to his well-known AGIL³ scheme describing the emergence of social action in a social system. This notion of action in the heart of the system might be strongly linked to the understanding of Zott and Amit (2010) in relation to their activity system.

In the course of this thesis, I adapt this framework and organize the activities in the EMS using “elements” that together constitute the activity system. These elements have three inherent variables: *content* – describing the nature of the activities the individual element contains; *structure* – describing the way the elements relate to each other; and *governance* – describing who performs the activities.

The challenge of the EAS is that it has to be normative to a certain extent to be instructive for practical applications. Although generally interesting, a purely

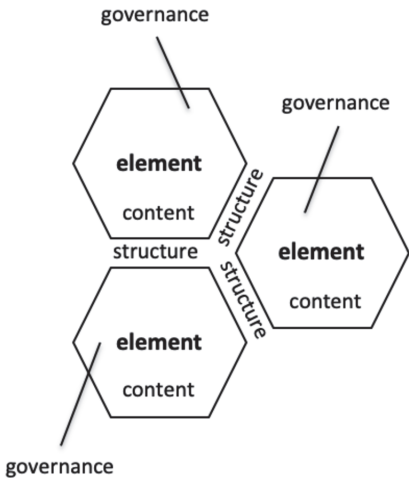


Figure 5: Content, structure and governance

³ A: Cognitive symbolization. G: Expressive symbolization. I: Moral-evaluative symbolization. L: Constitutive symbolization.

positivistic description of how entrepreneurs actually behave will not be sufficient guidance for EPs and ESPs. They would also need suggestions on how to best behave to optimize the chances of fulfilling their motivations. This relates to what Aversa et al. (2015) describe as going from “business models to business modelling“. The problem with such a normative approach is that it is difficult to agree upon any norm. Shane exemplifies this dilemma when he addresses the challenge of trying to find a best practice of entrepreneurship:

We did not intend to say that the entrepreneurial process is rational, planned, strategic, or even temporarily ordered, but merely that the entrepreneurial process has subprocesses. There may be no optimal entrepreneurial process, allowing for many equally effective approaches, which is an important issue for the field to explore. It is also possible that one approach may be optimal but that many entrepreneurs do not approach the process "the best way". This point has important ramifications for the fields desire to be normative (Shane 2012 p. 14).

On the other hand, if there is no optimal approach to the entrepreneurial process, we should stop saying there is. Our textbooks should not present, as they often do, the argument that the strategic and temporarily ordered approach is the best way to go about the activity in the absence of evidence to support this assertion (Shane, 2012 p.14)

Accepting that it is impossible to achieve a single, optimal approach for every variation of entrepreneurship, this thesis will try to first provide the most detailed description of entrepreneurship project activities possible based on a review of a selection of the most relevant entrepreneurial theories. This will be the starting point for the EAS. This starting point will be empirically tested and iteratively improved upon as insights are gleaned, using a portfolio of research methods to obtain descriptive knowledge to gradually improve upon the structure of the EAS.

Theoretically, this is grounded upon two main trains of thought: Venkataraman et al (2012) build on Simon’s research (1980), claiming that researchers actively play a normative part in the improvement of entrepreneurship. They describe entrepreneurship as a “science of the artificial”, in contrast to natural or social sciences.

The natural and social sciences are mainly interested in providing causal explanations. These explanations may yield normative prescriptions for controlling the phenomenon, but the lack of such prescriptions will not be held as a strike against them. In mathematical terms, we're interested in how the key variables relate to each other. Altering those relations is a subsidiary and often minority concern. As a theory develops, it splits into two streams: (1) "basic" research that continues to refine the causal explanations and (2) "applied" research that seeks to alter the variables of the explanation. At that point, the phenomenon of interest has become an artefact, it has become something to be designed. A science of the artificial is interested in phenomena that can be designed and in a phenomenon's variables to the extent that we can intervene and change them (Venkataraman et al 2012 p.24).

This dilemma seems to be a part of the unclarity of the related concept of business modelling. Some scholars seem to focus on the positivistic "observation" of business models. Others see business models as a framework of normative "simulation" and "design" (Aversa 2015). Van de Ven (2007) present a similar approach by combining normative and positivistic research in his "philosophy of engaged scholarship". Engaged scholarship attempts to combine practical research and knowledge with academic theory to meaningfully solve problems in communities.

2.1.2 The six theoretical pillars supporting the entrepreneurship activity system

The main criterion for choosing the theoretical models that I think best describe an entrepreneurship activity system is optimizing the usage of the EMS by EPs and ESPs. This means choosing theories that are widely adapted by these target groups and that are easily communicated to non-academics. The theoretical foundation is documented in paper C1 (Dahle, Anh et al. 2019). The theoretical pillars in this chapter thus have been chosen only if they satisfy four preconditions:

- 1) They have to be *theoretically* relevant, operationalised by the number of citations the sum of the articles within the pillar has got. None of the core articles in the pillars have less than 3000 citations, and they are also cited by the most important authors in the field.
- 2) They have to be *practically* relevant, operationalized by being well known and used by EPs and ESPs. Since one of the most critical research objectives of the PhD is to actually get EPs and ESPs to utilize the EMS and thus aggregate activity data, this is the criteria given the

most weight. Given the difficulties to find an objective indicator for the practical use of entrepreneurial theory, I have used subjective experience from working with EPs and ESPs in several countries for the last 8 years. Examples of the ESPs are; Innovation Norway, norwegian and danish municipalities, University College of London, University of Southern Denmark and about 40 others. According to that experience, concepts like the BMC, design thinking and Lean Startup are quite obviously being extensively used. The fact that most current entrepreneurial business development is built on the resource-based view, effectuation, Shane and Venkataraman's opportunity-based definition and bricolage is more subtle, but nevertheless quite clear.

- 3) They have to be *normative*. For the use in an EAS, the understanding of how entrepreneurs actually behave is of limited value. What the EPs and the ESPs want to be helped with is how they *should* behave to maximize their chance of success. For the EAS, I am looking for theoretical concepts that can help with that.
- 4) They have to be *interrelated*. This is operationalized by their logical relationship to each other, and to what degree they share citations. This means that they need to have a main focus on Activities. They have to concentrate on what the entrepreneurs *do*, contrary to what the entrepreneurs *are* (Gartner 1988). This again leave us with a focus on opportunity-based entrepreneurship theory, and resource-based entrepreneurship theory (Landström et al. 2012).

Given this prioritisation, several well-known papers within the discipline has been mostly disregarded. Particularly we have had little focus on economic entrepreneurship theory (Schumpeter 1910, Schumpeter 1912, Kirzner 1973), psychological entrepreneurship theory (Landström et al. 2012), sociological entrepreneurship theory (Reynolds 1991) and anthropological entrepreneurship theory (Baskerville 2003). This means that while I am grounded in Kirzner's (1973) focus on the entrepreneurs ability to recognize and exploit changes and imperfections in the market and Schumpeter's (1934, 1910) focus on disruptions in the market created by innovations as the main driver of economic growth, our main focus will rest on theoretical concepts strongly relating to "*The promise of entrepreneurship as a science*" (2000). The same approach is being used with regards to theorists within the field of strategic management like Porter (2008).

So, the starting point is Shane and Venkataraman's definition of entrepreneurship: "the scholarly examination of how, by whom, and with what effects opportunities to create future

goods and services are discovered, evaluated, and exploited". This is in accordance with Gartner's (1988) view that entrepreneurial studies should focus on the activities or processes taking place in the EPs rather than on the personal traits of the entrepreneur.

The EAS has been developed by repeatedly combining practical experience with opportunity-based entrepreneurship theory (Shane and Venkataraman 2000, Drucker 1985, Stevenson and Harmeling 1990) and resource-based entrepreneurship theory (Simpheh 2011, Ghezzi 2018). The focus on these two schools of entrepreneurship is due to our objective of widespread adaptation by practical entrepreneurs.

From these two schools, I have chosen six pillars that are being widely utilised by EPs and ESPs (Dahle, Anh et al. 2019). These different theoretical directions also seem to be closely related to each other as they share many of the same ideas.

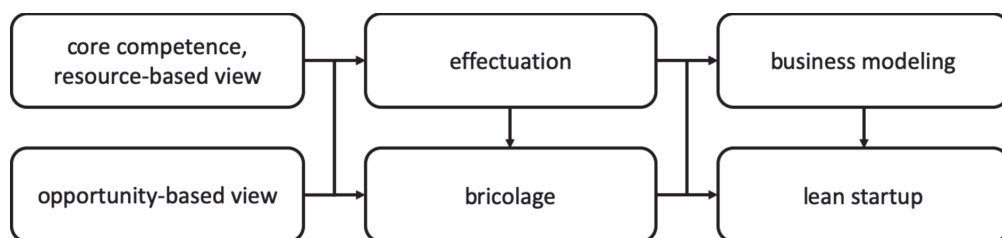


Figure 6: Six pillars of modern entrepreneurship theory

Our starting points are core competence (Prahalad and Hamel 1990, Javidan 1998) and the resource-based view (Barney 1991, Wernerfelt 1984). Next, I go to entrepreneurship as a nexus between entrepreneur and opportunity (Shane and Venkataraman 2000) before effectuation (Sarasvathy 2001, Venkataraman et al. 2012, Sarasvathy 2006, Simon 1980), bricolage (Baker and Nelson 2005), and business model innovation (Zott and Amit 2010, Zott et al. 2011, Osterwalder et al. 2005, Osterwalder and Pigneur 2010, Maurya 2012, Baden-Fuller and Morgan 2010, Morris et al. 2005, Ritter and Lettl 2018, Moore 1995). Our last stop is the Lean Startup Movement (Blank 2007, , Maurya 2012, Cooper and Vlaskovits 2013, Ghezzi 2018, Ghezzi and Cavallo 2018, Frederiksen and Brem 2017). I will explain how the theories support different parts of the activity system in the following section.

2.2 The entrepreneurship activity system

While acknowledging the strength of business model systems (Osterwalder and Pigneur 2010, Maurya 2012), we suggest an enhanced EAS. We suggest making this extension in four dimensions:

1) First, we argue that it would be valuable to include the purpose and resources on which the entrepreneurial project is based, as they according to our six pillars of theory are vital building blocks in the creation of a unique entrepreneurial project.

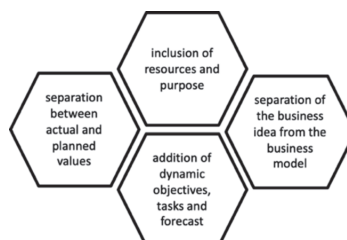


Figure 7: Extensions of the Business Model System

2) Secondly, we suggest separating the business idea from the business model. This separates the analysis of “which problem to solve” from “how to solve the problem.”, reducing the product-focus over customer-focus problem.

3) We believe that the project-management steps of objectives and tasks should be included in the EAS together with the forecasting step. This will secure a much more dynamic treatment of the elements in these steps than achieved by statically dealing with them as “cost-structure” and “revenue stream” in the business model. This will secure a more relevant day-to-day management of the EP.

4) Finally, we think that the content of the elements should be separated into the actual values that have been achieved (actual values) and the values that the EP plans to achieve (planned values). This will enable a distinction between the description of the present situation and the achievements that the EP aims for in the future. This will make it easier to adjust the plans according to a changing reality.

We build our entrepreneurship activity system on an iterative process that involves the notion of interrelated and interdependent activities. Our EAS has 28 elements, distributed over seven steps (see Figure 7). The main contribution for this chapter comes from paper C2 (Dahle, Supphellen et al. 2019)

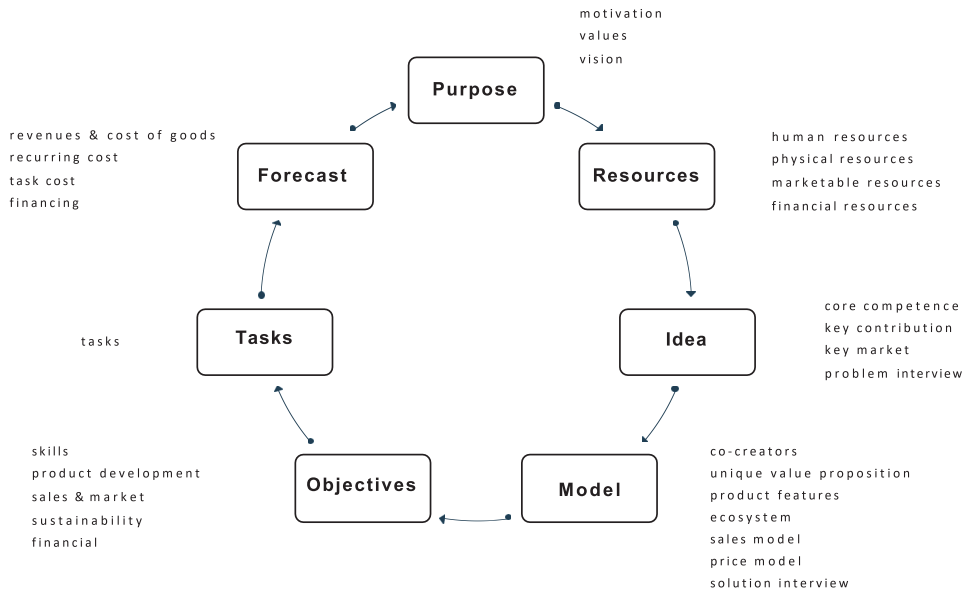


Figure 8: The seven steps and 28 elements of the entrepreneurship activity system

2.2.1 Purpose

The first step is defining what overall purpose the entrepreneurship project is built on. This step consists of three elements. The first element consists of the **core values** of the entrepreneurs behind the EP: “Core values are the essential and enduring tenets of an organization. A small set of timeless guiding principles, core values require no external justification; they have intrinsic value and importance to those inside the organization” (Prahalad and Hamel 1990). The second element is vision. “A well-conceived **vision** consists of two major components: core ideology and envisioned future. Core ideology, the yin in our scheme, defines what we stand for and why we exist. Yin is unchanging and complements yang, the envisioned future. The envisioned future is what we aspire to become, to achieve, to create – something that will require significant change and progress to attain” (Collins and Porras 1996). The final element is the overall **motivation**, or “generalized end goals” (Sarasvathy 2001), which describes why the entrepreneur starts his or her project. This will usually not be a detailed description of the tangible objectives of the EP. This thesis agrees with the effectuation (Sarasvathy 2001) view that very few EPs start their projects with an approach as rational as that.

2.2.2 Resources

The second step is analysing what *resources* will be available for the EP. Resources can be “physical assets, capabilities, organizational processes, firm attributes, information and knowledge” (Barney 1991), with particular focus on the core competencies that the project is built on (Prahalad and Hamel 1990). The order of the purpose and resource steps may vary between the different EPs and can be good examples of the iterative movement between the steps that we expect.

The resource elements quite simply describe the resources available when initiating the business development process of the EP. This endeavour can be started as a spin-off or a turn-around of an existing organization, or it can be started from scratch. The EP is not necessarily linked to the establishment of a company. The only thing needed is a nexus between an entrepreneur and an opportunity (Shane and Venkataraman 2000). Any such entrepreneurship project will be based on the resources available and will develop as these resources change (Barney 1991, Wernerfelt 1984).

In the resource step, there are four elements: (1) the **human resources** available to the EP and the specific competence of each individual. We include both employees and partners; (2) the **physical resources** available in the EP may be any owned, leased, or rented factory, office building, manufacturing machine or other physical asset; (3) **marketable resources** include all forms of intellectual property, including patents, and the products and services developed in the project; and (4) **financial resources** can be both equity and available credit. Here we also list all signed customer contracts, grant contracts, or important references (Moore 1995).

2.2.3 Business idea

The third step is the business idea. The entrepreneur defines *what* his project will be doing, while the business model step is a definition of *how* it shall be done. The business idea takes the viewpoint of the EPs customer (who am I, what problem do I have, and why is the EP the right candidate to solve it?). The business model describes what product features, partner, sales model, price model, etc., to choose to best be able to solve the problem and is an EPs internal analysis. The business idea relates to the business mission (Bart, 1997, Klemm et al. 1991), Moore’s UVP framework (1995) and Osterwalder’s Value Proposition Canvas (2014). Differentiating the customer-driven and external elements of the business idea from the internal elements of the business model (Dahle et al. 2014) puts the question, Do I have a

problem worth solving? ahead of the question, How do I solve the problem? There are four such business idea elements:

In the **key contributions**, the EP participants are asked to document what problems they solve for their target groups. In the **key markets** element, EP participants are asked to describe these target groups. This might be a demographic group, or it might describe a scenario or use-case (e.g., people attending a football match). In the **core competencies** box, the EPs participants should describe “a harmonized combination of multiple resources and skills that distinguish a firm in the marketplace” (Schilling 2013). The core competence is anything that enables organizations to be competitive over time. If nothing set the project apart from its competitors, it will be difficult to maintain a competitive edge. This can be any kind of skill set, asset, motivation, or passion. As documented by Alizadeh and Khormaei (2012), core competencies are “not resources in the sense of factors of production” but a particular type of competence (see Figure 9). These competencies are linked to the innovativeness of the organization (Forsythe and Khormaei 2011).

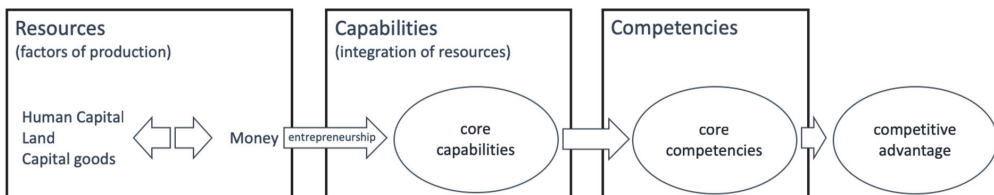


Figure 9: The relationships among resources, capabilities, and competencies

The fourth business idea element is the **problem feedback** interviews in which the importance of the different key contributions are rated by potential prospects (Ries 2011).

2.2.4 Business model

The business model is mainly built on our understanding of the business model canvas (Osterwalder and Pigneur 2010) and the lean canvas (Maurya 2012). The reason for this is that these concepts are widely used by EPs and the ESPs supporting them. I have chosen to merge these two models and to simplify the detailed steps in the models to exclude the elements irrelevant to EPs. In addition, Zott and Amit’s (2010) ideas about business models as activity systems are central. For each of the sets of four business idea elements, there is a matching set of seven business model elements:

Moore introduces the concept of **co-creators** in his 1995 book “Crossing the chasm”. Using Everett’s diffusion curve (Everett 2003) to separate all potential customers into “early market” and “mass market”, he suggests first selling to the former and then using this group as references to get into the latter. Maurya (2012) defines the **unique value proposition** as “a single, clear compelling message that states why you are different and worth buying”. Blank (2007) calls a value proposition a “ten-dollar phrase describing a company’s product or service. It’s the what are you building and selling?” Moore’s (1995) framework allows the EP to fill in a sentence structure to build their UVP and Cooper and Vlaskovits (2013) name their customer, the customer’s problem, and the description of the solution to the problem in their UVP. The **product features** are the more detailed product and service descriptions included in the delivery, while the **ecosystem** concerns the selection of allied actors in the business model platform (Fehrer 2018). The triple helix of university-industry-government relationships in places like Silicon Valley and the German Ruhr area constitute such ecosystems (Etzkowitz 1993, Etzkowitz and Leydesdorff 1995). The **sales models** may be any kind of paid, retention-based or viral strategy model (Maurya 2012), while examples of **price models** may include taking payment from the customer directly or being paid by a sponsor. Finally, **solution feedback** is where the feedback from customers who have been testing the product or service is stored. This is typically done by presenting the prospect with a type of *minimum viable product* (Ries 2011) in the form of a mock-up, prototype, or description of the product. While the problem feedback tries to answer the question; do we have a problem worth solving? the solution feedback tries to answer the question; do we solve the problem? This is similar to the “test” phase in the design-thinking method from Stanford University’s d.school and the consulting company IDEO (Brown and Katz 2011).

2.2.5 Objectives

The fifth step is transferring the general strategies of the business model into tangible objectives for an EP. These objectives typically measure both financial and non-financial achievements (Kaplan and Norton 1996). Contrary to the purpose elements, the elements in this section are always quantifiable and assigned to a specific time period. Objectives are either described as milestones, as numbers, or in monetary terms. According to both the effectuation and the lean startup views, these objectives will be very dynamic and change throughout the course of the project. I also emphasise that there can be more Key Performance Indicators than

the traditional financial ones. The development of knowledge in an entrepreneurial organization is vital (Prahalad and Hamel 1990). Thus, it is natural to develop specific KPIs measuring the build-up of strategic knowledge through recruitment and training, or *skills objectives*. On a balanced scorecard, this would constitute the learning and growth perspective (Kaplan and Norton 1996). The *product development objectives* typically include objectives such as the finishing of a new product version or prototype. On a balanced scorecard, this would be part of the customer and internal process perspectives. *Sales and marketing objectives* will be the types of KPIs that are included in customer relationship management projects: the number of customer contacts, sales letters, or how many ‘likes’ a company has on Facebook. On a balanced scorecard, this would also be part of the customer and internal process perspectives. The overall goal of any entrepreneurship project is to create value. The financial results of any business result from customers appreciating the value created to such a degree that they are willing to pay more than the costs incurred in developing these values. Similarly, the values created for employees, suppliers and the community surrounding the business should be greater than the resources you receive from these stakeholders. A simple set of overall objectives defining the impact is the UN sustainable development goals (SDG) (Sachs et al. 2019). These are 17 overall objectives attempting to bring together governments, businesses, media, institutions of higher education, and NGOs to improve the lives of the people in their country by the year 2030. To include these objectives in the EAS, we have the *sustainability objectives*.



Figure 10: UN sustainable development goals (SDG)

In that sense, the very definition of entrepreneurship is a dilemma; "Find and exploit opportunities to create goods and services" (Shane and Venkataraman 2000). Are we really sure that all goods and services that are created justify the use of the resources used to produce them? Is creating more and more new products necessarily a good thing? Sustainability should go like a red thread throughout any EP. It should be a theme when defining the purpose and resources and when choosing business idea and business model. But - it is also important to set specific sustainability goals. These are goals that will describe the degree to which the EP influence the community in a positive way.

Finally, the **financial objectives** are described in the form of monetary currency. On a balanced scorecard, this would be the financial perspective. The financial KPIs will be identical to the traditional revenue side of a profit-and-loss analysis, encompassing revenues and grants, and the payments-in side of a cash-flow analysis encompassing new equity and loan funding.

2.2.6 Tasks

The sixth step is where one manages the activities or **tasks** needed to fulfil one's objectives. The separation point between an objective and a task is that an objective is something you achieve, while a task is something you do. This means that if you can say "this is something I can achieve", it is probably an objective. If you can say that "this is something I should do", it is a task. In the same way as objectives are related to revenues and incoming payments, tasks are related to cost. According to activity-based cost setting (Sachs et al. 2019), costs and tasks should be treated in unison. Tasks are managed in a Kanban model (McInnis and Gross 2003). That means that instead of being statically prioritized, they are first listed in a "to do" list. Some of the tasks are then moved to the "doing" list before finally being moved to the "done" list when the task is finished. Tasks can be dynamically moved back and forth between the "to do" and the "done" categories as they are considered more or less important or urgent. The responsibility for performing the tasks can also be distributed to different people.

2.2.7 Forecast

In the forecast, you deal with the revenues and costs generated by the objectives and tasks. Coordinating these four concepts, and the flexibility achieved by this, is well described in the activity-based costing (ABC) literature (Kaplan and Cooper 1988). There are four forecast elements: In the **revenues and cost of goods** element, we define all the gross revenues from product and service sales and grants, the cost of goods directly related to each of these, and

the contribution margin. **Recurring costs** are the costs that will return periodically and that will typically constitute most of the EPs non-cost-of-goods related costs. The cost groups of salaries, consultancy fees, and rent for buildings and machinery belong here. **Activity costs** are directly linked to activities. Finally, we describe the **financial** forecasting elements. These are the equity infusions or loans injected into the EP.

2.3 The user interface

The user interfaces of the EMS are illustrated by Figure 11 and Figure 12. The seven steps and 28 elements are distributed to the EPs via white-labelled solutions specifically designed for each ESP. In addition, a solution unsupported by any ESPs was made freely available through Creative Commons for all EPs through www.entrepreneurdy.com from November 2019. The solutions have a left-hand-side interface for the ESP advisors and a centre EP interface presenting the seven steps and the 28 elements with explanations and video support. All advisor-EP communication and workflows can be managed in the right-hand-side collaboration interface:

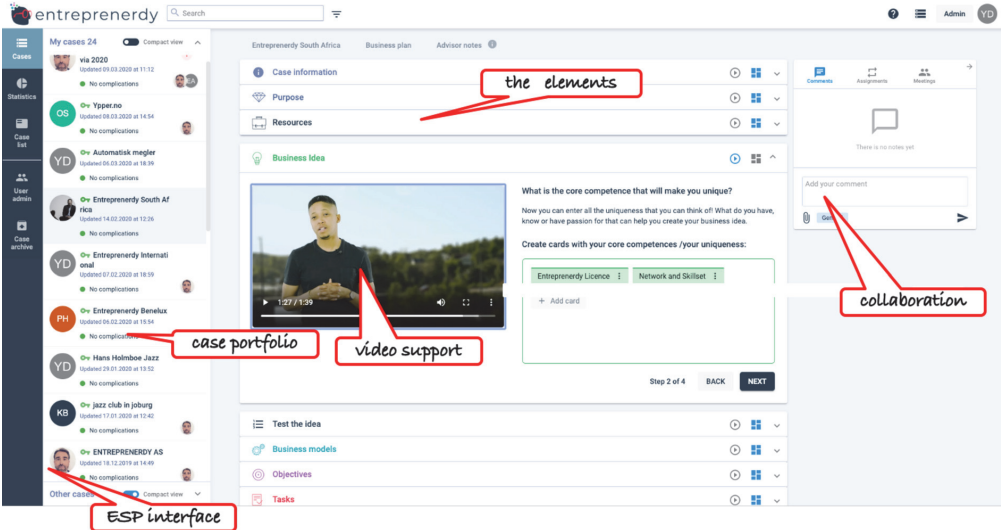


Figure 11: The EMS

The entrepreneurship project can add data in a “wizard view” as illustrated in Figure 11, or in a “board view”. Regardless, the data is linked with a timestamp and related metadata and registered as an object described in the system as a “card”, as illustrated in Figure 12.

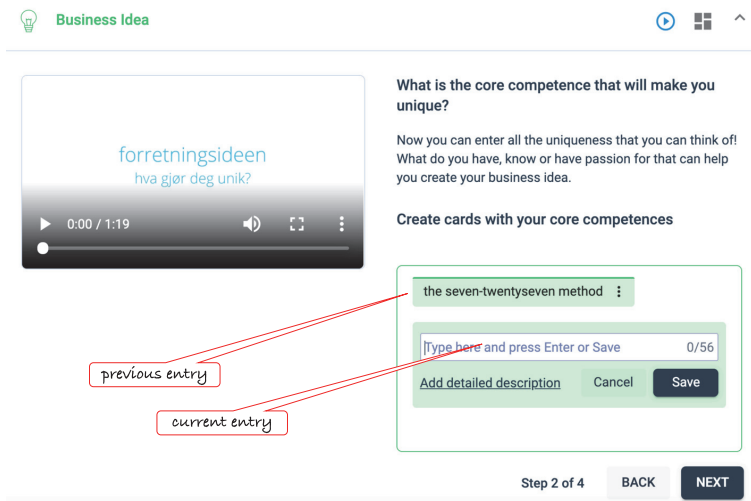


Figure 12: Data entry in one of the elements in the EMS

The development of the EMS platform was done mainly in-house. The developmental team started with requirements and iteratively implemented the platform. The team released in total three versions. Short sprints, frequent customer involvement, and scrum meetings were agile practices used throughout the whole developmental period. Given the very high degree of innovation in the project, the decision was made to co-create rapid, throw-away prototypes which were rapidly tested in customer situations. As seen in Figure 13, the adopted technology was MySQL for the database, Microsoft .NET framework for the backend and Bootstrap Version 4 for the frontend. The development was a close collaboration among several co-creating customers, the business developers in Entrepreneurly AS, and the St. Petersburg-based developmental lab.

Twice in the development process, the development was done from scratch, with very limited reuse of components. There was also very little formal or written communication in the specification of each of the new versions. In the second and the third releases of the platform, we added new features together with new user experience. The major change here was to adopt external designs (release 2 with Netlife Design and the production version with Google Material design). We also updated the frontend technology by using Angular 1 in prototype 2/3 and Angular 2-8 in the production version (see Figure 13).

	Prototype 1	Prototype 2/3	Prod Version
Data Base	My SQL	MS SQL Server	PostgreSQL
API	MS .net MVC	MS .net web API	MS .net web API 2
Data Warehouse	SQL Server based	Kibana/Elastic Search	PostgreSQL
Front End	Bootstrap Library V4	Angular 1	Angular 2-8
Design	Internal	Netlife Design	Google Material Design

Figure 13: Technology choices for the different versions

2.4 The analytics database

One weakness in many entrepreneurship studies is that they are unclear with regard to the object that is being studied. The concepts of the entrepreneur, the company, and the EP are often used interchangeably. In addition, activity data, demographic data, and individual characteristics are often interchanged without clear distinctions between them. The aim with this thesis is to make a generally applicable model of analysis that can easily be utilized by a large number of researchers. Thus, our priority is to create a simple and scalable model that can be used to analyse all 28 elements. This relates to paper C3 (Dahle et al. 2017).

The ambition of the thesis is to be able to study the activities within the ecosystem constituting the EP and related ESPs. The core representation of said activity is the *card*. A card contains a short qualitative text describing the activity, in some cases an extended description of the activity and a timestamp. The card is uniformly categorized within one of the 28 elements, thus giving a clear indication of what type of activity it describes, independent of the textual description. Each card belongs to one of three *action types* – create, update, or delete – and has a *created index* that declares what order the card was created in and a *created after 24 hours pause* tag that marks cards that have been created after a pause of more than 24 hours. Each card can be created, updated, or deleted by one *individual*. Each individual has an *individual ID*.

Each card belongs uniformly to one *entrepreneurship project (EP)*. Each EP is marked with a *Project ID*, as well as a *postcode* and a *country* that describe the geographical placement of the project, and a *project deleted* tag that marks if the project has been deleted from the system. The entrepreneurship project may or may not be linked to one or several ESPs. Each ESP has an *ESP ID*. Examples of ESPs are the programme for arts entrepreneurs managed by the norwegian cultural council and the programme managed by the norwegian region of

Møre/Romsdal. An ESP typically contains entrepreneurial training, reporting structures, grants, and other financial incentives. Each project may or may not be linked to a company. Sometimes an EP exists for a while before the company is established, and some EPs never lead to a company being created. A company may also have more than one EP linked to it. Each EP that is linked to a company is defined as “relating to the whole company” if it describes the totality of the company or “not relating to the whole company” if it is a sub-project within the company. Thus, the project may include a *company name* and *organization number*. *Company postcode* and *company country* contain information on where the company is registered. All organizations in Scandinavia are assigned a unique number by the authorities called an *org number*. A *NACE code* is the nomenclature code that describes what industry the company belongs to. All organizations in Scandinavia have to select a NACE code when registering their companies. The *year of registration* defines when the company was started. Finally, the *registration of bankruptcy* is the eventual date when the company’s bankruptcy is registered. In the Scandinavian countries, any company with an organizational number has an obligation to submit its financials to central registers. This is the basis of the *company KPI’s*. Having the organization number of the companies, these KPI’s can be acquired for the last five years. The following company data are included: The gross *revenue* of the company per year and the *profit and loss* mean the positive or negative financial result of the company per year. The *year of registration* states when the company was formally registered with the authorities. Finally, the *number of employees* is the registered number of employees in the company at the end of each year.

Main Object	Parameter	Possibilities	Format	
Card	Card ID	Code	Integer	
	Project ID	Code	Integer	
	Created index	Code	Integer	
	Created after 24hours pause	Yes/No	Boolean	
	Individual ID	Code / GUID	Integer	
	Date time	DateTime	String	
	Action type	Create		String
		Update		
		Delete		
	Element	P1 Motivation		String
		P2 Values		
		P3 Vision		
		R1 Human Resources		

		R2 Physical Resources	
		R3 Marketable Resources	
		R4 Financial Resources	
		I1 Core Competence	
		I2 Key Contribution	
		I3 Key Market	
		I4 Problem Interview	
		M1 Co-creators	
		M2 Unique Value Proposition	
		M3 Product Features	
		M4 Ecosystem	
		M5 Sales Model	
		M6 Price Model	
		M7 Solution Interview	
		O1 Skills and Capacity	
		O2 Product Development	
		O3 Sales and Marketing	
		O4 Sustainability	
		O5 Financial	
		T1 Tasks	
		F1 Revenues and COGS	
		F2 Recurring Cost	
		F3 Activity Cost	
		F4 Financing	
		Text	56-character string
	Extended text	X-character string	String
Project (not historical – only actual values)	Project ID	Code	Integer
	ESP ID	Comma separated list of ESP IDs	hoppid, sdu,
	Related to whole company	Yes/No	Boolean
	Project country	List of countries	String
	Project country ID	Code	String
	Project post code	Code	String
	Project deleted	Yes/No	Boolean
	Company name	Name	String
	Org number	Code	String
	NACE-code	Code	String
	Company country	List of countries	String
	Company country ID	Code	String

	Company post code	Code	String
	Registration of bankruptcy	Yes/No	Boolean
Company KPI	Org number	Code	String
	Year	Number	Integer
	Revenue	Number	String
	Profit and loss	Number	String
	Number of employees	Number	String

Figure 14: Logical model of the analytical database

The motivation behind designing the EMS is to let any researcher access data generated by EPs documenting the activities in their EAS with the help of an EMS. Each researcher should then be able to go through the phases of phenomenon exploration, phenomenon identification, hypothesis generation, hypothesis testing and simulation, using their preferred methods. This, of course, can be done with a large degree of freedom in the research design.

Even if this is the case, I find it instructive to include an example of how a researcher can use the EMS to shine a light on the activities within a set of elements in a group of EPs. Utilizing the data in the EMS can be done by characterizing the different data fields into three categories: 1) the two string fields of “text” and “extended text” in the card construct, can be categorized as “qualitative data”; 2) the “element” string field can be categorized as “quantitative data”; and 3) all other fields can be categorized as “category data”. Thus, a template for attacking any RQ using the EMS could be:

Stage 1: Use the category data to define the relevant set of EP strata you want to include in your study. This could be a large number of combinations, for example, EP participants attending different ESPs, EPs resulting in profitable versus unprofitable companies, or EPs operated by individuals belonging to different demographic groups – or any combination of these.

Stage 2: Select the “elements” that you want to study. If you want to study business modelling, select the 11 elements constituting the business idea/business model steps.

Stage 3: Create an order matrix using the “quantitative data” of the “elements”. Use this to review the order of the elements in the strata you want to research, or the differences in the order of the elements between the different strata you have chosen.

Stage 4: Use your preferred text analysis method on the “qualitative data” to analyse the content of each element in the selected strata, or the difference in the content of each element among the different strata.

The following is a simple example of covariation between “objectives” and growth rate:

Stage 1: Create two strata: Strata 1 = all EPs linked with companies with a growth rate of more than 5% per year and strata 2 = all EPs linked with companies with a growth rate of less than 5% per year. Disqualify all EPs not linked to a company, all EPs with less than five years of existence, and all EPs not related to the whole company.

Stage 2: Select the five “objectives” elements as your chosen activities to study.

Stage 3: Make an order matrix over all “objectives” cards for Strata 1 and Strata 2. Review the difference in number and order of cards entered between the strata and the way the cards have been created, updated, and deleted.

Stage 4: Make a concept cloud for the terms used in the “objectives” elements for Strata 1 and Strata 2. See if there is a difference. The analysis here would be whether it is possible to see a covariation between the growth rate of a company and its activities with regard to the elements of “objectives”. This could then be extended by, for example, filtering by industry, attending ESPs, or other factors that may be relevant.

3 Empirical results

3.1 Findings from the design and distribution of the EMS

This section contains the findings regarding RQ1 (How does the EMS need to be designed to secure adaptation by both EPs and ESPs, as well as allow for effective analysis of their activity data?) and it will be divided into three parts. The first two parts will contain the findings related to the first research objective (RO1): “create an EMS for capturing activities within EPs and between EPs and ESPs in their whole granularity”. The findings are separated into the development of the EAS elements in section 3.1.1 and the user interface and analytics database in 3.1.2. Section 3.1.3 presents the findings from RO2: “populate the EMS with a significant sample size of real entrepreneur activity, ranging over a significant number of ESPs”.

3.1.1 The experiences in developing the elements of the entrepreneurship activity system

The process of designing the entrepreneurship management system started in 2012 with an Excel mock-up presented to a handful of customers, primarily within creative industries. The

first prototype (2012–2015, with approximately 2.900 EPs) had 10 steps and 40 elements. This prototype was primarily created with Innovation Norway and auditing firm Grant Thornton as cocreators.

	prototype 1	prototype 2	prototype 3	production version
p u r p o s e	owners' motivation			motivation
	owners' core values			core values
	vision			vision
	owners' objectives			
	restrictions set by owners			
	owners' role in the company			
	use of the owners' instructions			
	owners' need for information			
r e s o u r c e s		owners' motivation		
		owners' core values	owners' core values	
		vision	vision	
		owners' objectives	owners' objectives	
		restrictions set by owners		
		owners' need for info		
	employees	employees	employees and partners	human
	partner and advisors	partner and advisors		
		patents and IPR	patents and IPR	marketable
	products and services	products and services	products and services	
o p e r a t i n g	operating resources and costs	buildings and rentals machines and equipment	buildings, machines and assets	physical
	customer contracts	customer contracts	revenues and grants	
	cash and credit	cash and credit	financial	
i d e a m o d e l s	key contributions	key contributions	key contributions	key contributions
	key markets	key markets	key markets	key markets
	core competences	core competences	core competences	core competences
		problem feedback	problem feedback	problem feedback
	customers	co-creators	co-creators	co-creators
		unique value propositions	unique value propositions	unique value propositions
	product features	product features	product features	product features
	partners and competitors	ecosystem	ecosystem	ecosystem
	sales models	sales models	sales models	sales models
	price models	price models	price models	price models
	delivery models			
	solution feedback	solution feedback	solution feedback	
B a s e	own strengths	own strengths	own strengths	
	own weaknesses	own weaknesses	own weaknesses	
	competitor strengths	competitor strengths	competitor strengths	
	competitor weaknesses	competitor weaknesses	competitor weaknesses	
		market sizing	market sizing	
o b j e c t i v e	skills	skills	skills	skills
	product development	product development	product development, sales and marketing	product development
	sales and marketing	sales and marketing		sales and marketing
	financial	financial	financial	financial
r i s k	threats	threats	threats	
	opportunities	opportunities	opportunities	
	tasks	tasks	tasks	
t a s k s	monthly tasks	monthly tasks	monthly tasks	tasks
f o r e c a s t	profit and loss	profit and loss	profit and loss	revenues and cost of goods
	cash flow	cash flow	cash flow	recurring cost
				activity costs
				financial forecast

Figure 15: Differences between the versions

The second (2015–2017, with approximately 5.200 EPs) also had 40 elements but now only nine steps. Prototype 3 (2017–2019, with approximately 4.900 EPs) still had nine steps but 34 elements. The second and the third prototype was created in close collaboration with HoppID, the public sector of north-western Norway. The production version (2019) came with seven steps and 28 elements (see Figure 15). Our co-creator here was the norwegian municipality of Vestland.

In the first prototype, there were 14 purpose and resource elements. In the next two prototypes, we merged the purpose and resource steps before separating them again in the production version. In the third prototype, the resource step was simplified into nine elements before the production version ended up with three purpose steps and four resource steps. The lesson learned from going through these simplifications was that the 3+4 combination yielded optimal understanding while not creating unnecessary complexity.

The business idea elements remained stable over the test period, apart from the inclusion of the Problem Feedback interview after prototype 1. It was clear that the possibility of testing the value of the different key contributions on potential customers was a very important offering in the EMS. The business model went through some major improvements after prototype 1. First of all, competitors were removed from the ecosystem element, leaving it to be reserved for partners and helpers. This made the concept much easier to understand for the EPs participants. Secondly, the description of different delivery models was removed because it offered very little value. Instead, unique value proposition and a solution feedback interview were introduced to make it easier to improve the problem-solution fit. After these changes, this step remained unchanged through the last three versions.

Two full steps were removed between the last prototype and the production version. The *GAP-step* in the EAS was designed to handle the competitor analysis of the EP. This was done by creating the strength and weakness part of a strength, weaknesses, opportunities and threats (SWOT) analysis (Gürel 2017) and then compare it with the perceived strengths and weaknesses of the competitors in the market. Practical experience revealed that this was a step that was rarely used by the EPs for two main reasons: firstly, the EPs tended to create long lists of things they were fairly good at and fairly bad at without linking them to the actual strategic task of the EP. This had very little value, as described by Hill and Westbrook (1997). We found that the concept of core competence (Prahalad and Hamel 1990) was more useful in describing the strategic resources of the EPs. Secondly, because a large part of the developmental process

of the entrepreneurship project often took place before a real competitive landscape was obvious, this analysis turned out to be difficult for the EPs participants to understand. We have also removed a market-sizing tool that originally was in the GAP-step (Dahle et al. 2014). The *risk-step* (Dahle et al. 2014) was designed to manage the opportunities and threat parts of the SWOT analysis. It was designed as a simple three-by-three matrix asking the EPs to define all opportunities and threats as low-medium-high on the two axes of consequence and probability. This also turned out to be an underused concept by the EPs. The EPs often had difficulties with separating externally created opportunities and threats on the one hand and consequences of their own actions on the other. Hence, the EP participants could enter “low motivation” as a threat or “great talent” as an opportunity, thus blurring the lines between risks and resources. In the objectives step, product and service objectives and sales and marketing objectives were merged before the third prototype and then split up again in the production version. The reason for this decision was that it proved helpful for the EPs to be able to treat these two concepts separately.

The task step had separate elements for one-off tasks and tasks that were recurring every month until the production version was launched. It proved that the EPs did not want to deal with recurring tasks in the KanBan but rather dealt with them in the forecasting step.

Finally, the forecasting step was not separated into revenues and cost-of-goods, recurring cost, activity cost, and financial forecast until the final version. The benefit of treating these as separate elements was that having the different components in the forecast allowed for a much more detailed analysis of the forecast of each EP. In addition to these rather significant changes, the semantics in describing the different elements were iteratively improved over the entire period, particularly with the addition of the video support in the production version. The details of this process will not be documented in this thesis, as the volume of information would be too large.

3.1.2 Findings from the development of the user interface and the analytics database

The design and development of the EMS has been following the main principles of an agile process (Beedle et al. 2001), rather than an open stage-gate process (Cooper 1990, Grönlund et al. 2010). The process was unstructured and scrum-based, and there was not a long-term specification at the start of the project. It has however gone further in the agility of the development in two respects. We had a deeper *co-creation* with customers than most agile

development projects, and we went further in *restarting* the project to take advantage of new technologies and to discard technological debt:

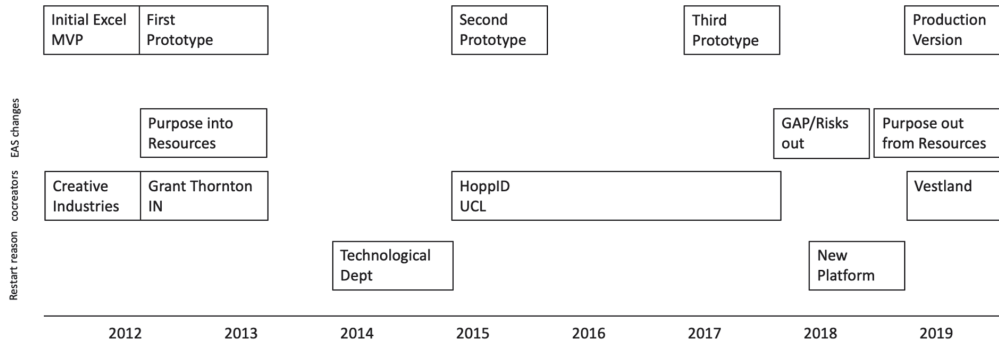


Figure 16: Project overview 2012-2019

1) *Cocreation*; Since this project lasted for almost seven years, we actually had several critically important cocreators involved. Doing developmental projects in agile groups is not uncommon at all in 2019. In the development of the EMS projects, however, the ESP representatives were actively contributing in the developmental group. Instead of separating the functional specification process, the technical specification process, and the development, they were done as one integrated process. In particular, in situations where the availability of new technology functioned as an inspiration for the design of new functional demands, this proved to be very fruitful.

For the first prototype we collaborated with Innovation Norway and auditors Grant Thornton. For the second and third prototype we collaborated with University College of Norway and north-western norwegian ESP HopplD. For the production version we had a very strong collaboration with the norwegian municipality of Vestland. Even though the importance of these different co-creators changed over time, all of them remained strongly involved in our project over time. The fact that such a close collaboration with this group of customers over such a long time, made our project fit very well with the description of a Lean Startup project (Blank 2007, Ries 2011, Maurya 2012).

2) *Restarting*; The combination of the long timeframe of the project, increased opportunities due to new technologies available and the constantly changing customer demands also made us realize that we needed to go further than developing the system in a series of incremental sprints (Beedle et al. 2001). Over a period of six years, we actually completely *restarted* the development two times, almost completely discarding the code and technology choices from

the previous version. This allowed us both to utilize the newest technologies available and to minimize technological debt (Cunningham 1992). The first restart took place in relation with the change to the second prototype and was mainly caused by the learning we did together with our cocreators and the need to discard of technical debt. The second restart was done when developing the production version and was mainly motivated by the wish to move to new technological platforms. During the period in which the EMS was developed, the optimal core technology available changed. Both the Angular development framework and Material design came on the market. At the same time, the actual understanding of the functional demands for the EMS changed continuously. As mentioned in section 3.1.1, the number and order of elements in the EAS were constantly improved upon, and the way to make the elements available to the EPs was discussed between the co-creating ESP customers and the business developers in Entrepreneurdy AS. A large number of customer tests were performed, and the findings from these made it necessary to make several incremental improvements to the EAS and the EMS.

I believe that this combination of total reengineering and integrated development was very well suited to our situation. We were developing the world's first EMS. The customers (the ESPs) did not really know that they needed this product, but they were curiously accepting Entrepreneurdy's arguments that the idea might have some merit. Neither were there any other EMSs existing in the market from which to draw inspiration. The restarts were done while being well aware of the trade-off between coding efficiency and innovation. I believe the two restarts that was done was very beneficial to the project, and the fact that we now have a solution void of technical debt easily outweighs the cost of the restarts.

The user interface design of the different prototypes of the EMS was iteratively altered over time. The first version was a Word document and the second was an Excel worksheet packed with macros. There were five main design challenges that caused us the greatest problems during the prototyping period:

The first was the challenge of combining a brainstorming phase and an idea-building phase in the business idea step. We learned that it was very difficult for the EP members to define their different potential business ideas one at a time. It made much more sense to first brainstorm all the potential core competencies, key activities, and key markets, and then use them as building blocks in a separate process where they "linked" the different elements into business ideas. Making this work took years of experimenting.

The second problem was to what extent to “export” content from element to element. In the beginning, we did this extensively. An employee, product, or source of finance could be entered into the resource step, be automatically copied to the business model, to the objectives, and finally end up in the forecast. The benefits of being able to do this proved to be limited; thus, simplifying it has been an important task.

The third challenge was at what point to enter the financial information. In the earliest prototypes, the EP members were asked to add a significant amount of financial information into the resource and task steps. In the production version, almost all financial information is entered in the forecast step.

The fourth problem was to find a way to present the different elements in a simple workflow that could be flexibly changed between the different ESPs and also managed by the ESP mentors. This was handled by creating a “wizard” design presenting one element at a time for the EPs and allowing each ESP to add or remove elements to make the EMS suit the specific challenge at hand. This was combined with allowing the mentors to “open” elements only when the previous elements had been satisfactorily handled.

Finally, the ability to give an EP value from the EMS without participants going to a training programme was addressed by adding almost three hours of MOOC video to the EMS, and a “chat” function enabling a dialogue between the EP and the ESP advisor. The videos cover both tutorials on how to use the EMS and presentation of the entrepreneurial theory supporting it.

3.1.3 The experiences in populating the system with empirical data

There are two main ways of recruiting EP participants into the use of the EMS. Firstly, they can be “supported” by participating in an ESP. They gain access to an individualized and white-labelled version of the EMS, and they always get both a structured course programme and, very often, individual mentoring. Examples of such ESPs are the norwegian cultural council’s “Ovation” programme for arts entrepreneurs, the norwegian unemployment benefit agency’s “NAV” programme for job seekers, University college of London’s education technology programme for tech startups, and more than 30 others. There were two main forms of these programmes: “enabled” programmes where the ESP managed most of the EP interaction themselves; and “outsourced” programmes, where Entrepreneurdy AS did the main part of the training and mentoring on behalf of the ESPs.

The other main source of recruitment to the EMS was “unsupported” recruitment. This means that the EP just found the EMS online and started using it, without the support of an ESP. Initially, this was done as a rather unstructured experiment. However, from November 2019, this way of distributing the EMS was done in a structured framework via www.entreprenerdy.com. On this site, the system is being launched containing a full-scale entrepreneurship massive online open course (MOOC) and video tutorials on how to use the EMS.

What has been learned from using this form of recruitment is that it is very difficult to get high-quality usage of an EMS without having either ESP or MOOC support. In the ESP run by the norwegian unemployment agency “NAV”, the MOOCs were gradually implemented during the course of the programme. The practical outcome of this was that there was both an improvement in the quality of the EMS input from the EPs that had MOOC support and that the advisors became much more efficient when they had the help of the MOOCs.

The value of the EMS for entrepreneurs within an ESP context is very high, particularly from “outsourced” programmes. Figure 17 shows the “value for my company” rating given by 136 EPs participating in the outsourced art entrepreneur programme “Ovation” for the years 2015, 2016, 2017/2018, and 2019,

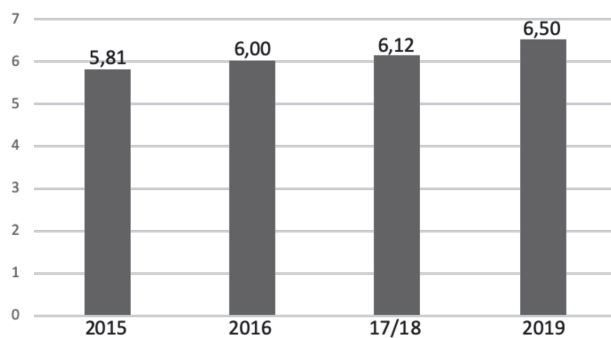


Figure 17: Value score Ovation

respectively. The value of the EMS is higher when the ESPs are designed to follow the EPs over a longer period of time. Thus, the Ovation programme has been prolonged every year since 2015. Short two- to three-day courses

and workshops have less value than long-term mentoring. This experience is similar to Heuer and Kolvereids’ (2014) findings regarding EEPs: “The findings indicate that educational programmes or events of limited duration have a rather limited usefulness and that efforts should rather be directed on programmes of longer duration”. Finally, the skill transfers to ESP personnel necessary for success-fully providing an “enabled” programme are challenging, particularly when the personnel have little practical or theoretical knowledge of entrepreneurship. Summarizing the challenges of making an ESP successful, our experience is that there are seven success criteria for an ESP:



Figure 18: Seven success criteria of an ESP

First, the ESP need to have a clear purpose or mandate, based on the motivation of the selected sub-group of entrepreneurs participating in the program. An incubator for social entrepreneurs may need to include sustainability objective in its KPI's while a series A venture capitalist may measure themselves on value growth. Equally important is recruiting the right candidates. The interaction with other entrepreneurs in the programme is a vital part of the value for entrepreneurs. If the participants have something in common, and are equally skilled and motivated, this effect will be high. Next the ESP need to be built on a solid theoretical platform and have a common methodology for the entire platform. This will be the only way to secure that the participants receive a uniform message regardless of what specific advisor or sub-program they relate to. The advisors in an ESP need to be both theoretically skilled and practically experienced. Unfortunately, to many ESPs are depending on advisors who have never been entrepreneurs themselves.

Only if these first five elements are in place, implementing an entrepreneurship management system will create value. A part of the “digitising” trend seems to be a belief among ESPs that purchasing a computer system will solve all problems. In my experience, the right mandate, processes and personnel has to be in place before an EMS implementation will be successful. A theoretically anchored method is the foundation on which the EMS must be designed, and no artificial intelligence can replace a skilled advisor. But, if all these criteria are fulfilled, the presence of an EMS enables the seventh criteria; the data from the EMS can be used for analytics and learning.

3.2 Findings from empirical studies using the entrepreneurship management system

Utilizing the EMS, a series of empirical experiments were performed to see if the data gathered could yield valuable information on entrepreneurship activity in general and, specifically, the impact of ESPs on EPs. This chapter describes the research done to answer RQ2, “to what degree does the EMS data provide observation of EP activity and the impact of the ESPs?” and the last two research objectives: (RO3) “identify potential research methods and strategies deployable using these data”; and (RO4) “make a proof of concept for the individual methods”. The chapter is organized according to the ways the experiments done relate to the elements in the EMS, with the earliest elements first. This chapter describes the research designs of the different experiments.

3.2.1 Findings from an initial study of all elements

In the early phase of this PhD project, two papers were written focusing on verifying whether or not an activity system-based EMS could be designed and would be used by EPs. Paper C3 (Dahle et al. 2017) researched whether it was possible to use an early prototype of the EMS to gather activity data from EPs. This was done between 1 February and 15 May 2017. The research objectives of this paper were simply to see if it were possible to get EPs to use the EMS, what average number of cards the EPs created, and if the cards were distributed on different elements. In this period, we had 78.296 cards distributed among 1.377 new EPs in the EMS. This averages to a little bit less than 57 cards per EP. The cards were divided among the steps as documented in Figure 19. At the time, we had four steps that we later excluded from the final

Participants	3535
Case Settings	9808
Purpose	4680
Business Idea	19169
Business Model	18061
Strength & Weaknesses	4772
Objectives	6420
Opportunities & Threats	1358
Tasks	10493
Sum	78296

Figure 19: Cards per step

model (participants, case settings, strength and weaknesses, and opportunities and threats). The prototype we were using at the time did not yet have the resources and forecast steps. We see that the business idea and business model steps accounted for almost half of the cards entered. When we look at the distribution of the cards over the three-and-a-half months the prototype was running, we had approximately 23.000 cards in February, 26.000 cards in March, 19.500 cards in April (Easter fell in April), and 9.500 cards in the first half of May.

Paper C4 (Dahle and Steinert 2016) aimed to research whether EPs would use an early prototype of the EMS in a “lean” (Ries 2011) or incremental way. We selected seven

Scandinavian EPs and measured how many times each of them created, deleted, or edited elements within the different elements per week over a time period of 35 weeks. The EPs belonged to different industries, they were all established between 2006 and 2016, and all but one of them had a revenue of less than 2 million NOKs.

The findings reveal that the seven pilot EPs entered cards for between 19 and 35 weeks, counting from their first entries in the EMS. Four of the EPs (EP 1, 3, 4, and 5) entered a relatively large number of cards after the first month. Two of the EPs (EP 3 and 6) entered cards relatively evenly over the weeks, while the other five tended to have long pauses without entering cards. Paper C4 also shows that there were a relatively large number of business idea and business model events in the mid and later weeks of the plan.

case/week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
Case 1	130	0	0	2	0	0	31	0	0	246	3	181	80	68	24	52	0	0	15																	
Case 2	208	86	317	83	203	0	3	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	4										
Case 3	2	0	5	80	0	1	1	1	121	34	0	0	0	0	69	20	44	76	234	419	0	0	67	10	30	0	20	5	6	2						
Case 4	23	0	10	10	0	209	96	8	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	3		
Case 5	41	4	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	178	0	140	5												
Case 6	4	0	0	5	3	0	16	2	0	32	10	2	9	2	0	1	0	0	0	11	0	0	8	11	9	10	0	12	0	8	5	8	0	38		
Case 7	95	18	0	0	172	0	0	66	0	0	0	0	1	0	0	0	0	0	0	12																
All Cases	503	108	332	186	378	210	147	77	148	312	13	183	90	70	93	73	44	76	254	419	201	0	207	23	45	13	30	5	18	2	8	5	11	0	38	

Figure 20: Cards per week

3.2.2 Findings regarding motivation, core competence, key contribution and key markets

Paper C5 (Toscher et al. 2019) concentrated on the *motivation, core competence, key contribution and key market elements*, analysing 779 EPs from three diverse ESPs consisting of technology, youth, and arts EPs participating in the said programmes between January 2014 and March 2019. The paper had three RQs, in which the first two had A and B parts, and we did specific tests to explore each of the RQs:

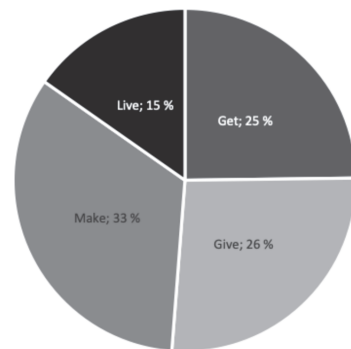


Figure 21: Get, give, make, live

To test the first RQ: “What are the motivations and reasons that individuals engage in entrepreneurship?” (C5RQ1a) and how do these motivations and reasons vary among participants in diverse ESPs?⁴ (C5RQ1b), we performed what we call an *objective type test*. We gathered 1,713 motivation cards from 609 out of 779 participants who had entered motivations. After translating the non-English content into English, we inductively explored

⁴ The term “ESP” describes the term “cohort” in the original paper.

each motivation card through an open, iterative, qualitative coding process (Strauss and Corbin 1998) based on grounded theory (Charmaz and Belgrave 2007, Glaser and Strauss 2009) to ultimately arrive at a coding scheme categorizing each card into one out of four “motivation types”: motivations to GET, GIVE, MAKE, and LIVE. For participants entering more than one card, we also assigned the participant to the best fitting general category.

With regard to C5RQ1a, (What are the motivations and reasons that individuals engage in entrepreneurship?), we found that there is a fairly even distribution among the four categories. “Make” has a somewhat higher share with 33%, while “live” has a smaller share with 15%. “Get” and “give” have 25% and 26%, respectively. Furthermore, 48% of the participants entered cards fitting more than one category, with all of the possible 15 combinations of categories present. The findings from C5RQ1b, (How do these motivations and reasons vary among participants in diverse ESPs?), showed that the those participating in the arts ESP stated “live” motivations more than any of the other groups (56%). The EP participants attending the technology ESP (13%) and one in the Youth ESP (6%) stated “live” as a motivation. EPs attending the Youth ESP (32%) said “give” was their motivation, which is higher than both of the other ESP groups.

To test the second RQ, we performed what we called a business ideation order test. We conducted a quantitative test of the order in which the EP participants entered the elements of their business ideas. In essence, these observations enabled us to determine whether they started their ideation process by entering the key contribution or key market elements (which fit best with a causal or market-based view (Porter 2008) or with their core competence (which fits best with an effectual or resource-based view (Sarasvathy 2001, Barney 1991).

In answering C5RQ2a, (Do EPs define their core competence or their key market/key contribution first?), we found that 74% of the participants defined their core competence before defining their key market/key contribution, and with regard to RQ2b, (How do the results from RQ2 vary among participants in diverse ESPs?), the EP participants attending the tech ESP were the main variation, with only 56% starting with the core competence.

To test C5RQ3, (What can we observe from the cross-tabulation of results from RQs 1 and 2?), we cross-tabulated the categorizations in the get-give-make-live motivation categories with the tendency to start with key contribution/key market or core competence. Finally, we compared the findings of all three RQs among the participants in the three different ESPs.

The cross-tabulation of results from C5RQs 1 and 2 reveals that the EP participants with a “live” motivation had a somewhat higher tendency to start their ideation process with the key contribution/key market combination.

3.2.3 Findings regarding resources, core competence, key contribution, and key markets

Paper C6 (Dahle et al. 2018) attempted to utilize the resource and business idea steps to research whether actual entrepreneurial behaviour mostly resembles a resource and competence (internal) view (Barney 1991, Wernerfelt 1984), or an environment and market (external) view (Porter 2008) according to the following RQ: How do EPs perform their business development with regard to internal and external viewpoints? (C6RQ).

The starting point for this research was to create and update events from 701 live EPs in the EMS registered between 15 November 2017 and 1 March 2018. Altogether, the accepted EPs had 6825 resource cards and 8754 business idea cards registered. For the resource count, we disqualified all the South-African EPs as these were presented with a simplified resource board. This limited sample includes 281 EPs, 3,317 resource cards and 4036 business idea cards. Finally, 678 of the 701 EPs come from five countries: South Africa (420), Norway (140), Denmark (56), Sweden (34), and the United Kingdom (28). The analysis was done by defining three separate measures for the relationship between the internal and external viewpoints: In the *resource count*, we counted the number of resource cards defined for each EP, with the theory that EPs with a high number of resource cards have a higher likelihood of favouring an internal viewpoint.

The internal viewpoint/external viewpoint *number coefficient* is calculated as follows:

$$NC = \frac{2 \text{ (# of "Distinction" cards)}}{\text{(# of "KeyContribution" cards + # of "KeyMarket" cards)}}.$$

The internal viewpoint/external viewpoint *order coefficient* is calculated as follows:

$$OC = \frac{2\Sigma(D^1, D^n)}{\Sigma(K^1, K^n)}$$

Finally, we cross-referenced the resource count per resource element with the number and order coefficient to investigate a potential covariation between the focus on resources and the internal/external viewpoints.

The first analysis indicates that the general tendency for the EPs in the sample is to favour the internal (resource- and knowledge-based) view over the external (environmental models of competitive advantage) view (C8RQ: How do EPs carry out their business development with regard to internal and external viewpoints?). Both the number and the order coefficient show a slightly higher tendency toward an internal view as opposed to an external view. The average number coefficient for the 701 EPs is 1.2, with a standard deviation of 0.85 at 99% statistical significance.

```
t = 37.289, df = 700, p-value < 2.2e-16
alternative hypothesis: true mean is greater than 1
99% confidence interval: (1.126123, Inf)
Mean value: 1.200571
```

The average order coefficient for the 701 EPs is 4.89, with a standard deviation of 16.7 at 99% statistical significance.

```
t = 7.7439, df = 700, p-value = 1.693e-14
alternative hypothesis: true mean is greater than 1
99% confidence interval: (3.41795, Inf)
mean of x: 4.886163
```

The second major finding in paper C6 is the variation in the internal/external viewpoint between the European and the African EPs. The difference in the order coefficient is documented in Figure 22. Here we clearly see a higher tendency toward the internal view in the European EPs than in the African ones. The difference is statistically significant at p=0.01.

	OC
Europe	7,02
Africa	3,62

Figure 22: Order Coefficient Europe VS Africa

```
data: OC by Continent
t = -2.6093, df = 688, p-value = 0.00927
alternative hypothesis: true difference in means is not equal to 0
99% confidence interval: -677.952331 -3.436449
sample estimates: mean in group Africa 3.62 mean in group Europe 7.02
```

The third major finding is that EPs that have a higher tendency to favour an internal view tend to have a higher focus on their resources than EPs favourable to an external view, particularly with regard to core resources such as core values, visions, and products.

3.2.4 Findings regarding the business idea elements of core competence (CC) and UVP

Paper C7 (Dahle et al. 2019) concentrates on the *core competence and unique value proposition* elements, discussing some problems regarding the practical use of these elements. The article uses a dataset similar to paper C5, with 756 EPs attending three different ESPs of technology, youth, and arts entrepreneurship. The paper is built around two research questions and operationalizations:

The first RQ is: Do the EPs⁵ express their CC and UVP as “unique” or not? (C7RQ1) This is operationalized by quantitatively counting the number of CC and UVP cards entered for each EP. Given the “uniqueness” of both of these two concepts, one could infer that a very high number of cards would indicate problems with the understanding of the uniqueness of the terms. The average number of CC cards was 4,36 entries per EP, and the average number of UVP cards was 1,89 entries per EP. This tendency was particularly high for the EPs participating in the Tech ESP, with 5,92 CC cards and 2,9 UVP cards.

The second RQ is: Do the EPs differentiate between the CC and the UVP when using the CC to describe the entrepreneur/EP and the UVP to describe the product/service? (C7RQ2). This is operationalized by what percentage of the EPs use the CC to describe the entrepreneur/EP and what percentage of the EPs use the UVP to describe the product/service. A high percentage would indicate that EPs use the two terms as intended in the theory. The qualitative content of each card was manually coded into one out of nine categories describing different combinations indicating whether the terms of CC and UVP was used in accordance with the theory.

This analysis finds that no more than 54% of the entered cards clearly describe the entrepreneur/organization in the CC element, and no more than 66% of the entrepreneurs clearly describe the product/service in the UVP element. This tendency is the highest for the way those participating in the youth entrepreneur ESP understand the concept of core competence. Only 37% of the cards from this group describe the EP.

Automated content analysis via Leximancer reveals a similar pattern. The CC texts indicate both concepts related to a description of a person or an organization, such as “experience”, “education”, and “knowledge”, and concepts related to a product-like thing or an object, such as “quality” or “design”. Similarly, the UVP texts show both concepts logically relating to a

⁵ The term “EP” describes an “entrepreneur” in the original paper.

product or a service, such as “quality”, “product(s)”, “delivery”, and “price”/affordability” but also “experience” – which would most likely relate to a person or an organization.

3.2.5 Findings regarding the business idea and business model elements

Paper C8 (Nguyen-Duc et al. 2017) does not use data from the EMS, but is supported by the logic of the EAS. This paper addresses the elements of UVP, product features and solution feedback by doing semi-structured interviews of 20 norwegian EP participants in the software startup segment. The interviews were coded in NVivo, and the results were interpreted using the behavioural theory of the entrepreneurial firm (BTEF) (Dew et al. 2008).

The paper describes six challenges regarding product development in early-phase software EPs. There is a tendency for EPs to focus on local optimal solutions and short-run feedback rather than long-run strategies. There is also a tendency to use resources on internal and external demonstrations, developing what is meant to be throw-away prototypes into production versions and struggling with getting sufficient user involvement. The conclusion of the paper is that the effectual nature of EPs may require a more proactive, flexible, and agile approach to product development and user involvement than traditional software product development.

Paper C9 (Dahle, Dybvik et al. 2019) uses two samples with 17 EPs⁶ in each to research how the focus on the nine different business model elements differs between EPs that use business modelling dynamically and those who use it statically. The Business Model element focus has been operationalized as the percentage of actions conducted in the BM elements, which we argue could indicate the time and attention the entrepreneur devotes to that specific element. The differentiation between dynamic and static approaches has been operationalized by selecting samples for the static group from EPs that used the EMS over the course of one initial 24-hour period only and for the dynamic group from EPs that used the EMS over multiple 24-hour periods. Differences in percentage-values between the two groups were statistically tested using the Welch T-test, Mann-Whitney U test, and Shapiro-Wilk test for normality.

A statistically significant distinction in the focus on different business model elements between EPs using business modelling in a dynamic way, compared to those who use it in a static way, could not be found (see Figure 23).

⁶ The term “EP” describes “case companies” in the original paper.

Variable (BM Element)	Dynamic			Static				
	Samples	Mean \pm SD	Median	Samples	Mean \pm SD	Median	Difference Mean \pm Std. Error	Difference Median
Key Contribution	17	24.7% \pm 12.8%	23.1%	17	21.7% \pm 8.3%	21.1%	2.9% \pm 3.7%	2.0%
Key Market	17	17.2% \pm 5.6%	17.2%	17	20.8% \pm 10.8%	16.7%	-3.6% \pm 2.9%	0.5%
Core Competence	17	21.0% \pm 11.6%	19.5%	17	22.8% \pm 6.9%	22.2%	-1.7% \pm 3.3%	-2.7%
Cocreators	15	5.6% \pm 2.8%	6.3%	15	6.2% \pm 3.5%	5.6%	-0.7% \pm 1.2%	0.7%
Unique Value Proposition	15	6.6% \pm 4.6%	6.1%	16	5.9% \pm 2.7%	6.4%	0.7% \pm 1.3%	-0.3%
Product Features	14	7.4% \pm 4.2%	6.6%	13	7.4% \pm 3.6%	6.8%	0.0% \pm 1.5%	-0.2%
Ecosystem	17	9.3% \pm 6.8%	7.9%	13	6.8% \pm 3.6%	5.6%	2.5% \pm 2.1%	2.3%
Sales Model	16	7.3% \pm 9.2%	5.2%	16	7.2% \pm 3.0%	8.1%	0.2% \pm 2.4%	-2.9%
Price Model	15	4.6% \pm 3.6%	3.7%	16	5.9% \pm 3.3%	4.6%	-1.3% \pm 1.2%	-0.9%

Figure 23: Statistical findings from paper C9

4 Conclusions

The conclusions in this chapter are mainly based on experiences from designing and distributing the four iterations of the EMS and the research done based on the EMS data. In addition, the experiences from running more than 1.000 workshop-days supporting more than 20 ESPs, the learning from interacting with more than 17.000 EPs, and the fruitful discussions with both of these groups and with my Entrepreneurery and NTNU colleagues have been important.

The programme has been an agile (Beedle et al. 2001) or “lean” (Ries 2011, Blank 2007) project, where the starting point has been more an overall motivation or a “generalised end goal” than clear objectives (Sarasvathy 2001). This means that the project has been run in very close collaboration with a selected group of co-creators, and that a significant flexibility with regard to where the project has been heading has been accepted. This has perhaps been most clearly symbolised by the fact that the development of the EMS has been completely restarted twice. The project has also tried to creatively take advantage of and re-use existing resources in a way that very much reflects the theory of bricolage (Baker and Nelson 2005).

Derived from these processes, this chapter contains the main conclusions of this PhD thesis. It is organized into two parts, one for each research question:

4.1 How does the entrepreneurship management system need to be designed?

Building on the findings from chapter 3, this section offers the conclusions regarding the following research question: (RQ1) “how does the EMS need to be designed to secure adaptation by both EPs and ESPs and allow for effective analysis of their activity data?” It supports the following two research objectives: (RO1) “design an entrepreneurship management system for describing activities within EPs and between EPs and ESPs in their

whole granularity”; and (RO2) “populate the EMS with a significant sample size of real entrepreneurial activity, ranging over a significant number of ESPs”.

As mentioned in Section 1.8, the challenge of an entrepreneurship activity system is that it has to be somewhat normative to be instructive for practical applications (Bechara and Van de Ven 2007). Sheridan (2010) describes activity systems as "almost always normative, meaning that they say how the system should behave if it were to follow the model". A completely flexible framework would be a blank canvas where any EP participants could write whatever they like. The problem with this is that it would be no step forward from analysing document-based business plans, where the problems are that the terminology is not common, and the comparison between different EPs and ESPs has proven to be difficult. The challenge with a normative framework is both that it is difficult to agree upon a norm and that such a norm would not be applicable across industrial verticals, entrepreneurial phases, and cultures. Even choosing a theoretical foundation for an EAS is challenging. In this thesis, four completely valid schools of entrepreneurship theory have been disregarded. In addition, within the two schools selected, thousands of valid contributions have been left out.

Hence, this PhD has not created a silver bullet for entrepreneurship whereby following the suggested method would guarantee success. That was also never the intention. What I will suggest it has done is create a starting point for easier gathering and comparison of empirical data across different EPs and ESPs, both by using the 28 existing elements and also by rehashing new constructs based on these. To be able to do that, however, the EMS should have certain capabilities:

- To be able to effectively measure the effect an ESP has on the participating EPs, the specific objectives and mandate of each ESP should be clearly defined. The reason for this is that the actual key performance indicators that must be measured will vary according to the mandate and objectives of the different ESPs. A high-tech incubator in Silicon Valley may have the exit value of the EPs as the primary objective, while a programme for arts entrepreneurs may focus on job creation or company survival. There is no single objective criterion that defines the impact of all ESPs; thus, knowing what to actually measure is the first precondition.
- An EMS should be built upon a uniform set of elements that are clearly defined and are the same for all EPs and ESPs regardless of differences in culture, language, and vertical industry. Such a set of elements can be described as an entrepreneurship activity system. Even if the

EMS has to be individualized from ESP to ESP, the core definition of the elements needs to be identical.

- To secure the usage of the EMS, the elements need to be structured in a logical order or workflow. Even if it is impossible to build a 100% optimal workflow, the elements still have to be ordered. This order may vary from ESP to ESP and from situation to situation, but it still needs to be there to be instructive for the EPs.

This thesis will claim that the chosen seven-step, 28-element EAS used in this PhD satisfies these capabilities. The usage and incremental development of the EMS in more than 30 ESPs and in more than 17.000 EPs indicates this. There may be a wide range of other EAS' that would work as well, but there is value in a large number of EPs and ESPs using the same one, due to the comparability between EPs and ESPs. Similarly, the six chosen theoretical pillars could easily have been complemented with other theories. I have used four criteria for selecting theories: 1) theoretically relevant (often cited), 2) practically relevant (often used by EPs and ESPs), 3) normative (giving clear advice regarding best entrepreneurial practise) and 4) interrelated (high degree of similar constructs in all of the pillars). Using these four criteria has led to a large number of entrepreneurship theories only being used indirectly as background constructs. This in particular is true for other paradigms like economic entrepreneurship theory (Schumpeter 1910, 1912, Kirzner 1973), anthropological entrepreneurship theory (Baskerville 2003), psychological entrepreneurship theory (Landström et al. 2012), sociological entrepreneurship theory (Reynolds 1991) and theories from the field of strategic management (Porter 2008).

- The analytics database must clearly separate the EP, the individual entrepreneurs, and the companies that may or may not come out of these and clearly define the relationships between them. It must also have a clear information model taking the ESPs into account. When an EP participates in an ESP, the measurement could be operationalized to the EP, the related company, or even the individual entrepreneurs. Say that the specific objective of the entrepreneurship support programmes studied is survival of the case developed. Suppose that the entrepreneur behind the EP established a limited company to handle the entrepreneurship project and that this company went bankrupt. Immediately after the bankruptcy, the same entrepreneur starts a second company, utilizing the exact same intellectual property rights as in the first and this time made it into a success. Would you count this as an example of the survival of a company (since the entrepreneur managed to

create a viable business, although it was the second attempt), or would you count it as a failure (since the first related company did not survive)?

- It is a large benefit if the analytics database can be automatically linked to governmental entity registers. This will make it feasible to analyse the covariations between entrepreneurial activities and the financial KPIs of the linked companies. It will also help reduce the problem of the same companies being registered several times.
- The EMS should be supported by well managed ESPs that follow the EPs over a period of time, at least ranging over nine to 12 months. The skillset of the entrepreneurship support programmes mentors is vital, and the selection and training of these mentors is a critical success factor for the ESPs.
- The EMS should contain a massive online open course (MOOC) that covers both the actual use of the EMS and the theoretical entrepreneurial concept upon which it is built.
- An EMS without the support of either an ESP or a MOOC has little practical value for most EPs. The general subject of entrepreneurship is too complex for that. The exception is distributing the EMS to the minority of entrepreneurs who have high theoretical knowledge within the field.
- When developing an IT system with a high degree of innovation required and with new, disruptive developmental technologies becoming available, restarting the project with a new code base can be a viable option. Closely integrating the pilot customers into a joint developmental process can also be constructive.

4.2 To what degree does the EMS provide observation of entrepreneurial activity and impact of ESPs?

Building on the findings from chapter 4, this section offers the conclusions regarding the following research question: (RQ2) “to what degree does the EMS data provide observation of EP activity and the impact of the ESPs?”. It supports the following two research objectives: (RO3) “identify potential research methods and strategies deployable using these data”; and (RO4) “make a proof of concept for the individual methods”.

The time limitation of the PhD has made it impossible to do empirical analysis of all of the 28 elements. However, as a part of this thesis, we have done different analyses of 14 of the 28 elements from four of the seven steps. We have found indications that:

- EP participants are willing to use an entrepreneurship management system (C3, C4, C5, C6, C7, C9)
- ESPs are willing to use an EMS and to demand that the EP participants attending the programmes do the same (C5, C6, C7)
- EPs actually are able to use the EMS over time, making iterative improvements in their “plan” over time (C4)
- EP participants have four types of motivation (get, give, make, live) that they often combine. The weighting of these four types may vary depending on what ESP the EP participants attend (C5).
- EPs have great difficulties separating the elements of core competence and unique value proposition from each other. They also seem to define a higher number of core competencies and Unique Value Propositions than one would expect due to the focus on uniqueness in both those two terms (C6).
- EPs have a propensity to favour the resource-based view. This tendency is higher in the chosen African EPs than in the European ones. Finally, EPs that favour a resource-based view tend to put more emphasis on defining their resources than the ones favouring a market-based view (C5) (C7).
- Since EPs are largely effectual, their approach to product development and user involvement should possibly be more proactive, flexible, and agile than traditional software product development (C8).
- There does not seem to be a significant difference in the focus on different business model elements between EPs taking a dynamic and a static approach to business modelling (C9).

The main point of this thesis, however, is not to interpret the individual findings from the analysis of the data. It is to actually prove that the findings can be made and that the existence of the combination of an EMS based on an entrepreneurship activity system ensures that entrepreneurial research questions can be handled in a systematic empirical manner. If that is the case, I will claim it to be a scientific contribution in itself.

The main conclusion from this section must be that an entrepreneurship activity system-based EMS *can* provide data that gives insight into the field of entrepreneurship. It *is* also possible to

measure and analyse differences in entrepreneurship project participants' behaviour, depending on what ESPs they have been assigned to.

We have also seen that access to the data can have value for researchers from adjoining disciplines. The data should be valuable for a magnitude of research groups tackling various questions in fields other than entrepreneurship. Of the co-writers of the papers used in this PhD, Magne Supphellen is a marketeer, Kevin Reuther is an innovation management researcher, Anh Nguyen-Duc and Pekka Abrahamsson are computer science researchers, and Ben Toscher is a social scientist.

The most encouraging fact, however, is that so far, the project has only scratched the surface of the research possibilities present in the data available. As the EMS is being distributed to more ESPs, the width of the data available will only increase. The possible research questions that can be undertaken will also increase as new scientists will be invited to use the data. In section 4.4, I will elaborate on the possibilities for taking this further.

4.3 Limitations of the work

The main limitation of this work is, in my opinion, the same as what makes it valuable. The specific choice of elements and the designed order of these in the EMS make it a fixed frame for how the EPs should develop their projects. Thus, one must take into consideration that the findings will reflect this "recipe". Thus, even if the structure of the EAS makes it easier to compare the activities within each element, the presence of the elements themselves will be an implicit feature of the EMS.

A possible bias in the research is the fact that EPs of course do not necessarily enter all planned or performed activities into the EMS. The collaboration both within the EPs and between the EP participants and the ESP mentors makes this less of a problem, since the EMS becomes the communication platform between the different individuals. This problem can also be mediated by doing cross validation using in-depth qualitative case studies.

Different variations of self-selection bias may also be a possible challenge. Certain types of entrepreneurial projects may have participants with a higher tendency to attend ESPs and therefore to use the EMS. In certain economies, just having access to the internet may be a bias, and entrepreneurs willing to use any business development system will probably be over-represented. However, the sheer numbers of users of the system will counteract this to a certain degree. This "wisdom of the crowds" may reduce the self-selection bias problem. Also,

the purpose of this research is not primarily to document existing entrepreneurial behaviour, but to normatively search for a “best entrepreneurial practice”. Thus, the representativeness of the projects is less important.

In some of the analyses toward RQ2 “to what degree does the EMS data provide observation of EP activity and the impact of the ESPs?” it was clear that entrepreneurs sometimes struggled with understanding the concepts in the EAS. This was particularly evident regarding the difference between the business idea element of “core competence” and the business model element of “unique value proposition” (Dahle et al. 2019a). This challenge can be approached from two fundamentally different viewpoints. Firstly, it could be looked upon as a *measurement issue*, thus weakening the validity of the EAS. From that viewpoint, the measures that would have to be put in place would be to insert logical checkpoints and improved user instructions in the user interface, making sure that the entrepreneurs got the understanding of the elements “right”.

The alternative way of looking at it would be that this tendency to misunderstand the elements as an empirical *finding*. In the example from paper C5 this would mean uncovering a deeper underlying difficulty in the overlap between the theoretical constructs of core competence (Prahalad and Hamel 1990) and unique value proposition (Blank 2007). After all, these constructs have been a central part of entrepreneurial business development for decades. It is not likely that the tendency to mix up the two constructs are exclusive for the EAS and the EMS. If this is the case, a deeper evaluation of the usefulness of the constructs and how we generally teach them to entrepreneurs should be performed. This would for example have implications for the way we use both the business model canvas (Osterwalder and Pigneur 2010) and the lean canvas (Maurya 2012), as the UVP is a central part of both. Generally spoken, this means we may both have to try to improve upon the elements we use in the EAS and explain the constructs behind the elements better in both literature, training given and mentoring. In addition, the constructs should be supported in *all available EMS'* by understandable user instructions in both help text and video format and by logical fail safes. These latter could utilize text analysis logic to try to capture unclear use of the constructs as they are entered into the EMS.

4.4 Future research

This project is only in its infancy. The Entrepreneurery project has an ambition to populate the EMS with at least 100.000 new EPs and 1.000 ESPs between 2020 and 2024. To reap the benefits of that from a research point of view, the plan underneath has been developed. The plan is depending on getting funding for an average of three full-time researchers throughout the period. Furthermore, I want to state that this is an agile plan, that will undergo a series of improvement and changes throughout the designated time period. The main activities undertaken, as we believe them to be right now, will be as follows:

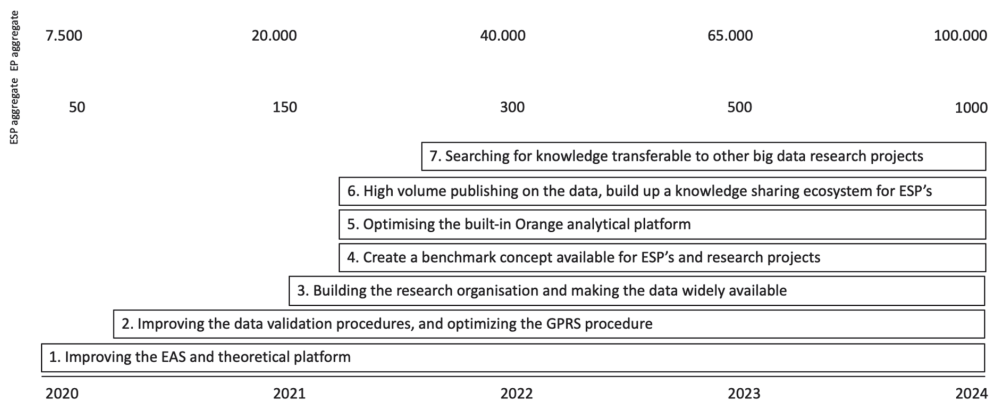


Figure 24: Future Research 2020-2024

4.4.1 Improving the EAS and the theoretical platform

This project is and is meant to be a continuous and never-ending agile knowledge gathering project. Even if the 2019 version of the six theoretical pillars and the EAS is a normative starting point for this knowledge gathering, neither the six pillars nor the 28 EAS elements are complete. Already in the last days before the launch of the production version, we reacted to a clear customer demand to include a 28th element, namely the *sustainability objective*. Trying to merge entrepreneurial theory and practical demand means that the development process will be ever ongoing, and agile, and the structure of the six pillars and 28 elements should be viewed as hypothesis' that we should forever seek to falsify (Popper 1963). This means making a growth, quality and maintenance plan for the future as part of the building process of the EMS.

4.4.2 Improving the data validation procedures and optimizing the GPRS procedure

A clear potential of improvement with regard to utilizing the EMS data is to write a clear whitepaper giving suggestions on how to secure data consistency and validity when designing

research projects using the data. Given the possibility to combine qualitative data from the text and extended text fields and quantitative data derived from the order of the elements, securing data validity will differ slightly from when using traditional query data. The way we have several potential participants in each EP also creates both challenges and possibilities for making sure we have as representative data from each EP as possible. One way of securing this, could be to do a consistency check by comparing the data from different individuals within the same EP. When coding the qualitative data from the text fields into categories, as done in C5 (Toscher et al. 2019), there are several ways to improve the data validity. First of all, it is possible to introduce a self-validation functionality where the entrepreneurs get to classify themselves after the coding criteria. The self-validation and the classification that comes from the coding of the text can then be correlated. In addition, multiple coders can be used to create a classification. If all of the coders arrive at similar coding patterns, then such inter-subjectivity would be an indicator of good quality.

Finally, we should take into consideration the possibility to compare text in the different element categories. If the input from one entrepreneur in one element category can be used to predict the content in another, this can be used to look for outliers and thus validate the data. We also need to find a way to tackle some challenges with regard to keeping strategic business secrets, and the further anonymization and aggregation of the data is a high priority.

4.4.3 Building the research organisation and making the data widely available

The next step will be to create a specific scientific environment, focusing on further developing and utilizing the EMS. This should be managed by an independent academic institution but be done in close collaboration with the ESPs. I believe that this organisation should gradually build a staff of three to four researchers with a wide range of competence within entrepreneurship and qualitative and quantitative methods. This organisation will also contribute in making the data from the EMS ready to be made available for external researchers who want to use the data through a creative common model.

4.4.4 Create a benchmark concept available for ESPs and research projects

As we learn more about the behaviour of the EPs and the effect it will have on the self-defined success criteria of each ESP, we will concentrate on developing and documenting a best practice for different activities in different given situation. As we define these best practices, they must be made available for both the research community and for practitioners within the

ESPs and EPs. The development of such benchmarks will be a vital future contribution from the project.

4.4.5 Optimising the built-in Orange analytical platform

The EMS has in the PhD project contained three main elements. The EAS, the user interface and the analytical database. In the latter stages of the project, I have started experimenting with including a fourth solution to the architecture. This is a simple-to-use and flexible analytical software tool, so tightly integrated with the data warehouse that the preliminary data structuring can be done very efficiently, and using different analytical widgets on both the quantitative order data and the qualitative content can be done in a “drag-and-drop” modus. Enhancing this part of the solution will help make the data easier accessible for researchers.

4.4.6 High volume publishing on the data, build a knowledge sharing ecosystem for ESPs

As these necessary improvements of the way we gather, validate and analyse the data are being performed, and access to the data gradually are being increased to more internal and external researchers, I expect to rapidly increase the publishing based on the data. I expect this to be a valuable scientific contribution in itself. In addition, the findings from this research will contribute to gradually increase the qualitative of both the entrepreneurship knowledge going into the EAS, and the structure of the EAS in itself.

Finally, I aim to distribute these findings directly to the EPs through the knowledge transfer done both by written and video-based documentation, and indirectly through the training and certification of the advisors in the ESPs. To contribute in making the results of the research available for the entrepreneurs is one of the places where I hope that this project will show it's uniqueness.

4.4.7 Searching for knowledge regarding the scalability to other big data research projects

A possible additional future research contribution stems from the fact that the project has systematically gathered a large amount of activity data from a large number of individual projects. Documenting these processes to create general learning points on how to create a big data warehouse has not so far been a prioritised part of the project. The experience and the knowledge are available, however. Documenting these with the purpose to generalize them to any kind of big data warehouse should be a part of the future research project.

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6 Papers

(C1) Dahle, Y., Anh, N. D., Steinert, M., and Reuther, K., 2019. Six pillars of modern entrepreneurial theory and how to use them. In: *Fundamentals of Software Startups: Concepts, Methods and Case Studies*. New York, NY: Springer.

(C2) Dahle, Y., Supphellen, M., Steinert, M., and Reuther, K., 2019. Extending the Business Model concept towards a holistic and dynamic entrepreneurship activity system. *International Review of Entrepreneurship* (under review).

(C3) Dahle, Y., & Steinert, M., 2016. Does Lean Startup really work? - Foundation for an empirical study. Presented at the 2016 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC), Trondheim.

(C4) Dahle, Y., Steinert, M., Anh, N., & Abrahamsson, P., 2017. Presented at the 2017 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC), Madeira.

(C5) Toscher, B., Dahle, Y., & Steinert, M., 2019. Get Give Make Live: An Empirical Comparative Study of Motivations for Technology, Youth, and Arts Entrepreneurship. *Social Enterprise Journal*.

(C6) Dahle, Y., Anh, N. D., Reuther, K., Steinert, M., & Toscher, B., 2019. An analysis of Core Competence and Unique Value Proposition as normative entrepreneurship elements. Presented at the 2019 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC), Nice.

(C7) Dahle, Y., Steinert, M., Anh, N., & Chizhevskiy, R., 2018. Resource and Competence (Internal) View vs. Environment and Market (External) View when defining a Business. Presented at the 2018 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC), Stuttgart.

(C8) Nguyen-Duc, A., Dahle, Y., Steinert, M., & Abrahamsson, P., 2017. Towards Understanding Startup Product Development as Effectual Entrepreneurial Behaviours. In *Software Business. ICSOB 2017. Lecture Notes in Business Information Processing (Vol. 304)*. Springer.

(C9) Dahle, Y., Dybvik, H., & Steinert, M., 2019. A dynamic and a static approach to the business model—Investigating the potential difference in business model focus. Presented at the 2019 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC), Nice.

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An analysis of Core. Six Pillars of Modern Entrepreneurial Theory and How to Use Them.
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Paper 2: Dahle, Yngve; Suphellen, Magne; Steinert, Martin; Reuther, Kevin.
Extending the business model concept and dynamic entrepreneurship activity system.
This paper is awaiting publication and is not included.

Building an Entrepreneurship Data Warehouse

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Abstract—The main principle of the Lean Startup movement is that static business planning should be replaced by a dynamic development, where products, services, business model elements, business objectives and activities are frequently changed based on constant customer feedback. Our ambition is to empirically measure if such changes of the business idea, the business model elements, the project management and close interaction with customers really increases the success rate of entrepreneurs, and in what way. Our first paper; “Does Lean Startup really work? - Foundation for an empirical study” presented the first attempt to model the relations we want to measure. This paper will focus on how to build and set up a test harness (from now on called the Entrepreneurship Platform or EP) to gather empirical data from Companies and how to store these data together with demographical and financial data from the PROFF-portal in the Entrepreneurial Data Warehouse (from now called the EDW). We will end the paper by discussing the potential methodological problems with our method, before we document a test run of our set-up to verify that we are actually able to populate the Data Warehouse with time series data.

Keywords— Big Data, Business Idea, Business Modelling, Data Warehouse, Machine Learning, Lean Startup, Pivot

I. INTRODUCTION

Since 2011 a new paradigm within entrepreneurship has been established to challenge traditional waterfall models (Royce 1970). It is called Lean Startup, and is, among others, based on the writings of Eric Ries (2011), Steve Blank (2013), Alexander Osterwalder and Yves Pigneur (2010) and Ash Maurya (2012). This paradigm differs from traditional business development in many ways, but the core of the concept can be interpreted as follows: For a startup, the rate of success correlates positively with:

1. Its ability to change the *business idea* when necessary.
2. Its ability to continuously change elements of its *business model* as defined by Osterwalder, Pigneur and Maurya. These two first points constitute a “pivot” as Eric Ries calls it.
3. Its ability to change elements of its *project development* according to changing circumstances

4. The frequency of its *customer interaction and testing* in the business development process.

In our previous work, (Dahle and Steinert 2016), the success of a startup was defined as a function of business idea, business model, project development and customer interaction:

$$S = \Delta f(BI) + \Delta f(BM) + \Delta f(PD) + \Delta f(CI)$$

Where S= Success, BI= Business Idea, BM= Business model, PD= Project Development and CI= Customer Interaction. This means that any alteration to the Business Idea, Business Model, Project Development and Customer Interaction will improve the level of Success.

We also outlined a possible way to build a test harness for gathering behavioural data from a large number of Companies over time (as shown in Figure 1). Utilizing a beta version of this tool, we did an initial pilot data gathering from a handful of Companies. This test verified that there are Companies that actually do change their Business Idea, Business Model and Project over time in a way similar to what is suggested in Lean Startup theory. This means it should be possible to evaluate the correlation between this behaviour and success.

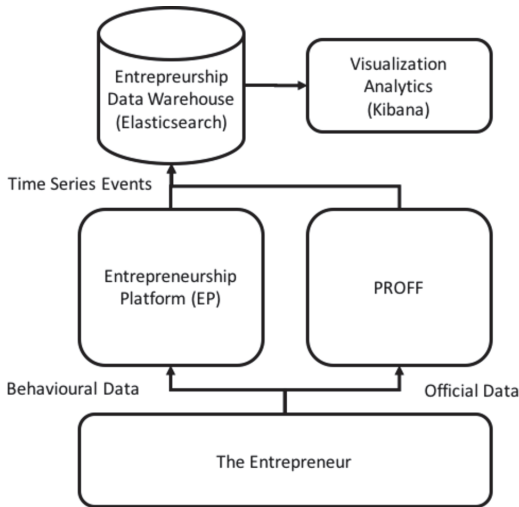


Figure 1: Empirical data collection and analysis approach

This paper will focus on presenting how to build and set up the test harness, or the Entrepreneurial Platform (EP) in an optimal way and how to build the so-called Entrepreneurial Data Warehouse (EDW). We are encouraging the entrepreneurs to evaluate and to change the Business Idea, Business Model and Project Development as often as necessary, and to perform new Customer Interactions as often as they want. This design is based on the principles of the “wayfaring” theories described by (Steinert and Leifer 2012).

Further we will show how we can populate the EDW by extracting and transferring data from the EP, and combining them with demographical and financial data from the PROFF-portal. We will end the paper by discussing the potential methodological problems we may encounter, before we document a test run of our set-up to verify that we are actually able to populate the Data Warehouse.

The paper is organized as follows, Section II presents the design of the Entrepreneurial Platform and the integration with PROFF. Section III presents the design of the Entrepreneurial Data Warehouse. Section IV discusses the challenges we may experience. Section V and VI offers a very brief initial run through of the first data entering the DW and describes some suggested future research.

II. THE ENTREPRENEURSHIP PLATFORM AND PROFF

A. The Entrepreneurship Platform

What set our project apart, is that we are creating a uniform categorization of the different theoretical events that constitutes a business development process. We call these *Event Categories*. The Entrepreneurship Platform (as shown in Figure 2) is the tool that enable us to monitor the creation of Events created, updated and deleted within each Event Category by a large number of entrepreneurs. After trying out different test versions in 2014, 2015 and 2016, the

EP was released in its 1.0 version in January 2017 and in its Data Warehouse ready 1.1 version in late May 2017.

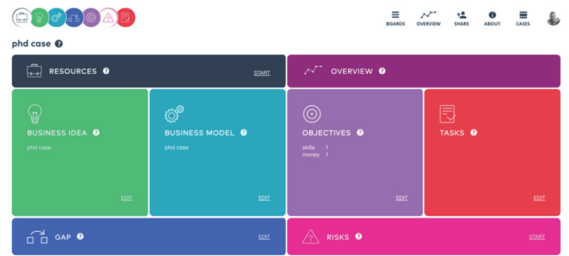


Figure 2: The Entrepreneurial Platform

The EP consists of approximately 150 components that constitutes 7 Boards, 3 different Customer Test Features and an Admin Console. Each of these consists of a number of *Boxes*, and the User Interface is based on filling these boxes with *Cards* containing the relevant Content. Everything is linked together, resulting in an *Overview*, giving the Case Company control over their current strategy, project and forecast. The thinking behind this model is clarified in the book *Lean Business Planning* (Dahle and others 2014).

The EP will be marketed directly as a free-of-cost SaaS tool toward the startups. In addition, it will be marketed in white-labelled versions from a number of partners (Banks, Innovation Centres, Venture Capitalists and Incubators). We are marketing a full version, a strategy only version and a project only version of the EP. The full version contains all the Boards, whereas the two other versions contains only the Boards relevant for the purpose. A Case Company can combine any of the seven Boards as they see fit. These different versions are called *Templates*. The Cases can switch between Templates. All variations will be flagged.

The Case Company can choose to work with a three-month, six-month or a 12-month fixed or rolling Case period. They can also invite internal and external participants to co-work with the Case. The internal participants are typically colleagues. The external participants can be representatives from helpers such as banks, incubators, consultants or innovation centres. We want to catch this whole level of interaction between the whole entrepreneurial ecosystem in our data set.



Figure 3: The Entrepreneurial Ecosystem

Figure 4: Example of Card. One of the Business Idea Cards

The design of the EP allows the Startups to document the changes as Cards (as shown in Figure 4). As we will show later in the article, three different kinds of actions can be done to the Cards. The businesses can Create a new Card, Update a card and Delete an existing Card. Each of these four actions constitute an Event.

Different Case Companies may work with all of the Boards in different ways. They can gather all the stakeholders for a workshop, they can let everyone work independently, or they can give a smaller group the mandate to present a suggestion for discussions. One way or the other, they typically should end up agreeing on an initial set of Cards, before changing these to a larger or a smaller degree over time. There may also be differences within the Case from Board to Board. It may make sense to work with the strategic Boards (Resources, Business Idea, Business Model and Gaps) in a facilitated workshop including owners, board members and managers to different degrees. Then the departments may be given a mandate to suggest Objectives, before the management group consolidates them. Finally, they may let each key employee suggest his own Tasks before the department heads consolidate them.

Entrepreneurial information will be tracked by the system using seven boards: (1) Resource, (2) Business Idea, (3) Business Model, (4) Business Gap, (5) Objective, (6) Risk, and (7) Task.

The Resource Board have three boxes that are relevant for the EDW (as shown in Figure 5). The first give the different stakeholders a chance to define the values they want to base the business on. An organisational value is “a belief that a specific mode of conduct is preferable to an opposite or contrary mode of conduct” (Rokeach 1974). The next box fits Cards that suggest the vision of the business. A well-conceived vision consists of two major components: core ideology and envisioned future. The core ideology is unchanging while the envisioned future is what we aspire to become, to achieve, to create. (Collins & Porras 1996) In the final box, the different owners of the Case Company can enter Cards with their personal objectives for the Case Company.

Figure 5: The Resource Board

The Business Idea Board (Figure 6) allows the stakeholders to define their “Business Idea”, or “Mission”. According to Canadian professor Chris Bart (1997), the Mission consist of three components:

1. Key Contribution: What problem will you solve?
2. Key Market: Who will have this problem?
3. Distinction: What makes you unique?

The suggested work method will be to first populate the different Boxes with Cards in a brainstorming type process. Then the Companies are advised to link the different Cards to as many different Business Ideas as they please. Any Card can be used many times, and any Idea can include many Cards. The only rule is that there needs to be at least one Card in each Box. We expect significant variation in how many Business Ideas the different Companies will create, how many of them the will develop into Business Models, and how often they will Update them.

Figure 6: The Business Idea Board

The Business Model Board (Figure 7) allows the Case Companies to expand as many of their Business Ideas as they want to by adding answers to six questions: Who will be your early market customers? What will be your unique value proposition? What product features will you offer? What partners will you have? How will you sell? and How will you get paid? (Dahle and Steinert 2016). We will, as mentioned before, release a number of different templates of the EP. Some of these versions will use Osterwalder and Pigneur’s BMC model (2010) or Maurya’s Lean Canvas (2012) instead of our simplified Business Idea and Business Model. We will map these according to Appendix A, and flag which model has been used in each Case.

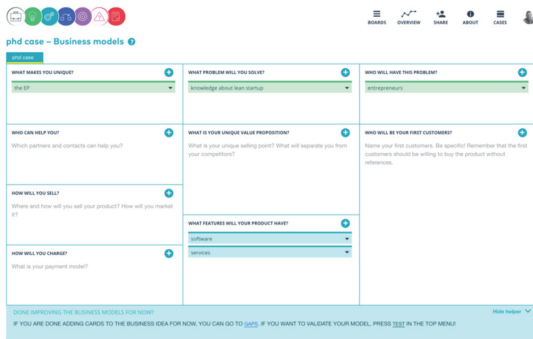


Figure 7: The Business Model Board

The Gap Board (Figure 8) is a combination of a competitor analysis and the Strength and Weaknesses part of a SWOT-analysis (Humphrey 2005) The improvement from a traditional SWOT, is that all the strengths and weaknesses, both for the Case Company and their competitors, need to be derived from a specific Business Idea or Model element. In this way, we only discuss strengths and weaknesses that are relevant for the chosen Business Idea/Business Model.

In this part, the Case Companies will be asked to first define up to three competitors or groups of competitors. Then they will be led through all their active Business Idea and Model elements and asked to create strengths and weaknesses for as many as them as they see fit. Finally, they will be asked to do the same for each of their competitors.

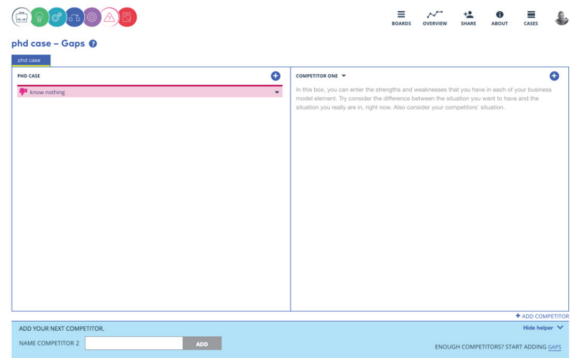


Figure 8: The GAP Board

The Objectives Board (Figure 9) is where the Case Company is supposed to actually start putting his strategy into action. The Case Company will be asked to start by defining their Skills Objectives. These are objectives that are related to increasing the competence of the organisation, typically by recruitment and hiring. These objectives can be defined as milestones or numerical objectives. Next the Case Company are asked to define their Product and Market Objectives. These Objectives are typically related to the development of new products or non-monetary KPI’s regarding sales and marketing. These objectives can be defined as milestones or numerical objectives. Finally, the Case Company are asked to define their Money Objectives. These can be related to Revenues, Loans, Grants or Equity, and they are always stated in \$ values. Money Objectives becomes the basis for the Revenue Part of the P&L Forecast.

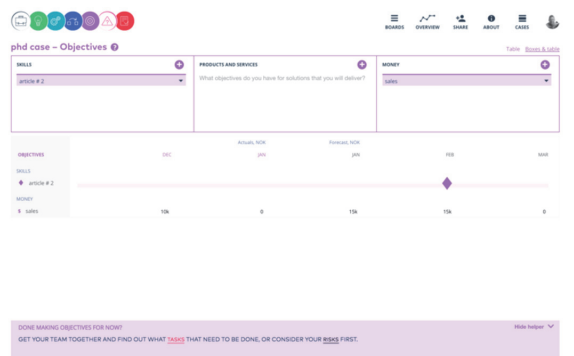


Figure 9: The Objective Board

As the Case period starts, the Case Company are asked to insert the actually achieved Objectives. They are also encouraged to adjust the estimates for the following periods as they gain experience. They are advised to delete irrelevant objectives and add new objectives at any point in the Case period.

The *Risk Board* (Figure 10) is where the Case Companies are advised to register their Opportunities and Threats (Humphrey 2005). Like in the Gap Board, they are asked to go through their Business Idea and Business Model element one by one, and try to document Events related to them that may happen outside of the Case Company's control. Here they are asked to also go through their Objectives in the same way. They are asked to categorize each Risk (Opportunities and Threats) as low, medium or high probability and low, medium or high consequence.

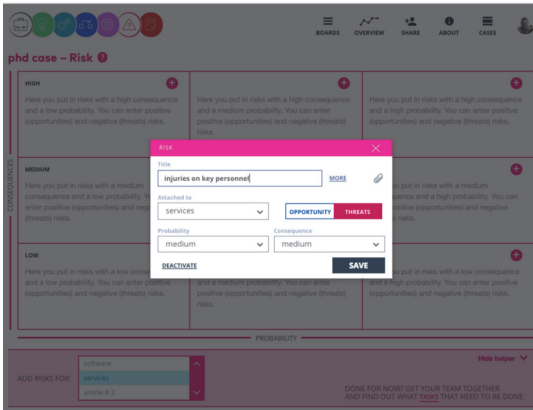


Figure 10: The Risk Board

The *Task Board* (Figure 11) is based on a KanBan model. The Case Companies are advised to go through each Objective and ask what must be done to reach each Objective. These Tasks are entered into the “Queue” Box. Here the level of inclusion of the team members may be very important. We suggest that each employee get a chance to define their own tasks, and then let department leaders make sure that no tasks are forgotten or done by several employees.

Each Task can be categorized as a Monthly Task or a one-off Task. Cost can be assigned to the Task, and the Task can be assigned to a specific employee. Tasks can then be moved from the Queue to the “Active” Boxes. In accordance to KanBan principles (McInnis and Gross 2003), it can always be moved back to the Queue. When done, the Task get moved over to the “Done” column, and the Actual Cost may be defined.

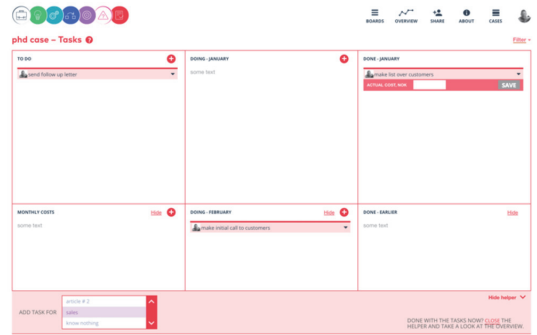


Figure 11: The Task Board

Do we have a problem worth solving? This is the initial customer test, as shown in Figure 12. We advise that the Case Company performs this test when they are working with the Business Idea. We also suggest that the Case Company should repeat the test every time they either do an iteration to the Business Idea, or they think there might be some kind of change in the preconditions for the Business Idea. The suggestion is to find 10-15 potential customers, and simply ask them to rate the problems that should be solved on a 7-point scale according to importance. The interviewees are encouraged to add their own suggestions for relevant problems, or to add comments to each of their ratings.

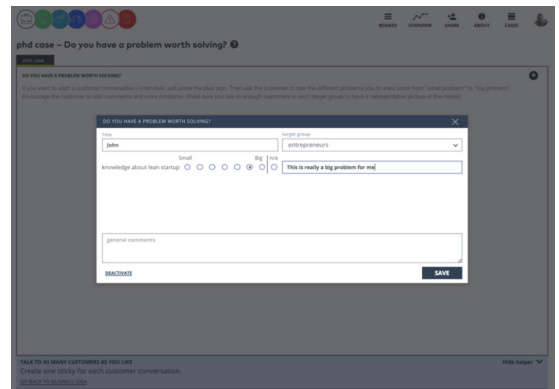


Figure 12: Test one: Do we have a problem worth solving?

The second customer test are: *Do we solve the problem?* (Figure 13). This should be done exactly the same way as the previous test, except it should be done while working on the business model, and that the interviewee is asked to rate the product features, sales methods and price models.

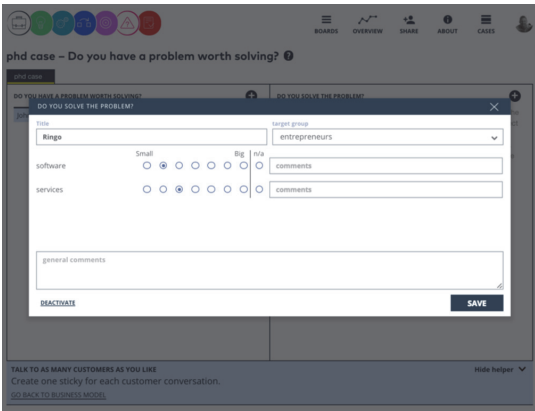


Figure 13: Test two: Do we solve the problem?

The last test we suggest is: *Is our market big enough?* (Figure 14). This test does not involve any kind of customer interviews. We ask the Case Company to make minimum and maximum estimates on: the total number of customers in each of their target markets, the expected market share they can expect and the expected monetary value of each of their customers. Based on these estimates, the system suggests a minimum and a maximum expected revenue for each market.

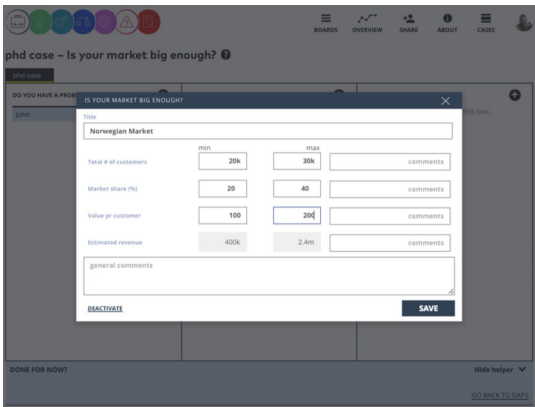


Figure 14: Test three: Is your market big enough?

The Overview Segment of the EP (as shown in Figure 15), is where the results of what is entered into the seven Boards are presented. Every month all unfinished Tasks and all Objectives in the period are presented in the End of Month part of the Overview. Here the Case Company are advised to do all necessary edits. They are also advised to go back and do alterations to their Business Idea, Business Model, Objectives or Tasks if the Financial Forecast looks critical.

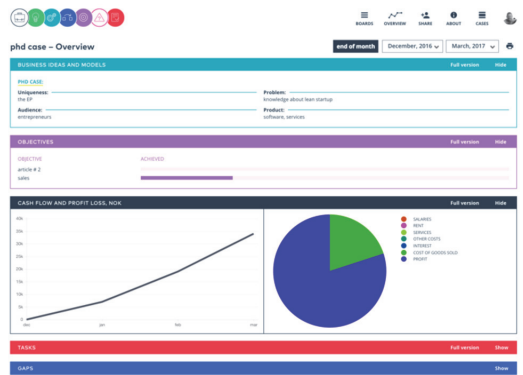


Figure 15: The Overview of a Case

B. The PROFF-portal

In Scandinavia, demographic criteria and financial performance indicators for different types of enterprises are public information in a central registration center. These data are gathered by a commercial company information portal called PROFF. We are building an interface toward their API to allow us to collect these data. We do this search on the organization number that the Case Company enters into the EP. Some of the data coming from PROFF, we label as Identifiers. That means that it is data connecting the Case Company to a name, a geographic area or an industry. Other data is financial success data such as revenue, profit etc. All these data is published annually, and we will have historical data for the last five years.

III. THE ENTREPRENEURSHIP DATA WAREHOUSE

In the EP, each Event is reflected in real-time. They are sitting there in a normalized form in a relational data structure meaning that it isn't possible to extract a record series quickly from it because many relations between different tables are to be joined. Doing this during research may severely affect the operation of the EP.

The data gathered in the EP will therefore be transferred to the EDW. The EDW is a non-relational database made in Elasticsearch that allows storage of big amount of data, specifically for research purpose. The EDW will also be periodically updated with Company information from the PROFF-portal. Our Extract/Transform/Load logic is being performed regularly. This procedure is pulling data from the EP, cleaning, denormalizing and pushing it into the EDW.

The EDW will be connected with a Kibana Visualization tool from the start. Eventually, this data will be made available for a large spectre of analytics tools.

Table 1: Event categories

#	Source	Event Category
1	ADM	Participants
2	ADM	Case Settings
3	RES	Values
4	RES	Vision
5	RES	Owner's Objectives
6	BI	Business Idea
7	BI	Key Contribution
8	BI	Key Market
9	BI	Distinction
10	BM	Early Market Customer
11	BM	Unique Value Proposition
12	BM	Product Feature
13	BM	Partner
14	BM	How to Sell
15	BM	How to Get Paid
16	GAP	Strength & Weaknesses
17	OBJ	Objectives
18	RISK	Opportunities & Threats
19	TASK	Task
20	TEST	Problem Worth Solving?
21	TEST	Solve the Problem?
22	TEST	Market Big Enough?
23	PROFF	Registration
24	PROFF	Revenue
25	PROFF	Profit & Loss
26	PROFF	Balance Sum
27	PROFF	Return On Assets
28	PROFF	Profit & Loss Percentage
29	PROFF	Return on Equity
30	PROFF	Current Ratio
31	PROFF	Equity Ratio
32	PROFF	Gearing
33	PROFF	Registration or Bankruptcy
34	PROFF	Number of Employees

The EDW will be built as a single table structure containing time series Events gathered from either the EP or PROFF. Each Event will have a unique time stamp and contain a number of identifying data.

The unique opportunity offered by our setup is that every Event belongs to one out of 34 *Event Categories*, as shown in Table 1.

Since all Events in the same Category is made in a very structured manner, they will have the same basic meaning – regardless of who initiated the Event, what Company they work in, or even what language they are using. This uniformity of the Event Categories is what allows us to compare the Events between Cases, countries, lifecycle phases and industries.

The relation between the Events, the Event Categories and time is illustrated in Figure 16. There can be an unlimited number of Events within each Event Category, and there will be one such combination for each Case. Each Company in the system can have several Cases.

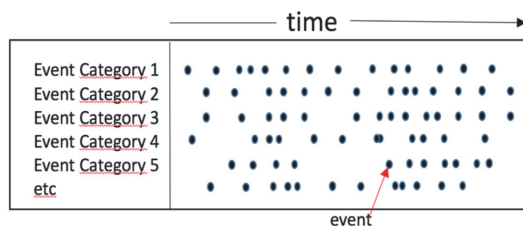


Figure 16: Events over time

Each event will consist of a number of Datafields. The full structure of the Datafields are presented in Table 2. First we will introduce the Datafields that are included in Events from all Event Categories:

Table 2: Datafields included in all Event Categories

Case ID
Case title
Event ID
Timestamp
Event category
Action type (CRUD)
Case Participant
Company Name
Organization Number
Country
Postcode
NACE-code (Industry)
Added by Case Role
Client ID
Relating to whole company
Event Title
Event Description

Since we are organizing the DW as a single table data structure, there will be a set of data that will be included in all the Events.

Each Event will be linked to a Case via a unique Case ID number and a Case title. It will also be linked to a specific Business Idea/Model via an Idea/Model title. Each Event will also be given an Event ID number, a Timestamp, a link to the relevant Event Category and an Action Type to tell whether the Event was created, updated or deleted. The individual initiating the Event will be linked to the event via a Case Participant ID. We will link each Event to a Company by registering the Company name, Organization number and Country. Based on the Organization, we will verify the Company name and country in the PROFF Portal. Finally, we will gather the postcode and the NACE-code from the PROFF portal. The NACE-code is a unique nomenclature defining which industry the Company is in.

The Case Role defines whether the Event has been initiated by an Entrepreneur, an Enabler or an Educator and the Client ID defines what template the Event is initiated from. The EP will be delivered in a wide range of different templates, each containing chosen Boards. Different

templates will be published by different partnering organizations. Virgin are releasing one version to manage UK Startup Loans, Grant Thornton are releasing a different one to do business development in the Swedish market whilst Innovation Norway are releasing one specific one for cultural entrepreneurs in Norway. We will register which of the templates any given Case is utilizing. It is also defined whether the case was Relating to whole company or not.

In addition to these fields, each event will contain a title and an extended information field. It may also contain one or more category specific fields.

The Resource Category specific field is whether a Case Participant is a partner or an employee.

For the Admin Board Categories, we get three specific fields. The Companies can also choose between three different business model structures. Osterwalder and Pigneur's "BMC" (Osterwalder og Pigneur 2010), Mauryas "Lean Canvas" (Maurya 2012) and our own "Lean Business Canvas" (Dahle and others 2014). We will register what canvas method each Company are choosing. We will also register whether the plan length is 3,6,9 or 12 months. Next, we need to know if a rolling forecast is chosen or not. A rolling forecast means that a new month is added to the end of the Case period at the beginning of every month.

From the Gap Board, we have a Category Specific Field to categorize each Gap as a strength or a weakness and one to define the name of the company the strength or weakness is relating to. This may be the Case Company or any of the three defined Competitors.

For the Objectives Board, we have five specific fields. The Objective Categories defines whether the Event is a Skills, Product/Market or a Money Objective. The Objective Type whether it is a milestone, numerical, revenue, loan, equity or grant objective. We define if we have a forecasted or an actual Objective and what Month it relates. If we have a numerical or monetary Objective, the value is defined.

Table 3: Event Category Specific Fields

Source	Field Name	Event Category
Res	Case Participant Type	Participants
Adm	Business Model Type	Case Settings
	Timespan	Case Settings
	Forecast Type	Case Settings
Gap	Strength & Weaknesses	Strength & Weaknesses
	Competitor Name	Strength & Weaknesses
Object	Objective Category	Objectives
	Objective Type	Objectives
	Actual VS Forecast	Objectives
	Objective Month	Objectives
	Value	Objectives
Risk	Opportunities & Threats	Opportunities & Threats
	Probability	Opportunities & Threats
	Consequence	Opportunities &

		Threats
Task	Cost Group	Task
	Task Month	Task
	Actual VS Forecast	Task
	Value	Task
	Status	Task
	Average Score	Problem Worth Solving?
	Average Score	Solve the Problem?
Test	Total # of customers low	Market Big Enough?
	Total # of customers high	Market Big Enough?
	Market share low	Market Big Enough?
	Market share high	Market Big Enough?
	Value per customer low	Market Big Enough?
	Value per customer high	Market Big Enough?
Proff	Yearly Revenue	Revenue
	Yearly Profit and Loss	Profit & Loss
	Yearly Balance Sum	Balance Sum
	Yearly Return on Assets	Return On Assets
	Yearly Profit and Loss %	Profit & Loss Percentage
	Yearly Return on Equity	Return on Equity
	Yearly Current Ratio	Current Ratio
	Yearly Equity Ratio	Equity Ratio
	Yearly Gearing	Gearing
	Number of Employees	Number of Employees

We have opportunities and threats from the Risk Board. Here we store the estimated probability (High/ medium/ low) and consequence (High/ medium / low) of each risk.

From the Task Board, we also have five specific fields. We store the cost group and value on the Tasks that have that, and the month the task relates to. In addition to the regular registrations of creation, edits and deletions – we also register each time the Task has been moved between the queue and active status and if we have a forecasted or an actual Task.

The ten Specific Fields coming from the Test Boards starts with whether we have any problems or features added by the Customer in the interview. For the "do they have a problem worth solving?" and "do they solve the problem?" we store the average scores from each interviewee. For the "is the market big enough?" Test, we store the high and low estimates of the total number of customers, market share percentage and value per customer.

For the Swedish, Danish and Norwegian firms where we have an organization number, we will be able to get financial and demographic data from the PROFF portal. The last ten Specific Fields relate to the Event Categories originating from these data. We will be able to get five years of financial data. The particular Events we will store in the DW will be; revenue, profit/loss, balance sum, return on assets, profit & loss percentage, return on equity percentage, current ratio percentage, equity ratio and gearing percentage. We will register any change in the number of

employees. We will try to gather as much of these data as possible also for Companies coming from outside the Nordic countries. However, the degree of openness with regard to these figures for startups are especially high in Scandinavia.

IV. THREATS TO VALIDITY

We are building an information gathering setup that is designed to gather a large amount of time series information from tens of thousands of Companies all over the world. There will be some methodological challenges to this operation. In this chapter, we will try to describe them:

A. *Actions outside of the system*

The main problem with our approach is that we can not be sure that all the activities of the Case Companies will be documented in the EP. There is of course a possibility that both changes to the Business Idea, Business Model, Project Development and Customer Interaction will be performed without anybody registering it in the system. We will try to counteract this by doing test interviews with selected Case Companies.

B. *The self-selection bias*

In accordance with privacy laws, all Companies entering Cases into the EP will have the option to opt out of volunteering its data for research purposes. It is imaginable that a certain subset of participants will have a larger tendency to do so than other. As an example, Companies in sectors with intense competition might be more eager to keep it's data private than others.

We think it will be possible to manage this problem by doing qualitative Case studies of some of the most interesting Cases in the system – and in those, focus on this specific question.

C. *The Company/Case problem*

The level of analysis in the EP is *Case*. What is a Case is defined by each Case Owner. There is no 1:1 relationship between a Case and a Company. Some of the Cases registered will not relate to a Company at all, they will merely be entrepreneurial ideas in the pre-establishment phase. These Cases will not be linked to a Company – and will as such not influence the study.

Another scenario is that a Case is just reflecting to a specific sub-process within a Company, such as a spin-off, a department or a project. We will handle this by asking specifically whether the Case is relating to the whole Company or not.

D. *The change of Identifiers problem*

Some of the Identifiers may change over time. We can imagine that the company may change it's name or moves from one geography to another. We will simply register such changes. The two unchanging Identifiers will be the Case number generated from the system and the Organization number.

E. *The time atomization challenge*

The core of our system is the time series Events that are gathered from the EP and PROFF. There are two problems with the time atomization of the time stamps.

First, we have to make some sort of estimate of what constitutes an Event. Say that you are Creating an Event. You open the Event Card, enter your content and save it. Then you remember that you have forgotten to input something, and open the card 10 seconds later – and enter something more. This sequence will be registered as two Events. One Create Event, and one Update Event. For now, we will keep it like that, but depending on what we learn from the data, we might put a time limit on when such an edit shall be deemed as an individual Update.

Second, there are some Events that takes place over a time range. As an example, any yearly financial update from PROFF will relate to a whole calendar year. We will solve this by assigning such an Event to the last second of the time range. So, the revenue of the calendar year of 2017 will be assigned to the time stamp 31.12.2017 at 23.59.59.

V. POSSIBLE RESEARCH METHODS AND INITIAL DATA TEST

This article focuses on the design of the Entrepreneurship Platform, The Entrepreneurship Data Warehouse and the general architecture to gather a large amount of behavioural, demographic and financial time series data from as many and as diverse entrepreneurial endeavours as possible. Having these data will allow us to perform any kind of analysis, and the specific analysis design will be the theme for future articles. However – our present belief is that we do our analysis in three steps:

Step 1: we want to do an initial hypothesis finding by doing an explorative quantitative analysis on a segment of the data set. We will start doing time series analysis using principal component analysis (Everitt and Dunn 2010) from the launch of the final version of the test harness in May 2017.

Step 2: Based on the hypothesis we find in Step 1, we will do quantitative hypothesis verification/ falsification on another segment of the data set.

Step 3: finally, we will do depth analysis of the most interesting Cases, including qualitative analysis of the content of each element, studies of the financial data from each Case and interviews of the key personnel in the Case Companies. In this phase we can also do verification tests with Case Companies from areas where we do not have external financial data. We will utilize automated word and text analysis in this phase of the study.

In our previous article (Dahle and Steinert 2016), we did a brief test to see whether entrepreneurs actually behaved in a lean way. In this stage, we want to verify that we are able to build up a data warehouse with an acceptable growth in users to get the kind of big data analysis that we are searching for. Therefor we want to use Kibana to check that our user base grows in an acceptable rate, and then contains the data that we need it to contain. The first full period of operations for the entrepreneurship platform 1.0 was

February 1st – May 15th 2017. During this period, we had 78.296 Events distributed on 1.377 Cases in the system. We have transferred a small subset of time series Events into the EDW for this period. The selected Datafields are:

Table 4: Initial Data Fields

1. Case title	2. Event category
3. Event title	4. Action type (CUD)
5. Timestamp	6. Card Title

So we had an average of almost 57 Events per Case in this period. The Events were distributed over the following 22 Event Categories (We have not integrated the PROFF Event Categories yet):

Table 5: Events per Event Category

	Create	Update	Delete
Participants	2688	64	783
Case Settings	1194	8565	49
Values	1486	458	180
Vision	804	334	99
Owners Objectives	926	298	95
Business Idea	1317	2106	239
Key Contribution	3356	1922	542
Key Market	2754	818	357
Distinction	3266	1385	549
Early Market Customer	1478	376	164
Unique Value Proposition	1316	517	200
Product Feature	3650	690	1021
Partner	3297	740	790
How to Sell	1696	324	177
How to Get Paid	1091	229	125
Strength & Weaknesses	3367	1119	286
Objectives	2568	3275	577
Opportunities & Threats	929	364	65
Task	4324	5421	748
Problem Worth Solving	354	135	69
Solve the Problem	67	40	9
Market Big Enough	40	22	2

The data will of course be more interesting when we are able to monitor them over time. Even further so when we will be able to compare them to the PROFF Event Categories.

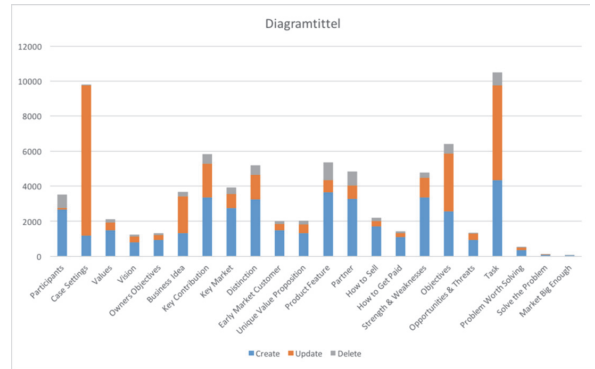


Figure 17: Event per Event Category illustration

However, we can already see some indications. Given that the Entrepreneurship Platform has so far not been marketed at all, we can see that there is a good chance that we will be able to get a significant amount of Data. Further more we see that we get a good number of Events in each Event Category. We get the most Events in the Task Category and the least in the Test Categories. This is not surprising. We know that actually going out and performing customer interviews is quite a challenge for many Entrepreneurs. We also have a relative low number of Events in the Values, Vision and Owner's Objective Categories, whereas both the Business Idea and Business Model Categories seems to have more Events. This may indicate that the initial entrepreneurs distribute their attention evenly between Business Ideas, Business Model, Objectives and Tasks – and use less time on (the less practical) Values, Vision and Owner's Objective Categories.

The distribution between the Create, Update and Delete Action Types are quite similar in the different Event Categories, apart from Case Settings. This Category have a much higher percentage of Updates. The explanation for this will have to wait until we get the full data set in the Data Warehouse.

Next, we have sorted the Events over the three and a half months we have been in operation. Given that we only have data from half of May, and that most of April is Easter – we see a steady flow of Events over the months.

When we include the Event Categories in the analysis, we see the same picture. The Event distribution throughout the Event Categories does generally not vary from month to month. The only anomaly here is the higher number of Case Settings Events in April. To find an explanation for this, we will need to get the full dataset into the Data Warehouse.

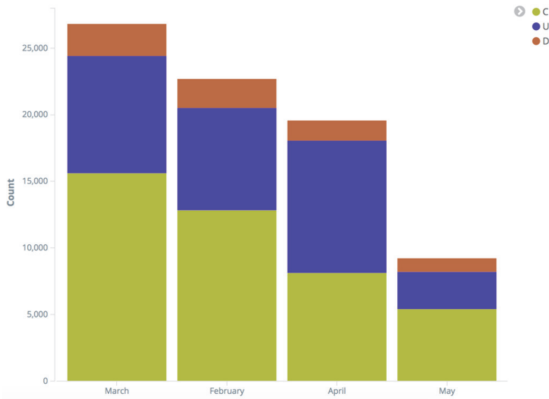


Figure 18: Event per month & Action Type illustration

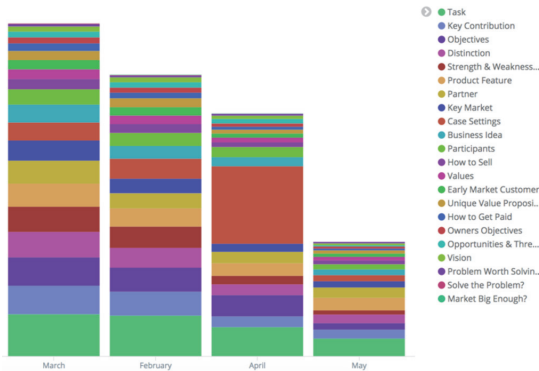


Figure 19: Event per month & Event Category illustration

VI. CONCLUSIONS

In our last paper (Dahle and Steinert 2016), we concluded that it will be possible to find Entrepreneurs that have a “Lean” behaviour, meaning that they will incrementally develop their business over time. In this paper we can conclude that it is possible to motivate Entrepreneurs to leave time series data regarding their business development process by giving them access to a business development tool, and that those data can be effectively transferred to a Data Warehouse.

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APPENDIX A

Table 6: Comparing our model and others

Our Model	BMC	Maurya
key contribution	no match	problem
key market	customer segments	customer segments
distinction	no match	unfair advantage
early market customers	no match	no match
unique value proposition	value proposition	unique value proposition
product features	no match	solution
partners	key partners	no match
how the Startups sell	channels	channels
how the Startups get paid	revenue streams	revenue streams
no match	no match	key metrics
no match	key activities	no match
no match	relationships	no match

Does Lean Startup really work?

Foundation for an empirical study

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Lean Startup has been a major influence on how business development has been performed by, and taught to entrepreneurs in our decade. In particular, the training and evaluation of entrepreneurs by public entrepreneurship offices (like Innovation Norway, Danish Growth houses or Innovate UK) often builds on Lean Startup. The main principle is that static business planning should be replaced by a dynamic development, where products, services and business model elements are frequently changed based on constant customer feedback.

The Lean Startup principles are widely acknowledged, even if very little empirical data exist to prove their validity. Our ambition is to test the business development behavior of a large number of businesses over a long period of time. We want to measure if frequent changes of the business idea, the business model elements, the project management and close interaction with customers really increases the success rate of entrepreneurs. We also want to learn more about the nature of these relations.

This paper presents the first attempt to model the relations we want to measure. We have also done an initial pilot data gathering from a handful of companies to verify that we can actually get the kind of time series data that we need to perform the empirical test.

I. INTRODUCTION

Since 2011 a new paradigm within entrepreneurship has been established. It is called Lean Startup, and is, among others, based on the writings of Eric Ries (2011), Steve Blank (2013), Alexander Osterwalder and Yves Pigneur (2010), Ash Maurya (2012) and others. This paradigm differs from traditional business development in many ways, but the core of the theory can be interpreted as follows:

“For a Startup¹, the rate of success correlates positively with:

- Your ability to change the *business idea* when necessary– or “pivot” as Eric Ries calls it
- Your ability to continuously change elements of your *business model* as defined by Osterwalder, Pigneur and Maurya

¹ Neil Blumenthal, leader of American consultancy firm *Warby Parker* defines a Startup as: “A Startup is a company working to solve a problem where the solution is not obvious and success is not guaranteed,” (2013). So, the term Startup in this context is not related to how long the said company has been in

- Your ability to change elements of your *project development* according to changing circumstances
- The frequency of your *customer interaction and customer testing* in the business development process”

We can state the Lean Startup principles like this:

$$\Delta S = \Delta f(BI) + \Delta f(BM) + \Delta f(PD) + \Delta f(CI)$$

Where S= Success, BI= Business Idea, BM= Business model, PD=Project Development and CI= Customer Interaction. This means that any change of BI, BM, PD and CI will improve the level of Success. The Lean Startup theory does not say anything about the nature of the functions (f). We will have to come back to that later.

The problem is that none of these concepts has been tested empirically in any way. Of course a large number of business cases have used the Lean Startup principles, but we have not been able to find any measured and documented effect of using these principles instead of more traditional methods. Our ambition is to empirically test the equation above, thus providing insight into the validity of the Lean Startup paradigm.

This article is meant to build the foundation for such an empirical test, by offering a deconstruction of $\Delta S = \Delta f(BI) + \Delta f(BM) + \Delta f(PD) + \Delta f(CI)$ that makes it possible to test it on a large number of Startups.

Our idea is to launch an online business development tool (called the Lean Business Planner) that will allow entrepreneurs to develop their projects according to the Lean Startup principles. The Lean Business Planner will allow a large number of businesses to define their Business Idea, Business Model and Project Development, in addition to allowing them to interact with their customers. Furthermore, we want to encourage the businesses to evaluate and change the Business

business, but to the degree of uncertainty and innovation in the company’s process.

Idea, Business Model and Project Development as often as necessary, and perform new customer interactions as often as they want. This design is based on the principles of the “wayfaring” theories described by Steinert and Leifer (2012). The effect all these changes, and the interaction between them, has on the success of the Startups, will be recorded. Finally, we will control the results with a set of demographic variables, trying to find variations between different nationalities, industries and differently sized companies.

The design of the Lean Business Planner allows the Startups to document the changes as *elements*. As we will show later in the article, three different kinds of changes can be done to the elements:

- The businesses can *Create* a new element
- The businesses can *Delete* an existing element
- The businesses can *Edit* an element by changing the content of the element

The last part of this article will be used to present a small set of *Pilot Data*. For this article, we have released the Lean Business Planner to a limited number of companies, and selected nine of these projects as case presentations. The pilot data gathering is only meant to see if we can find some companies that actually *make* incremental improvements to their projects. For the purpose of this article, we will not address whether these incremental improvements actually have an effect on the success rate of the companies. We will only try to verify whether it will be possible to gather time series data from the Lean Business Planner at all.

As we will show later in this article, we will:

- Deconstruct the Business Idea into three sub-sections; being the *key contribution* made by the business, the *key market* benefiting from this and the *distinction* enabling the Startups to stand out from the competition.
- Deconstruct the Business Model, into six sub-sections; being the initial *early market customers*, the *unique value proposition*, the *product features* offered, the Startups’ *partners*, *how the Startups sell* and how *the Startups get paid*.
- Deconstruct the Project Development into eight sub-sections; being *Startup’s strengths and weaknesses*, *competitors’ strengths and weaknesses*, *skills objectives*, *product objectives*, *sales and marketing objectives*, *financial objectives*, *opportunities* and *threats*, and *finally tasks*.
- Deconstruct the Customer Interactions into three sub-questions being: *do the Startups have a problem worth solving? do they solve the problem? and is the market big enough?*

Combining the three types of changes with all the sub-sections, the full equation can be defined as:

$$\Delta S = \Sigma_9^1 \Delta f_n(BI_n) + \Sigma_{18}^1 \Delta f_n(BM_n) + \Sigma_{24}^1 \Delta f_n(PD_n) + \Sigma_9^1 \Delta f_n(CI_n).$$

Combined, this equation combines sixty different events. 9 within the Business Idea, 18 for the Business Model, 24 for the Project Development and 9 for the Customer Interaction.

We will start with $\Delta f(BI)$, that is to describe how the different Startups may make changes to their Business Ideas.

II. DECONSTRUCTING THE BUSINESS IDEA - $\Delta f(BI)$

We use the term “Business Idea”. as a synonym to the term “*Mission*”. According to Canadian professor Chris Bart (1997), the *Mission* consist of three components:

- **Key Market:** Describe your target group or customer.
- **Key Contribution:** What do you do for this customer?
- **Distinction:** Why does the customer choose you?

Next, we need to define Eric Ries (2011) concept of *Minimum Viable Products* (MVP’s), and *Pivots* using the Business Idea Concept. To avoid wasting time and resources on creating products and services that the market simply does not want, Eric Ries suggests that you develop a Minimum Viable Product (MVP). This is a prototype that has sufficient functionality to be tested in the market, but does not cost a great deal to develop. This prototype is then released into the market with the aim of testing the fundamental premises for its success.

Next it is developed gradually via a series of improvements, based on feedback from your initial customers. This is based on the assumption that you measure feedback continually, preferably in the form of experiments in which various groups of customers are presented with different solutions and business models. If there are indications that the first business idea does not function, you can carry out what Eric Ries refers to as a *pivot*. Performing a pivot can be defined as to change which *key contribution* you make for which *key market*, utilizing a different *distinction*. Thus we interpret a pivot as “making a clear change of the business idea based on what you learned from your initial customers.” or $\Delta f(BI)$. Since there are three different components in the Business Idea (contribution, key market and distinction), we need to log changes in any of these three components, or $\Sigma_9^1 \Delta f_n(BI_n)$.

III. DECONSTRUCTING THE BUSINESS MODEL - $\Delta f(BM)$

In 2010, a book titled “Business Model Generation” was published. The main authors were Alexander Osterwalder and Yves Pigneur. The core of the book is the «Business Model Canvas (BMC)» which is a ‘canvas’ comprising nine building blocks that are connected and influence each other:

- *Customer segment*, in which you describe who your company creates value for
- *Value proposition*, in which you describe which problem you solve and what type of value the solution brings to the customer
- *Key channels*, describing how you contact customers and how you reach them

- *Customer relations* describes which type of relation you have through your channels
- *Revenue streams* that describe how you are paid
- *Key resources* addresses what type of resources the company needs to create value for the customer
- *Key activity* describes the activities you must yourself carry out to fulfil the value proposition
- *Key partners* are allies who help to make the value proposition possible
- *Cost structure* addresses the most significant cost drivers in order to operate the business model.

Ash Maurya (2012) has simplified the BMC. His version is different from Osterwalder and Pigneur's in four ways; *key partners* is replaced by *problem*, *key activity* with *solution*, customer relations is with *unfair advantage* and key resources with *key metrics*.

Both models moved the general concept of strategy work in a new direction. From a "Lean Startup" point of view, the advantage compared to traditional strategy models, is the ability to absorb changes coming from the surroundings. If the customer problem changes, the value proposition should change. Both canvases allow you to see this, and immediately change all the other boxes to fit the new value proposition.

The Lean Business Planner will combine the two canvases and at the same time simplify them. It uses six basic questions to build the business model on to the business idea. While the business idea describes what the Startup will do, the business model describes how it intends to accomplish it. When the Startups are working on each business idea, they should see through the eyes of the customer, and then change to their own perspective when developing the associated business model. For example, the concept of "what problem will you solve?" in the business idea should be considered from the customer's viewpoint. Then, move on to examine "what will be your unique value proposition?" and "what features will be included in your solution?" in the business model.

The six questions are as follows:

A. Who will be the first customers?

Geoffrey Moore's 1995 book "Crossing the Chasm" (Moore 1995) states that everyone have a different attitude towards purchasing new products or services. He uses Rogers' (2003) diffusion curve to separate all potential customers into the *early market* and the *mass market*. These groups act so differently when faced with a new product that Moore means there is a "chasm" between the early and the mass market.

The early market like untested technology. They willingly accept the role of pilot customer and they often have clearly-defined visions of the product or service they desire. They have a high tolerance for defects in developing products and are not especially concerned about references from other users.

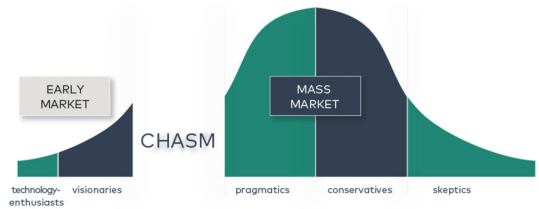


Fig. 1. Crossing the chasm

The mass market has got three absolute demands before buying a new product. Firstly, they want products that work. Secondly, the product or service they purchase must provide value. But most importantly, they demand references. They want to see other Startups in the same industry and country testing out the solution, and they will contact these references to be sure that they really have been satisfied. If you have a brand new product, you can't possibly have any references. Without references you can't sell to the mass market. The logical solution is to first sell to the early market, and use them as references. Even if you do not make any money from the early market, the references will be very valuable. These early adaptors fit into the "first customers" box.

B. What will be the unique value proposition (UVP)?

Steve Blank (2013) defines the UVP as: "A single, clear compelling message that states why you are different and worth buying." It is important that whatever product or service supplied is perceived as valuable in the eyes of the customer. Being successful in creating value is all about knowing your customers' needs and meeting them. The Startups can have one or many unique value propositions.

C. What features will the product have?

The job of creating good products consists of three steps:

- Identify the customer's needs
- Select the most important needs
- Create value by meeting the selected needs

The products or services supplied need to have a set of features that meet these needs. These features are defined in this part of the business model.

D. Who can help?

This section concerns the selection of allies. There are several types of potential partners that can create value for an organization, including distribution partners, partners with complementary products and deliverance partners. Parties influencing the customers purchase decision may be very relevant partners.

E. How to sell?

There are a significant number of variants here. You have direct sales or indirect sales via partners, proactive sales or reactive sales involving advertising and selling to respondent. The sales process itself can be organized in several ways. Some

salespeople prefer to improvise, while others sell according to a script. Letters, telephone contact, internet, meetings and email can be combined in different ways. All these different tactics to achieve your sales are registered in the business model.

F. How to get paid?

The Startup can take payment from the customer directly or use an alternative method. Some Internet-based services earn money from advertising revenue. Others are based on voluntary payment (in which a contribution is paid for services that are considered useful). Not everyone sells their product; some lease it out. Will the Startup take a fixed sum, or try to set the price based on the value it creates? Examples of this type of value-based pricing could be a price for each time the product is used, profit sharing, pay-per-user or per department. You can also employ a strategic introduction, where you charge an extremely low price (or even give it away free) for initial use, with a charge levied for continued use.

One of the main preconditions for the Lean Startup paradigm, is that any change in any of these six elements will positively influence the success rate of the Startup. This can be represented as: $\Sigma_{18}^1 \Delta f_n$ (BM_n), where BM is Business Model.

IV. DECONSTRUCTING PROJECT DEVELOPMENT - Δf (PD)

Eric Ries (2011) is very clear that the detailed practical activities of the Startup must undergo the same critical evaluation as the business idea and the business model. Based on customer input, everything from objectives, tasks and risks to competitive positioning must be continuously improved upon. In the Lean Business Planner, we have separated these project details into eight sub-sections:

A. Startup's strengths and weaknesses

The Startup's understanding of their own strengths and weaknesses is linked to the elements of the business idea and business model. The business idea and model is a normative description of how the Startup is supposed to be run in the future. The strength and weaknesses measures the relative distance to this vision today. A weakness means that the Startup is far away from its desired status and a strength means that it is relatively close.

B. Competition's strengths and weaknesses

In the Lean Business Planner, the Startup can record strengths and weaknesses for up to three main competitors. The strengths and weaknesses is measured relatively to the Startup's business idea and model. The reason for this, is that the business idea and model describes where the Startup want to be competitive. Only the competitor's strengths and weaknesses relating to that business idea and model, are relevant.

C. Competence objectives

Objectives are an essential part of the Startups project description. We separate objectives into four different groups: Objectives related to building new competence, developing product or services, sales and marketing and finally financial objectives. All these objectives can be registered as milestones,

numerical or monetary objectives. Competence objectives will typically relate to hiring of new employees, signing up of new partners or training or certifying existing personnel.

D. Product objectives

Product objectives typically relates to the launching of new versions of product or services. It can also be customer satisfaction data relating to products or services.

E. Sales and marketing objectives

Sales and marketing objectives is usually hard, monetary objectives describing the revenue generated from a product group or a territory. But it can also be milestones for the launch of a new campaign, number of facebook likes or reach of a blog.

F. Financial objectives

Financial objectives are typically the raising of new equity or loan capital. It can be capital raised from banks or investors, or financial support raised from government grants.

G. Opportunities and threats

This section allows the Startup to register possible externally created risks. Events out of the Startup's control can cause things to go better than expected. Other may cause things to go worse than expected. The risks are organized from low to high, taking into account the probability that they will occur, and the degree of advantage or disadvantage they may cause.

H. Tasks

The Task part specifies all necessary activities and who is responsible for them. Tasks can be removed, changed or added at any time. A task with high priority is categorized as active. The others wait in the queue. The cost of each task is also estimated. When a task is finished, the actual cost of the task is registered, and the task is categorized as finalized.

Given the eight variations of Project Development changes, and three types of actions, this can be represented as: $\Sigma_{24}^1 \Delta f_n$ (PD_n).

V. DECONSTRUCTING CUSTOMER INTERACTION - Δf (CI)

Steve Blank's "Customer Development Method" (2013) maintains that you have to develop your customers and product at the same time. This is accomplished in four steps:

- *Find* the customer, or select a small group of target customers.
- *Confirm* the customer by finding out which solution to offer the selected target group, and how you will sell and get paid. If you find a business model that works in practice, you have proved that the selected target group functions.
- *Scale* your business by selling to more representatives of your customer group. As you define and test out the optimal business model, there is less chance that you will waste money on unsuccessful marketing.
- *Invest* in the Startup. It is at this stage that you alter the Startup from the initial learning and searching modus into a more formal and structured organization.

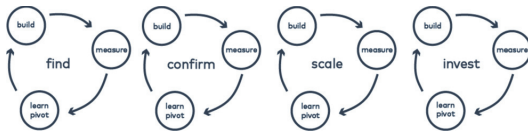


Fig. 2. The customer development method

Ash Maurya (2012) also stresses the importance of *testing*. Innovation in Startups is linked to considerable uncertainty. Therefore it is not wise to employ major resources to commission a product and a business model before you have tested your assumptions out on the market. Testing your product in the market place is often referred to as *market validation*. According to Maurya, we need to ask three questions to do the market validation: Working with the business idea, you must make sure the target *group really does have the problem you think they have*. In the business model, we want you to make sure that your product or service *really solves the problem*. Finally, you make sure the market is *big enough for you to profit from it*, and that it is not overcrowded by competitors. We interpret customer interaction as asking these three questions to the customers. This can be represented as: $\Sigma^l Af_n (CI_n)$ where CI stands for Customer Interactions.

VI. DECONSTRUCTING SUCCESS - ΔS

The concept of “success” is very subjective. Everybody will agree that Facebook and Google are successful Startups. But what criteria will we use to define that they are? And what time span should be used? How long should we give a Startup to show that they are successful? And where is the break-off point between “successful” and “not successful”?

For a commercial Startup it will be reasonable to argue that high revenue growth indicates some degree of success. At the same time a high growth in profitability will be a sign of success. Economists use a large amount of Key Performance Indicators to evaluate Startups. Which of these will be relevant?

We will measure success in the most traditional way imaginable. We will connect to the financial statements of the Startups, and measure their growth rate and profit margin over time. Of course a Startup can have many other measures of success. Meeting the subjective goals of the owners will always be the ultimate objective of a Startup. However, growth and profit rate are logical common denominators for such objectives.

Another problem is the fact that Startups in an investment phase can run with no growth and massive losses, and still reach their business development objectives. A pharmaceutical company can spend decades developing a drug without any revenue whatsoever. We will follow our target Startups over a three-year period. We think this will be sufficient to control for this problem.

VII. DEMOGRAPHICS

The “Lean Startup” movement uses a very wide definition of what a Startup is. It basically includes all time phases of the Startup cycle, all vertical industries in a number of countries and cultures. The final test we want to prepare for is if there are any differences in the relationship between change and success depending on these factors? How will this change over time? We will control for four demographic factors:

- Nationality
- Industry/vertical
- Number of employees
- Registration year for the Startup

VIII. PILOT DATA

Before starting the empirical research, we want to check that it will actually be possible to gather the kind of time series data that we want. For that to happen, we need to see if entrepreneurs actually work in the way predicted in the Lean Startup theory. Do they actually make incremental improvement on their Business Idea, Business Model and Project Development? Do they actually interact with their customers in order to do this? Only if at least *some of the* entrepreneurs change their projects in a way consistent with the Lean Startup thinking, we will be able to measure the correlation between this behavior and success.

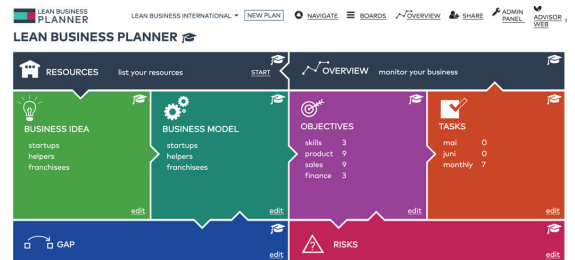


Fig. 3. The Lean Business Planner

In order to learn about this, we will use the *Lean Business Planner*. The tool encourages entrepreneurs to plan their projects according to the Lean Startup principles. This means that they are asked to create, delete and edit the elements of their Business Ideas, Business Models, Project Developments and Customer Interactions as often as they see fit. The tool has been made available to entrepreneurs in five countries, but it has not been actively marketed. Over the 35 weeks that it has been available, approximately 1500 companies have registered in the tool. Out of these we have selected seven case studies that we will take a look at in the pilot data test. The case studies have been selected based on the number of interactions in the system over time. This means that we have chosen the entrepreneurs that have logged in to the system the most. This means that if not even these selected entrepreneurs work incrementally over time, we may expect that it will be difficult to get the kind of time series data that we will need.

Cases closely linked to the personnel that have built the Lean Business Planner have been excluded from selection.

	country	established	industry	revenue (NOK)
1	norway	2014	creative	< 1''
2	norway	2009	publishing	< 2''
3	norway	2013	education	< 1''
4	norway	2014	graphic design	< 2''
5	norway	2013	creative	< 1''
6	sweden	2005	consulting	< 13''
7	norway	2016	food production	< 1''

Fig. 4. Pilot data case companies

In our simple pilot data gathering we measured how many times each of the seven selected entrepreneurs created, deleted or edited elements within the 20 different element categories from our equation (three business idea elements, six business model elements, eight project development elements and three customer interaction elements) per week since they signed up to the Lean Business Planner.

Figure 5 is an aggregated table over how many events each of the case companies have performed each week since they started working in the tool, regardless of event type. We see that the case companies have been using the tool between 19 and 35 weeks. We see that the case companies are using the tool differently, but that they seem to be working according to Lean Startup principles. That means that even if some of them have long periods without any activity, they are making changes in their plan over time. This suggest that it will be possible for us to get a large number of companies that will enter data over time.

The next interesting thing, is whether the companies will make their strategic decisions early in the planning period, and stick with it or if they will try to improve also the strategic elements over time. If they stick with their strategy, we will see that most of the events in the last week of the plan will take place within Project Development, while most of the Business Idea and Business Model events will be clustered in the first couple of weeks of the plan.

case/week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35		
Case 1	130	0	0	2	0	0	31	0	0	246	3	181	80	68	24	52	0	0	15																		
Case 2	208	86	317	83	203	0	3	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Case 3	2	0	5	80	0	1	1	1	121	34	0	0	0	0	69	20	44	76	234	419	0	0	67	10	30	0	20	5	6	2							
Case 4	23	0	10	10	0	209	96	8	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	3	
Case 5	41	4	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	178	0	140	5												
Case 6	4	0	0	5	3	0	16	2	0	32	10	2	9	2	0	1	0	0	0	0	11	0	0	8	11	9	10	0	12	0	8	5	8	0	38		
Case 7	95	18	0	0	172	0	0	66	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	
All Cases	503	108	332	186	378	210	147	77	148	312	13	183	90	70	93	73	44	76	254	419	201	0	207	23	45	13	30	5	18	2	8	5	11	0	38		

Fig. 5. Combined activity from each of the pilot cases

Figure 6 is showing the number of events per week for the aggregate of the seven pilot companies distributed over the sixty different event types. We see that the event types, are the same as in the equation in chapter 1. The weeks with a high number of events will show in a red color and the weeks without events will show in green color. The more events, the warmer the color.

We can see that there is a relative large number of Business Idea and Business Model events in the mid and latter weeks of the plan. Particularly considering that some of the pilot companies have been using the tool for fewer than 35 weeks. All this suggest that we will have a good chance of finding some companies that actually work according to the Lean Startup principles.

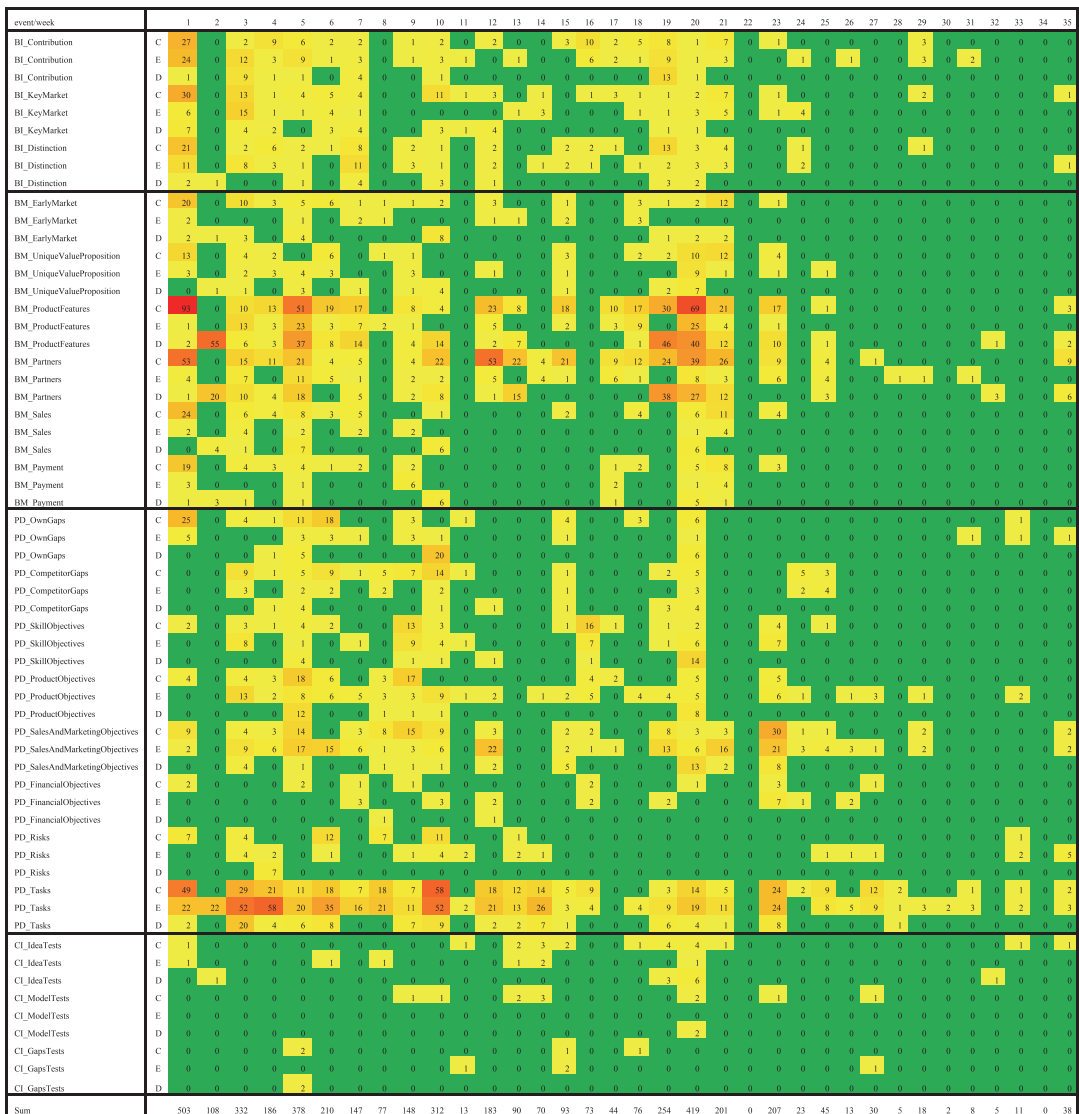
Finally, we want to see if any of the companies are doing the tests within the Customer Interaction segment. On this, the findings from the pilot companies are inconclusive. They do a small number of tests, but we would have been more confident if the number have been somewhat higher.

IX. POTENTIAL CHALLENGES

We can already see that we need to have a high focus on managing some challenges when we set up our full scale data gathering structure.

The main challenge, will be that some of the responding Startups may make events while failing to register it in the Lean Business Planner. Startups that do this, will create inaccuracies in the findings. We believe that we can control for this by interviewing a randomly selected subset of the Startups to measure this factor.

It will also be very important to select the Startups that will be included in the study in the right way. Since the Lean Business Planner will be universally available for all Startups, quite a number probably will "play around" with the system without really working systematically. This will be mediated by only including Startups that are registered as commercial companies, and only including Startups that work in the system a minimum number of weeks. We will need to set these two thresholds in such a way that we avoid creating bias.



This means that, although we expect to have some challenges in the empirical study, we think it will be possible to monitor the behavior of Startups acting according to the Lean Startup Principles over time, and thus analyze the correlation between the various part of this behavior and the eventual success of the Startups.

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Resource and Competence (Internal) View vs. Environment and Market (External) View when defining a Business

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Abstract — Startups is a popular phenomenon that has a significant impact on global economy growth, innovation and society development. However, there is still insufficient understanding about startups, particularly, how to start a new business in the relation to consequent performance. Toward this knowledge, we have performed an empirical study regarding the differences between a Resource and Competence View (Internal) vs Environment and Market View (External) when defining a Business. 701 entrepreneurs have reflected on their startups on nine classes of Resources (values, vision, personal objectives, employees and partners, buildings and rental contracts, cash and credit, patents, IPR's and brands, products and services and finally revenues and grants) and three elements of the Business Mission ("KeyContribution", "KeyMarket" and "Distinction"). It seems to be a tendency to favour the Internal View over the External View. This tendency is clearer in Stable Economies (Europe) than in Emerging Economies (South Africa). There seems to be a co-variation between the tendency to favour the Internal View and the tendency to focus on adding Resources. Finally, we found that an order-based analysis seems to explain the differences between the two views better than a number-based method.

Keywords: *Resource Based Model, Market Based Model, Knowledge Based Model, Environmental Models of Competitive Advantage, Internal View, External View, Distinction, Key Market, Key Contribution, Big Data, Business Mission, Business Idea, Data Warehouse, Lean Startup,*

I. INTRODUCTION AND THEORY

Starting a new venture is a common trend, especially at the modern world with advanced development and adoption of technology. There is a rapid growth of products and services created by newly created, little to none historical operation companies that attempts to build and scale their businesses. But first and foremost, one would be interested in the question - what is the best way of starting and developing a Startup? [1] Entrepreneurship literature offers two alternative school of

thoughts on this question. While the first focuses on leveraging existing resources and competences, the second focuses on adapting as good as one can to market conditions regarding customers identity and needs, competitors, substitutes and suppliers.

J. Barney has divided the approach of understanding the sustained competitive advantage of a firm into two different viewpoints, namely the *Resource Based Model* and the *Environmental Models of Competitive Advantage* [2]. The *Resource Based Model* examines the relationship between a firms' internal weaknesses and strengths (Internal Analysis) and its performance. These resources, according to Barney; consists among other things of the firms "assets, capabilities, organizational processes, firm attributes, information and knowledge". Wernerfelt has defined resources as "anything that could be thought of as a strength and a weakness of a given firm. More formally, a firm's resources at a given time could be defined as those (tangible and intangible) assets that are tied semi-permanently to the firm." [3]. Prahalad and Hamel has extended this in their discussion of the "Competence Based View" [4]. This theory enhances the Resource Based Model by focusing further on the Resources that constitutes "Unique Knowledge" in the organization. They claim that the competitive advantage of a firm is better understood by researching the core competences behind products than researching the products itself.

For the purpose of this article, we are not going to separate between the Resource Based Model and the Competence Based View. For the remainder of this article we will simply call this viewpoint the *Internal Viewpoint*.

The *Environmental Models of Competitive Advantage*, on the other hand, tries to understand competitive advantages by primarily analyzing the organization's external opportunities and threats. This latter model draws heavily on Porter's Five Force Model [5], where the company is understood in

accordance to a competitive ecosystem containing threats from new entrants and substitutes, the bargaining power of suppliers and customers and finally, the existing competitors within the industry. For the remainder of this article we will call this viewpoint the *External Viewpoint*.

Our research objective is to investigate the adoption of internal and external viewpoints among the Startup population. Derived from this objective, we present the Research Question (RQ):

RQ: How do Startups perform their business development regarding to the Internal and External viewpoint?

We argue that there may be an interesting contribution to this debate by adding Christopher K. Bart's [6] definition of the *Business Mission* to the analysis. According to Bart, any firms core identity can best be understood by looking at the interaction of three core phenomena in parallel: "KeyContribution" (what problem do you solve, or what need do you satisfy), "KeyMarket" - what variables does best describe the firms typical customers and "Distinction" - which describes the unique competence that enables the firm to be competitive in solving this problem.

If we combine the separation into the Internal and External Viewpoint with the Business Mission thinking, one could imagine that a firm with a primary tendency to view themselves according to the Internal Viewpoint, would have a higher propensity to focus on the Internal (or Competence) Element in the Business Mission, namely "Distinction". Similarly, one could think that a firm with a primary tendency to view themselves according to the External Viewpoint, would have a higher propensity to focus on the two External Elements in the Business Mission, namely "KeyContribution" and "KeyMarket". Furthermore, one could imagine that a firm with a strong emphasis on defining and developing their Resources would tend to have a higher tendency to have an Internal Viewpoint.

Now we need to find a way to measure these parameters. We can use our Entrepreneurial Data Warehouse (EDW) to take a look into this. The construction of the EDW draws heavily on Blank, Ries and Maurya [7,8,9].

This paper is organized as follows, Section II describes the Entrepreneurial Data Warehouse. Section III introduces three new theoretical constructs that we have made to simplify the understanding of our data. Section IV describes the way the empirical test is set up. Section V presents the empirical findings. Section VI discusses weaknesses and problems with the design. Section VII contains the conclusions.

II. THE PLATFORM AND THE ENTREPRENEURIAL DATA WAREHOUSE

Since the 15th of November 2017, we have had our Entrepreneurial Data Warehouse fully operative [10]. So – this paper is the first attempt to utilize the data in the EDW. The fact that the EDW has been operational for such a short time suggest that the data will be more powerful at a later stage. Between November 15th, 2017 and March 1st, 2018 – there have been added a number of 701 new cases relevant to this study to the

platform, where each entrepreneur has been adding a plethora of information about their businesses over the time span. Among other things, the entrepreneurs have added their *Resources* and their *Business Mission*. This Section of the paper will describe how the Entrepreneurship Data Warehouse is set up, and how it can help us shed light on the Internal versus the External Viewpoint:

What set our project apart, is that we are creating a uniform categorization of the different theoretical events that constitutes a business development process. We call these *Event Categories*. The Entrepreneurship Platform (EP), as shown in Figure 2, is the tool that enables us to monitor the Events created, updated and deleted within each Event Category by a large number of entrepreneurs [11].

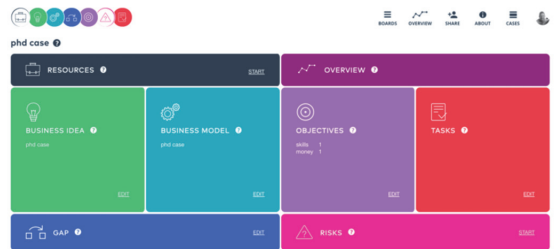


Figure 1: The Entrepreneurial Platform

The EP consists of 7 Boards, 3 different Customer Test Features and an Admin Console. Each of these consists of a number of *Boxes*, and the User Interface is based on filling these boxes with *Cards* containing the relevant Content. Everything is linked together, resulting in an *Overview*, giving the Case Company control over their current strategy, project and forecast. The thinking behind this model is clarified in the book *Lean Business Planning* (Dahle, Dagestad, Alskog, & Bang Abelsen, 2014)

The EP is marketed directly as a free-of-cost SaaS tool toward startups. In addition, it is marketed in white-labelled versions from a number of Banks, Innovation Centres, Venture Capitalists and Incubators.

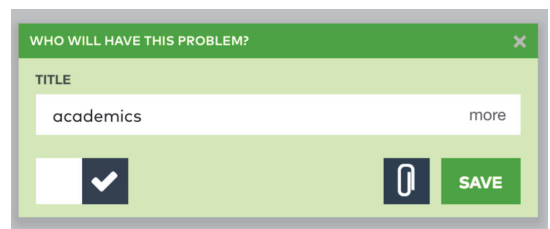


Figure 2: Example of Card. One of the Business Idea Cards

In this article, we will focus on only two of the seven boards in the system, the *Resource Board* and the *Business Idea Board*. The content from all other boards, will be ignored.

The *Resource Board* have nine boxes (as shown in Figure). The first box gives the different stakeholders a chance to define the *Values* they want to base the business on. The second box

fits Cards that suggest the *Vision* of the business. A well-conceived vision consists of two major components: core ideology and envisioned future. The core ideology is unchanging while the envisioned future is what we aspire to become, to achieve, and to create [12]. In the third box, the different owners of the Case Company can enter Cards with their personal *Objectives* for the Case Company. The fourth box contains cards for *Employees and Partners of the firm*. The fifth box is *Buildings and Rental Contracts*, in case the firm have one or several building or rental offices. The sixth box is about *Cash and Credit*, giving the detail of financial situation of the firm. The seventh box registers *Patents, Intellectual Properties and Brands* that the firm assesses. The eighth box presents cards for each *Products and Services* of the firm. And finally, the ninth box describes *Revenues and Grants*.

Table 1: Event Categories

#	Source	Event Category
1	RES	Values
2	RES	Vision
3	RES	Owner's Objectives
4	RES	Employees and Partners
5	RES	Buildings and Rental Contracts
6	RES	Cash and Credit
7	RES	Patents, IPR's and Brands
8	RES	Products and Services
9	RES	Revenues and Grants
10	BI	Key Contribution
11	BI	Key Market
12	BI	Distinction

<p>WHAT ARE THE OWNERS CORE VALUES?</p> <p>Create the card for each of the values that the owners want for the company. These values should be guiding principles for how your company should behave. Core values could be a commitment to being environmentally friendly or to give priority to innovation.</p>	<p>WHAT IS THE COMPANY'S VISION?</p> <p>It is where your company's wants to exist. It should define the overall aims of the company, and be the basis for your company's strategies. The vision is usually not changed over time. You could argue that if you change the vision, it becomes a different company altogether.</p>	<p>WHAT ARE THE OWNERS' OBJECTIVES?</p> <p>Create cards for what the owners want to get out of the company personally. Do they want to sell the company? Do they want to leave it to the next generation? Is it money that motivates them, or is it something else?</p>
<p>WHO ARE YOUR EMPLOYEES AND PARTNERS?</p> <p>Make a card for each of your employees or partners. If you have many, make a card per department or group. You can also add their monthly salary.</p>	<p>BUILDINGS AND RENTAL CONTRACTS</p> <p>If you have an office or another building, make a card for it. Same if you have an important machine. Put in what it costs you each month.</p>	<p>CASH AND CREDIT</p> <p>You may have some cash available for your project, or you may have a line of credit. Make a card for each account, and put in how much money you have available right now.</p>
<p>PATENTS, IPR AND BRANDS</p> <p>If you have patents or intellectual property rights, create a card for each one. If you don't just leave the box empty.</p>	<p>PRODUCTS AND SERVICES</p> <p>Create a card for each of your existing products and services.</p>	<p>EXISTING REVENUES AND GRANTS</p> <p>If you have existing revenues and grants that you know will bring revenue in the coming months, make a card for each one. Add the contract value to the card.</p>

Figure 3: The Resource Board

The *Business Idea Board* (Figure 4) allows the stakeholders to define their "Business Mission". As previously mentioned (Bart, 1997), the *Business Mission* consist of three components:

1. "KeyContribution": What problem will you solve?
2. "KeyMarket": Who will have this problem?
3. "Distinction": What makes you unique?

Each Entrepreneur will first populate the different Boxes with Cards in a brainstorming type process. The Companies are then advised to link the different Cards to as many different Business Ideas as they please. We will ignore this latter process in this article.

III. INTRODUCING THREE NEW CONSTRUCTS

The amount of data allows us to perform various types of quantitative analysis. The first step is to define metrics that are relevant and meaningful for our given theories. To be able to make a meaningful analysis, we will simplify the vast amount of information in the EDW into three simple quantitative constructs, namely The Resource Count, The Number Coefficient and The Order Coefficient

A. The Resource Count. First, we want to simply *count the number of Resource Cards* defined for each Case. We call this the *Resource Count*, as described in the formula below:

$$\text{TheResourceCount} = \#Values + \#Vision + \#Owner's\ Objectives + \#Employees\ and\ Partners + \#Buildings\ and\ RentalContracts + \#Cash\ and\ Credit + \#Patents,\ IPR's\ and\ Brands + \#Products\ and\ Services + \#Revenues\ and\ Grants.$$

For the Resource Count, we have excluded all South African Cases, as the system in South Africa has included only three of the nine Resource Boxes. This has left us with 281 Non-South-African cases. In these cases, a total of 3317 Resources have been entered, averaging 11,8 Resources per Case. The averages have been distributed as follows over the nine Resource Classes, as shown in Table 2

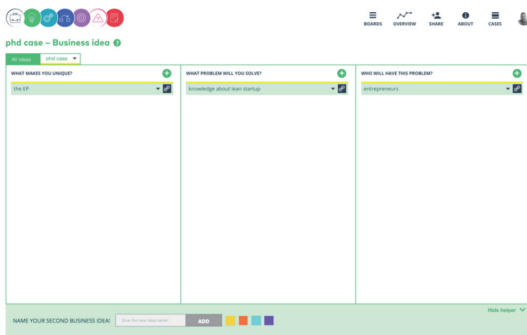


Figure 4: The Business Idea Board

Table 2: Resource Count Averages

Resource element	All (excluding African cases)
Core Values	2,44
Visions	1,44
Owners Objectives	1,84
Employees & Partners	1,37
Buildings & Machines	0,73
Cash & Credit	0,52
Patents, IPR and Brands	0,51
Products	2,25
Revenues and Grants	0,70

Thus, for this article, we will focus on 12 Event Categories, as shown in Table 1. The source of Event can be the Resource board (RES) or the Business Idea board (BI).

Next, we want to create two different constructs for the propensity for an Internal Viewpoint versus an External Viewpoint in a case, based on the relationship between the

“Distinction” cards, the “KeyContribution” cards and the “KeyMarket” cards. These coefficients are calculated for all the 701 cases in the sample.

B. The Internal Viewpoint/External Viewpoint Number Coefficient

The Number Coefficient (NC) as we will call it here, is calculated as follows:

$$NC = \frac{2 \text{ (# of "Distinction" cards)}}{\text{(# of "KeyContribution" cards + # of "KeyMarket" cards)}}.$$

The Number Coefficient has a theoretical range from 0 to +∞ (in the very theoretical case that the entrepreneur enters an unlimited number of distinction cards). The numerator represents the Internal View and the denominator represents the External View. Any Coefficient higher than +1 suggests a propensity for the Internal View. Any Coefficient between 0 and +1 suggests a propensity for the External View.

C. The Internal Viewpoint/External Viewpoint Order Coefficient

Another way of looking at the Internal Viewpoint versus External Viewpoint propensity, is to analyze the *order* in which the cards are entered. Since the entrepreneurs are allowed to enter the cards in any order they like, it could be possible to assume that the elements most important for the entrepreneurs would be entered first. We base this in an exponential simulation, where we have assigned the value 200 to the first card entered, and then 150, 125, 100, 80, 60, 40, 20, 10 and 5 for the next 9. Cards after the 10th have been given no value. The Formula for the Order Coefficient (OC) is

$$OC = \frac{2 \sum(D^1, D^n)}{\sum(K^1, K^n)}$$

If “Distinction” is represented by D, and both “KeyContribution” and “KeyMarket” is abstracted by K, one example of the order of entry is:

D → D → D → D → K → D → K → K → K → K
200 → 150 → 125 → 100 → 80 → 60 → 40 → 20 → 10 → 5

The calculation of values of D and K in this example, will be as follows:

$$\begin{aligned} D &= 200 + 150 + 125 + 100 + 60 = 635 \\ K &= 80 + 40 + 20 + 10 + 5 = 155 \\ D/K &= 635/155 \\ D/K &= 4,10 \end{aligned}$$

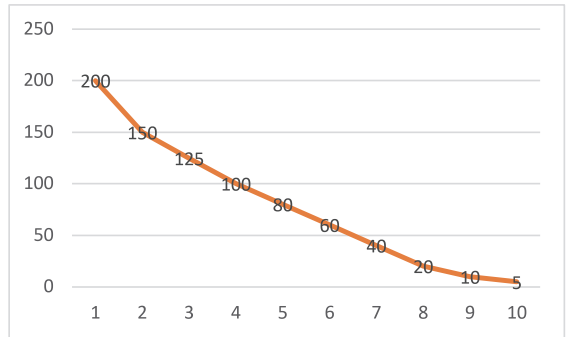


Figure 5: The Order Coefficient Exponential Curve

The Order Coefficient has a range from 0 to +314 (2*(200+150+125+100+80+60+40+20+10)/5). This represents the case that an entrepreneur enters only one K-card – and that is the 10th and last card entered. The numerator represents the Internal View and the denominator represents the External View. Any Coefficient between +1 and +314 suggests a propensity for the Internal View. Any Coefficient between 0 and +1 suggests a propensity for the External View.

IV. THE RESEARCH DESIGN

First of all, we have to remember that this is an early attempt to utilize the EDW. So – we will not attempt to make any novel conclusions based on the material, but rather try to shed some light on the Internal View versus External View Axis. We still have a very limited number of observations for a quantitative study. This is rapidly increasing for every day that passes. Thus – we can at a later point extend this study both with regard to the number of observations and by looking more closely at the qualitative content of each case. The estimates are that the EDW will surpass 10.000 cases by the end of 2018.

The starting point for this research, is the 701 Cases in the EDW registered between November 15th, 2017 and March 1st, 2018, that are defined as real live cases. All test, demo cases and incomplete cases are removed in a manual data pre-processing step. Altogether the accepted cases had 6825 Resource Cards and 8754 Business Mission Cards registered. For the analysis of the co-variation between the Resource Count and the NC and OC, we disqualify all the South-African Cases – as these have been presented with a simplified Resource Board. This limited sample include 281 cases, 3317 Resource Cards and 4036 Business Mission Cards. In this analysis, we have only included Create and Update Events, as Delete Events are deemed irrelevant. Finally, 678 of the 701 Cases come from five countries, as shown in Figure 6, which are South Africa (420 cases), Norway (140 cases), Denmark (56 cases), Sweden (34 cases), and United Kingdom (28 cases).

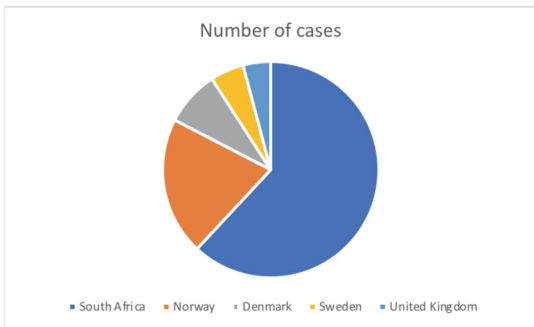


Figure 6: Country Distribution

To shed light on the concept of the Internal View versus the External View, we break down our main RQ into three sub questions (SQs)

SQ1: Is there generally, for startups, a higher tendency toward the Internal View in comparison to the External View?

One could imagine that firms with a primary tendency to view themselves according to the Internal Viewpoint, would have a higher propensity to have a high focus on their Resources. Therefore, one would think that any case with a high NC or OC would also tend to have a high Resource Count. Here we have separated the Sample into three parts, separately for the Number Coefficient and the Order Coefficient. The Higher Quartile represent the 25% of the cases with the highest NC or OC. The Lower Quartile represent the 25% of the cases with the lowest NC or OC. The remaining 50% in the middle is not taken into consideration. Thereafter we have analysed the Co-variation between the Resource Count and the NC and OC in the Higher Quartile and the Lower Quartile respectively. We come up with a list of hypotheses to explore We come up with a list of hypotheses to explore this SQ1: SQ1:

- H1a: Null hypothesis: There is total neutrality between the Internal and the External View, thus the NC would be 1.0
- H1b: Alternative hypothesis: There is an Internal View leaning tendency in startups (NC>1)
- H2a: Null hypothesis: There is total neutrality between the Internal and the External View, thus the OC would be 1.0
- H2b: Alternative hypothesis: There is an Internal View leaning tendency in startups (OC>1)
- H3a: Null hypothesis: There is no difference in the Resource Count between lower quartile NC and higher quartile NC.
- H3b: Alternative hypothesis: There is a statistical difference in the Resource Count between lower quartile NC and higher quartile NC.
- H4a: Null hypothesis: There is no difference in the Resource Count between lower quartile OC and higher quartile OC.

- H4b: Alternative hypothesis: There is a statistical difference in the Resource Count between lower quartile OC and higher quartile OC.

We would perform a one tail t-test for mean value of NC and OC values to test these hypotheses.

SQ2: Is there a geographical difference in Startups' tendency toward the Internal View or the External View?

Entrepreneurship in different geographical areas, tend to be very culturally different [13]. In particular, these differences are clear between emerging economies and more stable entrepreneurial ecosystems. Is this also true for the Internal View versus External View Axis? We will check this by comparing the NC and OC of the African cases versus the European Cases. We come up with this hypothesis to explore SQ2:

- H5a: Null hypothesis: There is total neutrality regarding the difference between the Internal and the External View in the African cases versus the European Cases.
- H5b: Alternative hypothesis: There is higher propensity for the Internal View in the European cases than in the African Cases.

SQ3: Is there a difference between the Number Coefficient and the Order Coefficient in describing SQ1 and SQ2 ?

Finally, it will be interesting to see which one of the NC and the OC (if any) that proves to give the clearest results. Whether the sheer number of "Distinctions" versus "KeyContributions" and "KeyMarkets" will be the most useful concept, or whether the order in which these elements are added into the case gives more insight. We can loosely discuss this by looking at how the two concepts differ in the first two SQs. We do not expect to come up with hard evidence on any terms usefulness, but hopefully we will be able to derive some interesting learning points from it.

- H6a: Null hypothesis: There is total neutrality between the explanation power of the Number Coefficient and the Order Coefficient.
- H6b: Alternative hypothesis: The Order Coefficient has a higher explanation power than the Number Coefficient.

V. FINDINGS

A. General Tendency toward Internal versus External View (answering SQ1)

Both the Number Coefficient and the Order Coefficient is designed in such a way that a complete balance between the Internal View (Focus on the "Distinction") and the External View (Focus on "KeyContributions" and "KeyMarkets") will give a coefficient of 1.0. Any Coefficient higher than 1.0 will suggest a higher focus on the Internal View and any Coefficient below 1 will suggest a higher focus on the External View.

The average Number Coefficient for the 701 cases, is 1.2, with a standard deviation of 0.85 at 99% statistical significance.

t = 37.289, df = 700, p-value < 2.2e-16
 alternative hypothesis: true mean is greater than 1
 99% confidence interval: (1.126123, Inf)
 Mean value: 1.200571

We accept the alternative hypothesis H1b here. This shows a slight tendency toward the Internal View.

The average Order Coefficient for the 701 cases, is 4.89, with a standard deviation of 16.7 at 99% statistical significance.

t = 7.7439, df = 700, p-value = 1.693e-14
 alternative hypothesis: true mean is greater than 1
 99 percent confidence interval: (3.41795, Inf)
 mean of x: 4.886163

We accept the alternative hypothesis here. This shows a statistically significant tendency toward the Internal View. This supports Barney [2], who claims that the tendency toward an Resource based (Internal View) is the prevailing tendency.

B. Covariation between Resource Count and NC/OC (answering SQ1)

To enhance our findings, we will analyze two further things: The definition of Assets, Resources or strengths/weaknesses is rather vague in the Resource Based vs Environmental Based literature [2]. Here we want to study the variations in the Correlation between the Resource Count and the tendency for Internal View versus External View depending on which Resource Event Categories we include. We start with the Number Coefficient, as shown in Table 3

Table 3: Resource Count per Quartile – Number Coefficient

Order Coefficient (OC)	Higher Quartile	Lower Quartile
Core Values	2,55	2,49
Visions	1,41	1,50
Owners Objectives	1,71	2,11
Employees & Partners	1,59	1,29
Buildings & Machines	0,73	0,58
Cash & Credit	0,47	0,47
Patents, IPR and Brands	0,45	0,40
Products	2,03	2,28
Revenues and Grants	0,87	0,56

The distribution of resource count value per quartiles of NC can be seen from Figure 7:

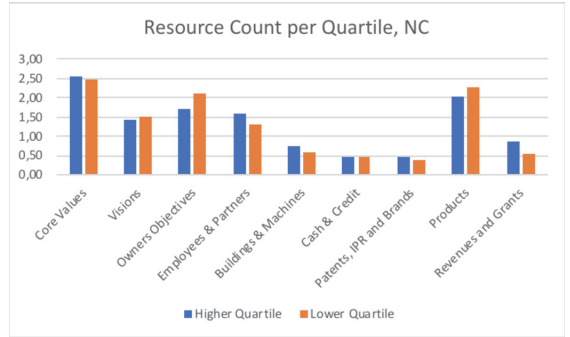


Figure 7: Resource Count per Quartile, NC

As in the previous paragraph, the NC do not give very clear answers. Counterintuitively, we see that some of the main Resource Classes have a higher Count for the Lower Quartile than the higher Quartile. The average Resource Count of the Number Coefficient lower quartile cases is 11,13 while the higher quartile cases is 12,54, showing no statistical significance.

```
data: SUM by NC
t = -1.4976, df = 279, p-value = 0.1354
alternative hypothesis: true difference in means is not equal to 0
99 percent confidence interval:
-3.866877 1.035828
sample estimates:
mean in group LQ mean in group UQ
11.12925 12.54478
```

Here, we accept the Null hypothesis H3a.

Next, we look at the distribution of the Resource Count in the different classes based on the Order Coefficient Quartiles.

Table 4: Resource Count per Quartile – Order Coefficient

Order Coefficient (OC)	Higher Quartile	Lower Quartile
Core Values	2,85	2,14
Visions	1,86	1,12
Owners Objectives	2,20	1,71
Employees & Partners	1,49	1,45
Buildings & Machines	0,85	0,58
Cash & Credit	0,58	0,54
Patents, IPR and Brands	0,45	0,43
Products	2,61	1,72
Revenues and Grants	0,58	0,69

The distribution of resource count value per quartiles of OC can be seen from Figure 8:

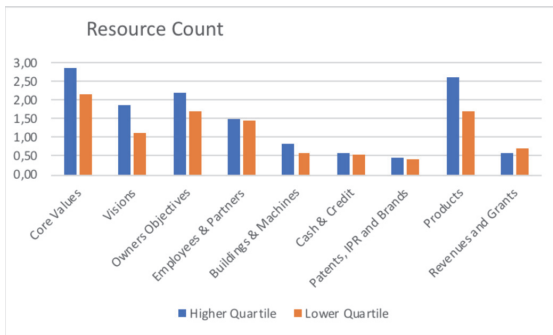


Figure 8: Resource Count per Quartile, OC

Here we can see that most of the Resources Categories are quite a lot higher in the Higher Quartile than in the Lower Quartile. The average Resource Count for the Higher Quartile cases are particularly higher for the Core Values, Visions, Owner's Objectives and Products. The average Resource Count of the Order Coefficient lower quartile cases is 10.33 while the average Resource Count for the higher quartile cases is 12.46, at 95% statistical significance.

```
data: SUM by OC
t = -2.088, df = 279, p-value = 0.03771
alternative hypothesis: true difference in
means is not equal to 0
99 percent confidence interval:
-4.777635 0.515977
sample estimates:
mean in group LQ mean in group UQ
10.32558 12.45641
```

Here, we accept the Alternative hypothesis H4b. The defined Resources are very central strategic assets for any entrepreneurial firm, and if a company have a Resource based View, it would make sense that they have a higher focus on defining the most important Resources.

C. Variations in OC/NC between Emerging and Stable Economies (answering SQ2)

If we split the Number Coefficient up into the five main countries we have in the sample, we get the following results:

Table 5: Number Coefficient per Country

Countries	Number Coefficient
South Africa	1,20
Norway	1,22
Denmark	1,26
Sweden	0,99
UK	1,34

Graphically, the distribution of Number Coefficient values across countries are presented in Figure 9.

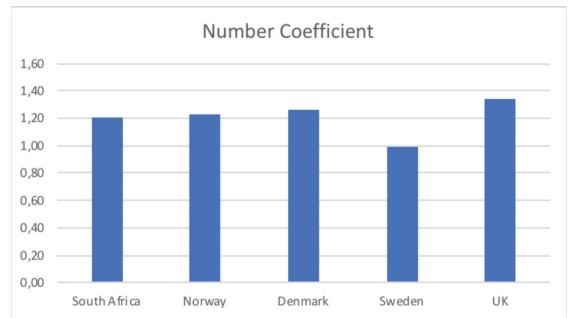


Figure 9: number Coefficient per Country

We see that there are no significant findings here. This is in line with other findings with regard to the Number Coefficient. Next, we look at the Order Coefficient:

Table 6: Order Coefficient per Country

Countries	Order Coefficient
South Africa	3,62
Norway	7,56
Denmark	7,81
Sweden	2,95
UK	9,36

Graphically, the distribution of Order Coefficient values across countries are presented in Figure 10.



Figure 10: Order Coefficient per Country

Here we can see a clear trend. If we break it down into the one African country (South Africa), which we define as an Emerging Economy, and the four European countries, defined as Stable Economies, the difference in the Order Coefficient will be:

Table 7: Order Coefficient – Africa vs Europe

Continents	Order Coefficient
Africa	3,62
Europe	7,02

```

data: OC by Continent
t = -2.6093, df = 688, p-value = 0.00927
alternative hypothesis: true difference in
means is not equal to 0
99 percent confidence interval:
-677.952331 -3.436449
sample estimates:
mean in group Africa mean in group Europe
3.62 7.02

```

Here, we accept the Alternative hypothesis H5b. We see a clearly higher tendency toward the Internal View in Europe than in Africa. The difference is statistical significant at $p < 0.01$. If we define Africa as an emerging market and Europe as a stable market, this has some logical merit. In an unsettled market where there are higher demand and fewer qualified competitors (like Africa), the tendency to focus more on the External market elements would be logical. Similarly, the tendency to focus on one's own "Distinctions" would be logical in a more mature market with more competitors fighting for the customers.

D. The differences between the explanation power of the NC and the OC (answering SQ3)

We see through the analysis that the Order Coefficient tends to give results more in line with what we would logically expect. It gives significant results on all three analyses.

The Number Coefficient does not give a significant result on two of the three questions. This suggests that we should accept the Alternative hypothesis H6b.

This Coincides with a way of thinking that would suggest that the Order in which you add the Business Mission Elements will be a better indicator on the value you put in them than the sheer number of Elements entered.

VI. THREATS TO VALIDITY

We are building an information gathering setup that is designed to gather a large amount of time series information from tens of thousands of Companies all over the world. There will be some methodological challenges to this operation. Our previous paper [10] discusses many challenges regarding to the study design, data collection and analysis. We will discuss two issues that are specifically linked to this work:

A. The "left to right" dilemma

Due to the practical design of a computer screen, the 9 boxes in the Resource Board and the three Boxes in the Business Mission Board of the EDW will have to be placed according to each other in one or another order. In the Business Mission Board, the "Distinction" is placed to the left, the "KeyContribution" is placed in the middle and the "KeyMarket" is placed to the right. If you are used to write from left to right (as we are in the western world), this *could* cause bias when considering the Order Coefficient. In future studies, this can be managed by randomizing the order of the boxes, or we could simply analyze the content of the Cards.

B. Threats to generalization

To be able to generalize the findings, a sample should be drawn statistically from an intended population. With the 701 participants we do not claim that our observation can be generalized to the whole entrepreneurial population. However, given certain characteristics of the sample, we can bring implication towards early-stage entrepreneurs in Europe and Africa.

VII. CONCLUSIONS

Entrepreneurship and Startups are essential contributors to the global economy growth, innovation and society development. Research on startups must leverage disciplines from multiple areas, i.e. entrepreneurship, management, organization and engineering. We have performed an industrial survey that collects data on how Entrepreneurs start and develop their business. We have adopted a theory of Resource and Competence (Internal View) and Environment and Market (External View) to shed light on the collected data. We are reluctant to draw too clear conclusions based on the 701 cases that we have studied. But we will point toward some indications.

In our sample, consisting of a wide range of actual entrepreneurial cases from five countries, followed between November 15th, 2017 and March 1st, 2018, and based on a method utilizing the Order Coefficient (measuring the order the entrepreneurs enter "Distinctions", "KeyContributions" and "KeyMarkets" into their Business Mission Board), we see indications that:

1. There is a higher tendency toward an Internal (Resource and Knowledge Based) View versus an External (Environmental Models of Competitive Advantage) View.
2. This tendency is clearer in stable economies (Europe) than in emerging economies (South Africa).
3. Cases that have a higher tendency to favour an Internal View (Resource and Knowledge Based), tend to have a higher focus on their Resources than cases favourable to an External (Environmental Models of Competitive Advantage) View. In particular, with regards to core Resources like Core Values, Visions, Owner's Objectives and Products.

Finally, we can state that an Order Based Method (using the order of the entered Business Mission elements) seems to give clearer indications on this than a Number Based (using the number of the entered Business Mission elements) Method.

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An analysis of Core Competence and Unique Value Proposition as normative entrepreneurship elements

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Abstract—The search for a “best practice” of entrepreneurship has been a big part of the science of entrepreneurship of our millennium. Using text analysis, this article empirically investigates the way 756 entrepreneurs from three different cohorts conceptualize 2 of the 27 elements in such a suggested normative model. The two elements explored are “Core Competence” and “Unique Value Proposition”. Our findings are that there may be two problems with the use of these elements. Firstly – the number of entries from each case suggest that entrepreneurs struggle with finding and settling on a “unique” statement for either of the two elements. Secondly, a percentage of the entrepreneurs seem to struggle to differentiate the two concepts from each other. Finally, there seem to be differences between the three investigated cohorts concerning the findings, where higher education and more experience may make it easier to utilize and understand Core Competence and Unique Value Proposition as parts of the entrepreneurial process

Keywords— *Entrepreneurship, Core Competence, Unique Value Proposition, Business Idea, Business Model, Key Contribution, Key Market, Big Data, Data Warehouse*

I. INTRODUCTION

In 2012, Scott Shane wrote an article in the Academy of Management Journal [1] reflecting on and summarizing the infamous article entitled “The promise of entrepreneurship as a field of research” [2], that he co-wrote with Venkataraman. In this article he addressed the major challenge of normatively trying to find a “best-practice of entrepreneurship:

“We did not intend to say that the entrepreneurial process is rational, planned, strategic, or even temporarily ordered, but merely that the entrepreneurial process has subprocesses. There may be no optimal entrepreneurial process, allowing for many equally effective approaches, which is an important issue for the field to explore. It is also possible that one approach may be optimal but that many entrepreneurs do not approach the process “the best way”. This point has important ramifications for the fields desire to be normative.”

This search for a set of best-practice subprocesses of entrepreneurship has motivated us to create a 7 step and 27 elements *Normative Model of Entrepreneurship (NME)*, and the minimum viable product of the online test environment derived from it (NME-TE) [3]. This article attempts to cast a light on two of these elements; *Core Competence (CC)* and *Unique Value Proposition (UVP)*. We empirically explore the characteristics of CC and UVP in 756 startup cases.

This paper is organized as follows: After this Introduction, Section II aims to familiarize the reader with the NME. Section III discusses the theoretical concepts of Core Competence and Unique Value Proposition and how entrepreneurial theory might expect them to relate to each other. Section IV introduces and describes the three research questions. Section V talks about the explorative and qualitative method chosen. Section VI describes the findings. Section VII discusses weaknesses and problems with the design. Section VIII contains the conclusions.

II. THE NORMATIVE MODEL OF ENTREPRENEURSHIP AND THE TEST ENVIRONMENT

From 2012 onwards, we have been gradually and incrementally developing the NME and the different minimum viable products of the NME-TH. Since then we have distributed more than 30 different white labelled entrepreneurship support platforms, serving over 10.000 entrepreneurial cases. The improvements and findings from these cases done throughout this period have resulted in the NME and NME-TH generation 1 being released in april 2019 [3].

The development of the NME has been based on six interlinked pillars of modern entrepreneurial theory [4]. We are starting with the concept of the Resource-Based View [5] [6], with special focus on Core Competence as a resource [7]. We then look at entrepreneurship as a nexus between entrepreneur and opportunity [2] and then try to build a bridge via the discussions around Effectuation [8] [9] [10] Bricolage [11] and Business Modelling [12] [13] [14] toward The Lean Startup Movement [15] [16]. We are aware that this does not provide a comprehensive overview of all entrepreneurship-related theories that have been part of the academic debate, but

these are the ones considered especially valuable as a foundation for our approach towards an NME.”

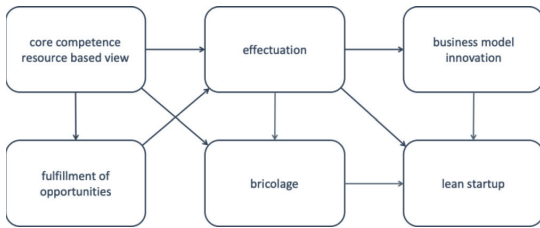


Figure 1: The six theoretical pillars

Based on these theories, and Shane’s concept of entrepreneurial subprocesses, we are assuming that there are some main building blocks involved in most entrepreneurial projects. Also, it might make sense that these building blocks can be put in a logical or sequential order. If you develop a case, you would rather try to find the business idea before the business model, you would try to find your objectives before worrying about what to do to actually reach those objectives and the development of a financial forecast would typically be done after all those things are handled. After that, you would engage in a round of iterative learning and improvements of each step, meaning that you would have to go back in the sequence and change what you have done. Like Shane, we do not aspire to find one optimal entrepreneurial process. Neither do we suggest that all entrepreneurs work in a similar fashion. The NME is simply a starting point for a proposed model for empirically comparing the actions of a large number of entrepreneurs when having their sub-processes labelled in a structured fashion.

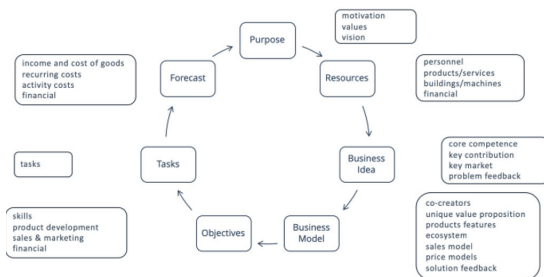


Figure 2: The Normative Model

The NME suggest that the entrepreneurial process starts with defining the *purpose* of the startup, following up with registering the initial *resources* available for the entrepreneur. Then the two strategy steps of defining the *business ideas* and *business models* of the case are followed by the project development steps of *objectives*, *tasks* and *forecast*. These steps are developed and improved in the structure of a Finite State Machine [17] or a set of interrelated Deming-cycles or PDCA-cycles [16], combining continuous redesign of the seven steps with documenting the actual results from the entrepreneurial case. We acknowledge that these steps cannot constitute the only perspective on entrepreneurial processes and that other steps might be added, or the sequence of some steps might be debatable. However, it is a useful starting point for our research and can also be the basis for further academic debate. The elaboration of the seven steps leads to 27 elements that constitute a more detailed version of our suggested

entrepreneurial subprocesses [3]. By looking at different perspectives in each step, the entrepreneurial stage can be understood better through the connections among the perspectives. For example, the purpose of entrepreneurship can be seen from both vision, motivations and core values, which are interrelated and not separable from each other. As illustrated in Figure 2, we propose a normative model of entrepreneurship with seven steps and 27 elements.

III. THE CONCEPTS OF CORE COMPETENCE AND UVP

In this article, we have chosen to focus on two out of the 27 elements of the NME: Core Competence as one part of the Business Idea and Unique Value Proposition as one part of the Business Model.

The first one originates from Prahalad and Hamel [7], and is defined as “a harmonized combination of multiple resources and skills that distinguish a firm in the marketplace” [18]. As helpfully indicated by Alizadeh and Khormaei [19], they however do not belong to resources in the sense of “factors of production”, but are rather based on a competence view (see figure 3), and related to the innovativeness of the organization [20].



Figure 3: The relation between resources, capabilities and competencies.

In our model, this is therefore included as a part of the Business Idea step together with *Key Market* and *Key Contribution*.

As an example, Prahalad and Hamel [7] attribute the NEC corporation’s ability to be competitive in fields of business as different as semiconductors, telecommunications, computing, and consumer electronics to viewing themselves as “a portfolio of core competencies – the company’s collective knowledge about how to coordinate diverse production skills and technologies.” Here they specifically point to the CC as reaching beyond individual products, services or even business units.

The *Unique Value Proposition (UVP)* is a somewhat more unclear concept, although it is one of the most used concepts in practical entrepreneurial coaching. The reason for this is that it is a centerpiece of Osterwalder and Pigneur’s Business Model Canvas [13]. Here, the UVP is defined as “the bundle of products and services that create value for a specific Customer Segment”.

Ash Maurya has developed a competing framework called “Lean Canvas”. Here, the UVP is defined as: “A single, clear compelling message that states why you are different and worth buying” [21].

Steve Blank [15] writes that a Value Proposition is a “ten-dollar phrase describing a company’s product or service. It’s the what are you building and selling?”

Geoffrey Moore [22] has developed a whole framework where companies are supposed to fill in words in a sentence-structure to create their UVP. They are asked to start with their target customer, then add that customer’s problem and need. Next, they are asked to add a general categorization of the products and services that the company provides to solve this

problem or satisfy the need. Then the company should add the primary benefits of the given products or service, and also describe the advantages over the main competitor's products and services. Finally, the company is supposed to describe the primary differentiations of their products over the competitors' products.

Vlaskovits & Cooper have developed a similar framework called Customer-Problem-Solution [23]. In their presentation, they ask an entrepreneur whom they are advising to put down the name of their customer, then the customer's problem and finally to describe the solution to the problem.

Concentrating on the UVP, we can see that five of the most read and used sources of advice to practical entrepreneurs are quite inconsistent with regard to what the UVP actually is.

Maurya and Blank connect it very clearly to the product, describing it more or less as a marketing statement or pay-off describing the differentiation of the product or service compared to the competition.

Osterwalder/Pigneur, Moore and Vlaskovits/Cooper do the same, but they are rather basing these product features on an understanding of the combination of the Key Contribution (a problem to solve) and a Key Market (target group who has this problem).

When we look at the CC and the UVP together, we can see that both are very useful concepts that are center stage of the business development of entrepreneurial projects. Furthermore, they have one clear similarity, and one very clear differentiation. Both from a theoretical point of view:

The Similarity lies in the term "Unique". Both terms are strongly linked on the precondition that they should be used to clearly differentiate the entrepreneur/offering from its competition. From this it follows that there cannot be a large number of such uniquenesses. The level of differentiation demanded from the terms makes it unlikely that someone could be able to have a large number of either CC's or UVP's.

The difference, however, is based on the object of analysis. The unique features defined under CC describe either the entrepreneur as an individual, or the entrepreneurs' company or organization. Following the definitions introduced before, they describe the abilities, assets or resources of the entrepreneur or the entrepreneurial organization on an overall level.

In contrast, the unique features defined under UVP relate to the products and/or services produced and marketed by the entrepreneur or organization. To a certain extent, there is an unclarity between the different theories about the degree to which these features should describe the physical functions of the product, or the satisfaction of the actual needs or problems of the entrepreneurs potential customers. [24]. There furthermore is the problem of one-product or one-service companies. In such cases, it can be difficult to differentiate between the uniqueness of the entrepreneur or company and the uniqueness of the product or service. Thinking of for instance one-person law-firms or consultants, you could claim that the sole employee/entrepreneur actually *is* the product. Unclearly may also arise in the situation where the products are not finalized. Both concepts are very often used in the pre-product stage of business development, where the entrepreneur may have defined a customer problem, but so far have not yet found a solution to the problem. They may have an un-tested minimum viable product [16] or even a very

unclear vision on how to solve this problem, and the CC everything is built on may be equally unclear.

To clarify the difference between the terms: According to the theories we have been citing so far in this article, the logical order of developing a new product or service could be: 1) Start with the *core competencies* (abilities, assets or resources) of the entrepreneur. 2) Based on this (and without any bias based on having a ready-made product) find a combination of a Key Contribution (a problem to solve) and a Key Market (target group who has this problem). Verify that there is a real problem concerning a real group of potential customers. Then 3) try to develop a product or a service that has a set of distinct *Unique Value Propositions* that makes it stand out in the market place (defined by the Key Contribution and the Key Market) in comparison with all potential competitors. Then verify that it actually does so. This is also in accordance with Steve Blanks Customer development model [15].

In the next chapters we will present an empirical test showing how 756 entrepreneurial cases divided on three totally different cohorts *actually* use the two concepts of Core Competence and Unique Value Propositions.

IV. THE RESEARCH QUESTIONS

Since this paper relies on the subjective understanding of the two terms CC and UVP and the interpretation of entrepreneurs' related statements, it might be challenging to acquire clear results of unrestricted significance. However, it enables us to find indications on whether the two terms are actually being used according to the theories.

The theory states that:

- a) both the CC and the UVP should be reserved for truly "unique" features.
- b) there is a difference between the concepts of CC and UVP.
- c) the difference is related to what subject the statements refer to – where the CC relates to the entrepreneur/organization and the UVP relates to the products/services.

To validate that this is the way the entrepreneurs use the concepts, we ask three questions:

- 1) Q1) Do the entrepreneurs express their CC and UVP as "unique" or not?
- 2) Q2) Do the entrepreneurs separate between the CC and the UVP as of using the CC to describe the entrepreneur/organization and the UVP to describe the product/service?
- 3) Q3) There are variations between the three cohorts with regard to Q1 and Q2?

To operationalize this, we will measure:

- O1) The number of different suggestions of CC's and UVP's for each case, meaning how often entrepreneurs edited or changed these. A large number of CC's or UVP's per case could indicate that there are problems with the understanding of the demanded uniqueness of the terms, given that both

terms are meant to be describing something truly special with the entrepreneur/organization or with the product/service.

- O2) What percentage of the cases use the CC to describe the entrepreneur/organization, and what percentage of the cases use the UVP to describe the product/service. A high percentage of cases would indicate that entrepreneurs use the two terms as intended in the theory. We will also look more closely at the specific language that are used in describing the CC and UVP by running a qualitative text analysis.
- O3) Here we measure the same variables as in O1 and O2, only separately for the three cohorts.

V. THE TEST DESIGN

We have studied 756 entrepreneurial projects from 3 diverse entrepreneur cohorts that participate in our test. These participants come from diverse cultural, economic, and professional backgrounds. All of the participants are entrepreneurs, and all of the data comes from the NME-TH, with which they interact and develop their business idea.

The first Cohort consists of 125 Scandinavian Arts Entrepreneurs. These are working in cultural and creative industries and have the ambition to live off their talent by building a profitable business. These include entrepreneurs working in music, film, photography, games, architecture, design, advertising, cultural heritage and artistic activities. Participants gain insight into a practical and creative way to develop their business as well as access to good tools to build profitable operations. Of this cohort, approximately 30 participants are also students in a music management education program in Norway. The educational background of this group is somewhat varied, but most of them have some kind of higher education.

The second cohort consists of 202 Educational Technology Entrepreneurs who are participants in the University College London’s educational technology incubator. The incubator provides business growth support and bespoke mentoring to small and medium sized enterprises (SMEs) in the education technology sector. All of these entrepreneurs have higher university education.

The third cohort consists of 429 South African Entrepreneurs aged between 18-35, all recruited from Broad-Based Black Economic Empowerment background. They are participants in a 6-month program that offers improved operational processes and tools, access to business skills support, fit-to-purpose mentorship, financial and non-financial resources, and targeted market access. These entrepreneurs rarely have a university education.

All of these entrepreneurs have gone through training programs based on the Normative Model of Entrepreneurship, and they have been instructed to develop their business using the Test Environment. We got 756 responses, with 429 coming from the South African Youth group, 202 responses from the British Tech group and 125 responses from the Scandinavian Arts group.

With regards to the CC, all entrepreneurs were trained in the concept of the Business Idea – consisting of Core Competence, Key Contribution and Key Market.

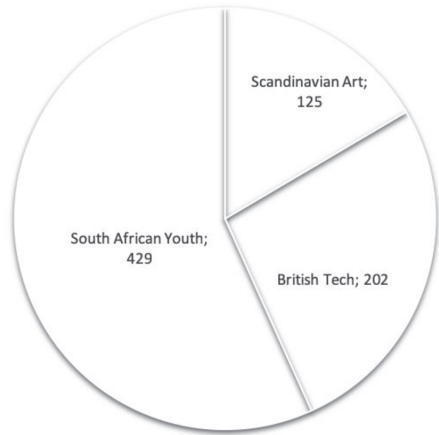


Figure 4: Total number of cases

For the CC, a story about the Chinese basketball player Yao Ming was told to exemplify how being 229 cm tall is a core competence for being a basketball center. For the CC, the following support text was presented from the system:

“WHAT MAKES YOU UNIQUE? Here you should add what makes you better suited to solve the problem than anyone else. Why should the customer choose you? What will make it difficult for the competition to copy you?”

With regards to the UVP, it was presented as a part of the Business Model step, together with the co-creators, product features, eco-system, sales model and price model. They were specifically informed that the CC was supposed to be related to the entrepreneur and the organization – viewed from the customer problem perspective, whereas the UVP was supposed to be related to the product or to the solution perspective. As an example, the UVP of driving pleasure for BMW versus the UVP of traffic safety for Volvo was discussed. For the UVP the following support text was presented from the system:

“WHAT IS YOUR UNIQUE VALUE PROPOSITION? What is your unique selling point? What will separate you from your competitors?”

The output was then treated in three different processes:

1. Q1) All of the entries (cards) in the CC and UVP elements for each of the 743 cases were counted (There are 13 cases less than in O2 due to the time difference between the two tests). An average was calculated.
2. Q2) All of the text in the CC and UVP elements for each of the 756 cases was coded as 1, 2 or 3 according to the following criteria:

Table 1: Coding of the CC and UVP elements

(A) The CC is describing:	(B) The UVP is describing:
(1) The products/services	(1) The products/services
(2) The entrepreneur/organization	(2) The entrepreneur/organization
(3) Unclear or no answer	(2) Unclear or no answer

The combination of these answers was then categorized into 9 categories, and the number of entries in each category was calculated:

Table 2: Nine Categories

Id	Category names
1	Both CC and UVP describes the product/service
2	CC describes product/service, UVP describes the entrepreneur/organization
3	CC describes product/service, unknown what UVP describes
4	CC describes the entrepreneur/organization, UVP describes the product/service
5	Both CC and UVP describes the entrepreneur/organization
6	CC describes the entrepreneur/organization, unknown what UVP describes
7	Unknown what CC describes, UVP describes the product/service
8	Unknown what CC describes, UVP describes the entrepreneur/organization
9	Unknown what CC describes, unknown what UVP describes

It was of course not unproblematic to categorize the cases. These two examples show how it was done:

Case 9129¹ CC: “rinse free washing liquid soap, just wash and hang, few hours to dry up, we manufacture rinse free washing soap liquid, this kind of soap does not need any water to rinse your washing. It saves time and water usage; we focus on manufacturing chemicals using less water.”

Case 9129 UVP: “we will add value to our customers by providing high quality, environmentally-friendly cleaning chemicals, services and products.”

This candidate has related the CC to the product and the UVP to the product. This would place him in category 1.

Case 9601 CC: “experience of HR management, integrated solutions, management of our talent pool, experience in working with SMME’s.”

Case 9601 UVP: “experience, follow through, well researched tools, limited number of service providers, experience.”

This candidate has related the CC to the entrepreneur and the UVP to the entrepreneur. This would place this particular candidate in category 5.

We then collected all statements and merged them into two text files, one for the Core Competence and one for the Unique Value Proposition. The text files were translated to english where necessary, washed for typographic errors, and all text containing any kind of indicators of identity of persons, companies or geographies was removed for privacy reasons. The text files were then run into Leximancer² to find logical concepts. The text files contained the following number of words:

Table 3: Number of Words per text file

Element	# of Words
Core Competence	23782
UVP	12824

Q3) Then the average number of entries (cards) in the CC and UVP elements was calculated per cohort. The category belonging to Q2 was calculated per cohort, and the statements were separated into six text files. One for each of the three cohorts for the CC and one for each of the three cohorts for the UVP. The files were then run into Leximancer, an automated content analysis software, to find logical concepts. We include an automated content analysis to perform exploratory analysis of the data to see if there are any unforeseen logical concepts inherent to the CC and UVP elements, based upon the entries provided by the entrepreneurs in our study. This automated content analysis produces both text concepts and concept maps. The text files contained the following number of words:

Table 4: Number of Words per text file per cohort.

Cohort	Element	# of Words
Scandinavian Art	Core Competence	4246
British Tech	Core Competence	6517
South African Youth	Core Competence	13019
Scandinavian Art	UVP	2359
British Tech	UVP	3033
South African Youth	UVP	7432

VI. FINDINGS

We made the following observations:

Q1) The average number of CC entries done over the 743 cases was 4,36 entries per case. The average number of UVP entries done over the 743 cases was 1,89 entries per case. This is more than the 1 entry per case you would expect if the entrepreneurs fully related to the uniqueness requirement. Particularly for the CC, the number of entries was high.

Q2) The distribution of the cases over the nine categories was as follows:

Table 5: Distribution to the Categories

Category # - Description	# of Cases	% of entire sample
1 - Both CC and UVP describes the product/service	172	23 %
2 - CC describes product/service, UVP describes the entrepreneur/organization	23	3 %
3 - CC describes product/service, unknown what UVP describes	40	5 %
4 - CC describes the entrepreneur/organization, UVP describes the product/service	258	34 %

¹ The cases are numbered automatically as they are entered into the NME-TH

² www.leximancer.com

5 - Both CC and UVP describes the entrepreneur/organization	42	6 %
6 - CC describes the entrepreneur/organization, unknown what UVP describes	112	15 %
7 - Unknown what CC describes, UVP describes the product/service	72	10 %
8 - Unknown what CC describes, UVP describes the entrepreneur/organization	12	2 %
9 - Unknown what CC describes, unknown what UVP describes	25	3 %
Total	756	100 %

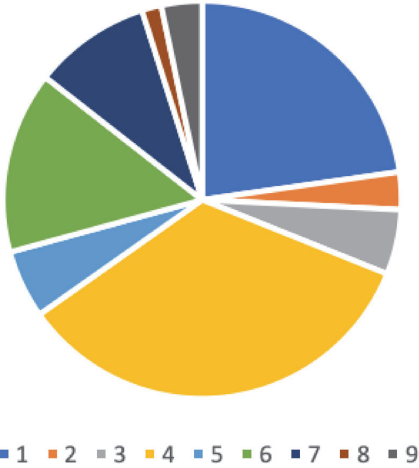


Figure 5: Distribution to the Categories, Graph

This shows that no more than 54% of the entrepreneurs clearly describe the entrepreneur/organization in the CC element. The remaining 46% either describes the product/service, give an unclear description or give no description at all.

Similarly, no more than 66% of the entrepreneurs clearly describe the product/service in the UVP element. The remaining 34% either describe the entrepreneur/organization, give an unclear description or give no description at all. Automated content analysis via Leximancer produces both higher order text concepts and concept maps which helps us to explore and to understand how the entrepreneurs conceptualize the CC and UVP differently.

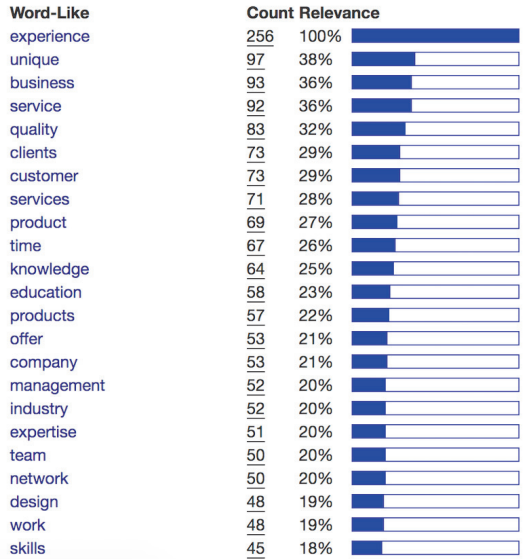


Figure 6: Text Concepts – CC

The text concepts show that the CC texts have a set of concepts you would expect to be related to a description of a person or an organization, like “experience”, “knowledge” and “education”. Here the term “experience” is by far the most common concept at 100%. On the other hand, there are also concepts that you would relate to a product-like thing or an object, like “quality” or “design”. However, the dominance by the concept of “experience” leads us believe that the entrepreneurs in our study strongly associate experience and experiential knowledge with their core competence. Indeed, it may be true that in all walks of life, whether business or personal, all “experience” is unique – which fits tightly with how the entrepreneurs were prompted to answer.

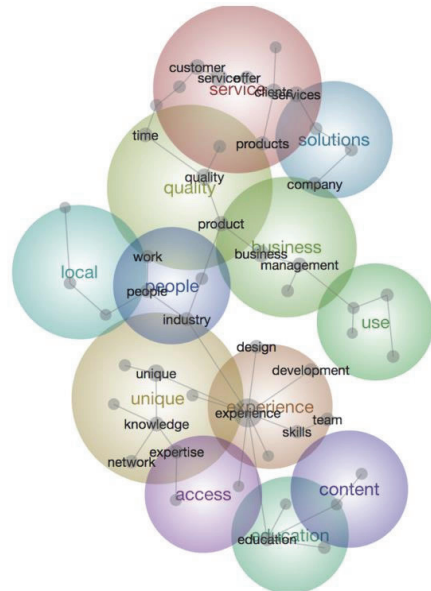


Figure 7: Concept Map for CC, Graph

Similarly, the UVP texts have concepts that would logically relate to a product or a service, like “quality”, “product(s)”, “delivery”, and “price”/” affordability”/” value”. We note that quality is 100% relevant for this cohort. But, even if there are not so many as in the CC element, there are also references to “Experience” – which most likely relates to a person or an organization. In addition, we find the cluster of “quality”, “solutions”, “products” and service, that most likely relates to the product-service axis as something unique to the organization. This may be somewhat problematic, as the CC should be describing core skillsets enabling the organization to develop products and services, not the products and services in themselves [7].

Word-Like	Count	Relevance
quality	104	100%
time	69	66%
unique	63	61%
service	43	41%
clients	43	41%
product	40	38%
value	39	38%
services	38	37%
products	35	34%
customers	35	34%
business	34	33%
customer	31	30%
experience	31	30%
use	29	28%
offer	29	28%
market	27	26%
delivery	26	25%
based	25	24%
best	24	23%
free	23	22%
industry	23	22%
price	22	21%
affordable	22	21%

Figure 8: Text Concepts - UVP

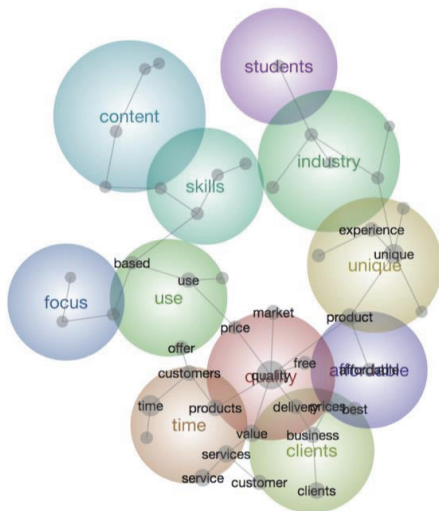


Figure 9: Concept Map for UVP, Graph

Q3) When separating the different analyses on the three cohorts, we get the following results:

Table 6: Average count of entries - cohorts

Cohort	Average CC	Average UVP
Young South African	3,75	1,59
Arts	4,07	1,42
Tech	5,92	2,90
Sum	4,36	1,89

First, we see that the Tech entrepreneurs create a higher average number of entries per case on both the CC and UVP elements than both the other two groups.

Table 7: Distribution to Categories, cohorts

Categories	Arts	Tech	YSA	All
Category 1	9 %	11 %	32 %	23 %
Category 2	1 %	0 %	5 %	3 %
Category 3	3 %	4 %	7 %	5 %
Category 4	56 %	44 %	23 %	34 %
Category 5	6 %	2 %	7 %	6 %
Category 6	16 %	31 %	7 %	15 %
Category 7	5 %	6 %	13 %	10 %
Category 8	2 %	0 %	2 %	2 %
Category 9	2 %	2 %	4 %	3 %
	100 %	100 %	100 %	100 %

When we look at the distribution between the nine categories, we see that the young South African entrepreneurs seem to be higher on category 1 (Both CC and UVP describes the product/service) and lower on category 4 (CC describes the entrepreneur/organization, UVP describes the product/service).

The Arts entrepreneurs seem to be higher on category 4, while the Tech entrepreneurs apparently are higher on category 6 (CC describes the entrepreneur/organization, unknown what UVP describes). When looking closer on this, it seems to be related to a higher number of blank entries in the UVP element for the Tech entrepreneurs.

We also note that Tech entrepreneurs had the lowest representation in category 5, indicating that they are more able to distinguish themselves as entrepreneurs from the product/service they are creating. The nature of the cultural industries, where an individual name or identity is a brand with associated aesthetic value, could explain why Arts entrepreneurs tended more to have the CC and UVP describe the entrepreneur.

When we start looking at the text concepts separated on the three cohorts, we first of all find what we would expect. The Arts entrepreneurs have a higher content of art-specific concepts like “art”, “cultural” and “music”. The Tech entrepreneurs have concepts like “teaching/teachers” and “skills”. Since they specialize on education technology that

should not be surprising. Apart from that, the findings seem to be in line with what we learned in Q2.

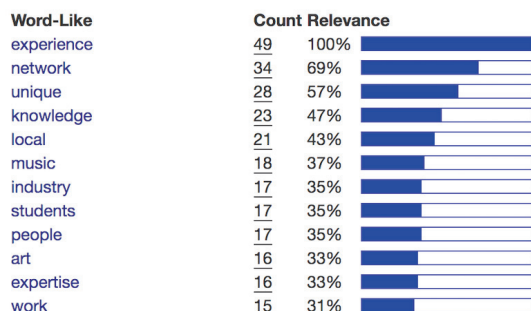


Figure 10: Text Concepts – CC, Arts

When we look at the CC for the Arts entrepreneurs, we see that most of the concepts are consistent with describing an entrepreneur. Concepts like “experienced” and “network” could very well be useful Core Competences to have in the arts business.

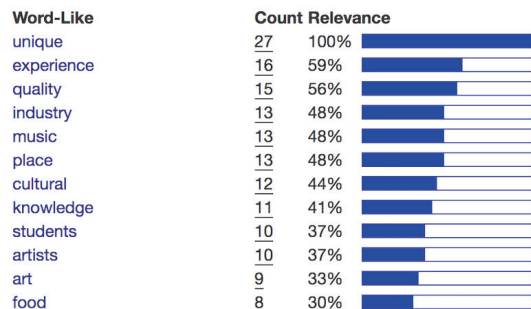


Figure 11: Text Concepts – UVP, Arts

The concepts described by the Arts entrepreneurs in the UVP element, is also consistent with the delivery of art as a service. Here terms like “experience” and “quality” fits well with this.

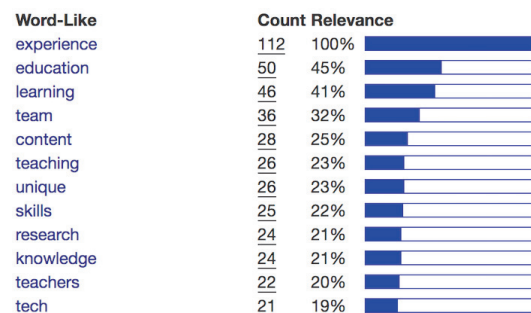


Figure 12: Text Concepts – CC, Tech

The Tech entrepreneurs CC is a bit harder to separate from the UVP, as their deliveries often can be described by similar concepts to the ones describing the knowledge or skillset of the entrepreneur. Additionally, we note that the Tech cohort had the largest representation in category 6 (31%), indicating relative unclarity over the UVP concept. Here we see that

terms like “learning” and “skills” are represented in both elements.

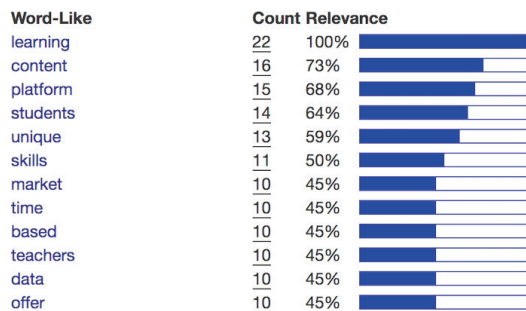


Figure 13: Text Concepts – UVP, Tech

Here we see that the Tech entrepreneurs have a concept like “skills” included in the UVP. This may be due to the fact that “skills” in this context may relate to the product or service of the Tech entrepreneurs, which is presumably a technology for knowledge transfer. Thus, we infer they are not referring the skillset of the entrepreneurs.

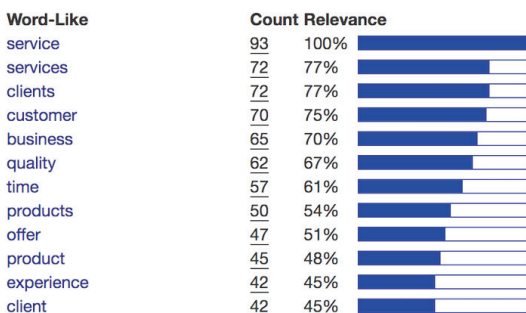


Figure 14: Text Concepts – CC, YSA

The main finding in the text analysis of the YSA cohort, is that we lack the concept of “experienced”, even if that have been the most common concept in the other two cohorts. This is especially relevant given the age (18-35 years old) and background of the cohort.

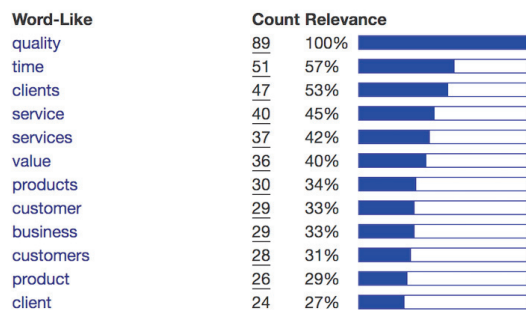


Figure 15: Text Concepts – UVP, YSA

VII. THREATS TO VALIDITY

The data used in the course of this paper is based on a Minimum Viable Product version of the NME-TE. The main purpose of this version of the NME-TE has been to learn as

much as possible, e.g. about how entrepreneurs might use the test environment, before launching Generation 1 in April 2019. Given the provisional nature of the NME-TE at the time of data gathering, the findings based on this data may not yet reflect the full potential of our approach and we do not wish to make any dogmatic conclusions on this basis. Since the Test Environment generates a steady stream of data, it is possible to repeat any experiment at all times and it therefore allows the elimination of potential problems.

The first possible bias concerns how the entrepreneurs have been instructed and trained to use the Test Environment. We have attempted to train the three cohorts as identical as possible. Whenever possible, the training has been done by the same people and the same presentations have been used. The supporting text and video material used has been identical, although there is an option to get it translated to different languages. The preparation of the different entrepreneurs therefore may have minor variations. Additionally, the entrepreneurs' conceptualizations of the elements, such as CC and UVP, are influenced by the training and the support texts. Whereas we attempted to deliver a uniform training to all participants, we nevertheless acknowledge that the words provided by the entrepreneurs are influenced by our own theoretical understanding of these elements (CC and UVP) and the subsequent building of the NME-TE and that training and support texts have a potential for optimizations to serve our future research.

Related to this is our own ability to explain the difference between the Core Competence and the Unique Value Proposition. We have focused on explaining the use of the terms, but we have not used the term "Core Competence" in the support text, as we fear it may make it harder to understand that a CC can be an asset or a motivation that is not limited to the conventional understanding of the term "competence" as something solemnly relating to knowledge. Improving the support is of course one of the main motivations for this research.

The next possible bias concerns the coding of the cases. Due to limitations in time and resources, the coding has been done by one individual (the first author), and a coding software has not been used. We still think that this part of the research gives relevant results, but we will consider redoing the experiment using a more systematic coding approach together with the next release of the NME-TE.

In addition to this, there are two minor aspects to be mentioned. First, the count of entries when answering Q1 is done with 13 fewer cases than when answering Q2. This is due to these cases being deleted from the NME-TE by the entrepreneurs in the time between test 2 and 1. Secondly, related to the counting of the entries when answering Q1, there may be more than one individual entering cards in some of the cases. In the current version of the NME-TE, we technically cannot control for this. More people may of course generate more entries, although the consolidation of the entries into just one CC and one UVP entry is encouraged.

VIII. CONCLUSIONS

Given the nature of the NME-TE at its recent state and the data it provides, we consider it appropriate to be cautious in developing sound conclusions and we offer some basic implications instead:

Q1) The average number of 4,36 CC entries per case suggests that there is a potential for improvement in how the entrepreneurs understand that a Core Competence should be something really unique. The average number of 1,89 UVP entries per case points in a similar direction, although less clear. Ideally, both these numbers should move toward 1 as the entrepreneurial concepts matures, and their identity becomes clearer.

Q2) There seems to be a tendency to sometimes create descriptions of uniquenesses concerning the product and services as a part of the CC. To a somewhat smaller degree, but still absolutely present, there seems to be a tendency to sometimes create descriptions of uniquenesses concerning the entrepreneur and the entrepreneurial organization as a part of the UVP.

In general, this might indicate that even though the CC and UVP elements are very important contributions to the Normative Model of Entrepreneurship, they can sometimes appear as too theoretical and difficult to differentiate to the average entrepreneur. There furthermore are indications that the entrepreneurial ecosystem would benefit if academics and practical entrepreneurs could try to simplify the concepts together and explain it in a better or more comprehensive way.

Q3) It seems that in particular education and experience to a certain degree make it easier to separate between the CC and the UVP. The young South African entrepreneurs are the youngest cohort with the least formal education. They were the ones who had the most problems with describing the entrepreneur or organization in the CC element and the product or service in the UVP element. They only had 23% in category 1 (Both CC and UVP describes the product/service) compared to 34% in the total population. Given that this cohort could be very representative for a large number of young entrepreneurs in developing countries that will come in the near future, it may be a place where further research is warranted.

The interesting thing is that the Tech Entrepreneurs, who all have higher education, were the ones who created the most entries in both the CC and the UVP elements. This is counter-intuitive to what we would expect, based on the education level of the entrepreneurs. This phenomenon warrants further research.

Irrespectively, we have attempted to demonstrate our efforts in utilizing our test environment to further develop the understanding of how different types of entrepreneurs, conceptualize two specific elements of an entrepreneurial model. As we are launching the next generation of the NME-TE, we will systematically work our way through more of the elements, in order to shed lights on strengths and weaknesses with the concepts currently being used in the knowledge transfer to the future value creators in the entrepreneurial ecosystem.

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A dynamic and a static approach to the business model - Investigating the potential difference in business model focus

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Abstract—This white paper is conducted for Lean Business encompassing a first attempt at empirical testing of data extracted from the Lean Business database. Lean Business adhere to the Lean Startup Movement, where the core principle is that static business planning should be replaced with a continuous dynamic business model development and that doing so increases chances of success. To begin to understand lean startup and entrepreneurial behavior the potential differences in focus on the different business model canvas elements have been investigated. Based on two samples, one for dynamic use and one for static use of the business model canvas, differences were investigated statistically. A distinction in focus on the different business model elements between a dynamic and a static approach could not be found. However, statistical testing of quantitative data represents an important step towards understanding entrepreneurship.

Keywords— *Business Model, Business Model Development, Lean Startup, Static Approach, Dynamic Approach, Business Model Canvas, Lean Canvas, Quantitative Data*

I. INTRODUCTION

This is a white paper conducted for Lean Business encompassing a first attempt at empirical testing of data extracted from the Lean Business database, the Entrepreneur Platform. An in-depth description of the Entrepreneurship Platform and database development can be found in previous work [1]. The Entrepreneurship Platform has been built as a structured model for entrepreneurship consisting of a clearly defined terminology [1]–[3] and it is a part of an attempt at developing a quantitative and longitudinal approach to entrepreneurship research. In an attempt to further understand entrepreneurship, entrepreneurial and startup behavior, this paper begins an empirical investigation on quantitative company data regarding the business model [4]–[6].

Lean Business adhere to the Lean Startup Movement, which advocates an agile behavior in terms of business model development and product development. The core principle here is that static business planning or development should be replaced with a continuous dynamic development, and that by doing so increasing the chances of success [1], [7]–[10]. In the Entrepreneurship Platform [1], Lean Business incorporate and illustrate these notions as follows; Companies with frequent changes in their Business Idea and Model, Project Development and Customer Interaction will have a greater chance for success:

$$\Delta S = \Delta f(\text{BI}) + \Delta f(\text{BM}) + \Delta f(\text{PD}) + \Delta f(\text{CI})$$

Where S = Success, BI= Business Idea, BM = Business Model, PD = Project Development and CI = Customer

Interaction. This means that any positive change in BI, BM, PD and CI improves the level of Success. It is of Lean Business interest to investigate if there are differences between companies, organizations or entrepreneurs that iterate and change often, (that is; have a dynamic approach to developing a business) and those who do not change as frequently (that is; have a static approach). This can increase our understanding of what it is that make companies, organizations, entrepreneurs, or even startups successful. Moreover, it could begin to investigate if the underlying principles in the Lean Startup Movement hold.

To begin such an investigation of differences between a dynamic and a static approach, this paper focuses on investigating the Business Idea and Model. In the Entrepreneurship Platform, the Business Idea is a part of the Business Model, which consists of nine elements. These nine elements, from here on out called the business model elements have been created by combining the elements from the Business Model Canvas of Osterwalder and Pigneur [5], [9] and the Lean Canvas created by Maurya [8]. The elements are; KeyContribution, KeyMarket, Distinction, EarlyMarketCustomer, UniqueValueProposition, ProductFeature, Partner, HowToSell and HowToGetPaid, and they contain similar information as the Business Model Canvas and Lean Canvas. We refer to Dahle et al. [1], [2] for a thorough description of their development and what they encompass. A sample have been constructed to represent a static approach and a dynamic approach to using the nine business model elements in the Entrepreneurship Platform. Case companies were extracted from the Lean Business database and information on actions conducted in each of the nine elements analyzed. The amount of actions conducted in each business model element is used as a proxy for the attention and time a company spend on that element, that is to what extent they focus on that element. The hypothesis is that focus on the business model elements will be different in companies with a static approach compared to companies with a dynamic approach. Therefore, the amount of actions in each Business Model Element have been statistically tested for differences between companies representing a static and a dynamic approach.

Following this introduction, the remainder of the paper consists of a theoretical background, where the basic assumptions of the Lean Startup Movement are presented, in addition to the theoretical underpinning of these. The research question is stated and operationalized into testable hypotheses before presenting the results. Lastly, results and limitations are discussed, before providing concluding remarks.

II. EXISTING THEORIES & PREVIOUS WORK

Lean Business adhere to the Lean Startup Movement, which is based on notions from Blank's "Customer Development process" [7] that were incorporated Ries' "Lean Startup" methodology [10]. Furthermore, it utilizes ideas and tools from Maurya's "Running Lean" [8] and "Business Model Generation" by Osterwalder and Pigneur [5], [9].

In a Lean Startup, an agile behavior in terms of business model development and product development is promoted, aided by iterations and learning as fast as possible. Mantras such as "learn fast, fail fast" [8] and "fail early, fail cheap" occur frequently and describes the mindset and methodology to the Lean Startup Movement. The core principle is that static business planning or development should be replaced with a continuous dynamic development and that by doing so increasing the chances of success. Therefore, the success of a startups depends on the following abilities inherent to the startup. First, a startup must have the ability to change the business idea and subsequently its business model this is necessary [1]. This needs to be recognized by the entrepreneurs, who have to make necessary changes accordingly. Key to the process of recognition is seeking feedback through frequent customer interaction and continuously iterating on business offerings and business model by incorporating feedback. Here, the term business offerings is selected to capture the range of possible offerings to the customer, from a pure product offering to pure service offering, since this depends greatly on the nature of the business. In an effort to make changes in the business model easier and facilitate business model development, Osterwalder and Pigneur [5], [9] and Maurya [8] have developed a visual one-page tool. These tools, labeled Business Model Canvas and Lean Canvas respectively, have been widely accepted and adopted due to their flexibility. Both described the business model as a series of elements and have a strong focus on the interrelations of elements, seeing how conducting changes in one element affects the other. Making decisions and taking actions necessary to realize what is described in the canvas is what should cause success. As mentioned in the introduction, Lean Business combines these two tools in their Entrepreneurship Platform, which provides a visual tool with a defined terminology [1], [2] a canvas available for startups and entrepreneurs.

Theoretical foundation for investigating differences in a dynamic and a static approach can be found in an argument of investigating a company's dynamic capabilities [11] and dynamic entrepreneurial learning capabilities [12]. An ability to dynamically adapt to changing customer and market requirements is necessary to sustain a position in the market place and to continue to serve value to the customer [4], [6]. This can be aided by experimentation, organizational change or product development, and should be reflected in the business model. Business model development represent changes in the business model. Therefore, indications of a company's dynamic capabilities could be provided by understanding the elements, the relations between the elements and how changes affect one another. Using the description of the business model as a series of elements and their interrelations is in line with the business-model elements research perspective [13]. The ability to learn and change are likely to be among the most important capabilities a firm can possess and therefore empirical attention should be devoted to the topic [11], [14].

Demil and Lecocq [15] note the different uses of the concept business model, notably there are two distinct uses of the term reflecting the static approach and the transformational approach to the business model. The static approach emphasizes the 'model', the business model functions as a blueprint enabling description and classification. This focus on the coherence between the core components of the business model in the static approach have been useful for managers and entrepreneurs as it provides a consistent picture of the business model components and their interrelations to communicate to others. Furthermore, the static approach allows for creating topologies and research relationships between these and their success. The transformational approach describes the process of business model development or evolution, which the static approach cannot do. The business model is here used as a tool for addressing change and innovation in the company or in the business model itself. This approach advocates iterative refinements to develop a sustainable business model and/or adapt to the environment. Acknowledging that the business model is a subject of change, continuously making changes and discussing how it changes is essential to the transformational approach, which corresponds to a dynamic business model approach.

III. METHODS

A. Presented study, Research question & Hypothesis

Our interest is to investigate whether there are differences between the case companies have a dynamic approach to business model and the ones that have a static approach to business model, with regard to their focus on the different Business Model elements. This led to an overarching research question.

Research Question:

Do entrepreneurs or companies that have a dynamic approach to the business model focus on other elements of the business model than companies that have a static approach?

The research question stated above is operationalized into testable hypotheses. To create hypotheses so, the ratio of actions conducted in the nine business model elements have been used as a proxy for the focus of the entrepreneur. Therefore, we have used the percentage of actions conducted in the nine business model canvas elements. This percentage-value corresponds to the ratio of actions in the element, which we argue could indicate the time and attention the entrepreneur devotes to that specific element. For all nine business model elements, the null hypotheses and alternative hypotheses are stated below.

KeyContribution:

H_0 : There is not a statistically significant difference in the percentage of actions conducted in the "KeyContribution-element" between dynamic and static use of the canvas.

H_A : There is a statistically significant difference in the percentage of actions conducted in the "KeyContribution-element" between dynamic and static use of the canvas.

KeyMarket:

H_0 : There is not a statistically significant difference in the percentage of actions conducted in the "KeyMarket-element" between dynamic and static use of the canvas.

H_A: There is a statistically significant difference in the percentage of actions conducted in the “KeyMarket-element” between dynamic and static use of the canvas.

Distinction:

H₀: There is not a statistically significant difference in the percentage of actions conducted in the “Distinction-element” between dynamic and static use of the canvas.

H_A: There is a statistically significant difference in the percentage of actions conducted in the “Distinction -element” between dynamic and static use of the canvas.

EarlyMarketCustomer:

H₀: There is not a statistically significant difference in the percentage of actions conducted in the “EarlyMarketCustomer-element” between dynamic and static use of the canvas.

H_A: There is a statistically significant difference in the percentage of actions conducted in the “EarlyMarketCustomer -element” between dynamic and static use of the canvas.

UniqueValueProposition:

H₀: There is not a statistically significant difference in the percentage of actions conducted in the “UniqueValueProposition-element” between dynamic and static use of the canvas.

H_A: There is a statistically significant difference in the percentage of actions conducted in the “UniqueValueProposition-element” between dynamic and static use of the canvas.

ProductFeature:

H₀: There is not a statistically significant difference in the percentage of actions conducted in the “ProductFeature-element” between dynamic and static use of the canvas.

H_A: There is a statistically significant difference in the percentage of actions conducted in the “ProductFeature-element” between dynamic and static use of the canvas.

Partner:

H₀: There is not a statistically significant difference in the percentage of actions conducted in the “Partner-element” between dynamic and static use of the canvas.

H_A: There is a statistically significant difference in the percentage of actions conducted in the “Partner-element” between dynamic and static use of the canvas.

HowToSell:

H₀: There is not a statistically significant difference in the percentage of actions conducted in the “HowToSell-element” between dynamic and static use of the canvas.

H_A: There is a statistically significant difference in the percentage of actions conducted in the “HowToSell -element” between dynamic and static use of the canvas.

HowToGetPaid:

H₀: There is not a statistically significant difference in the percentage of actions conducted in the “HowToGetPaid-element” between dynamic and static use of the canvas.

H_A: There is a statistically significant difference in the percentage of actions conducted in the “HowToGetPaid -element” between dynamic and static use of the canvas.

B. Applied Research Methods

Classical statistical methods were used to test for differences between independent samples. Statistical tests were selected based on the characteristics of the data

Sampling two Independent Groups

From the Lean Business database we sampled cases for statistical analysis. The total database population was separated in two independent groups, the static group and the dynamic group. The static group contained all companies having used the canvas over the course of one, initial 24-hour period. The dynamic group contained all other companies, which used the canvas over multiple 24-hour periods. An additional requirement was the actual existence of the company, which had been manually controlled by the database operators.

Random sampling of static cases:

From the static group, a random sample of 17 companies was made. Company data for each of the companies in the sample was checked again, to ensure that the assumptions were met.

Stratified sample for dynamic cases:

From the dynamic group, the 17 companies having the most 24-hour periods were selected. This translates to those companies having revisited and iterated on the canvas the most. Company data for each of the companies in the sample was checked again, to ensure that the assumptions were met.

IV. FINDINGS

A. Statistical Analysis

The results from the statistical tests are presented here. Data from a total of N = 34 cases (17 for dynamic sample and 17 for static sample) were analyzed in SPSS Statistics [16] to investigate the potential statistical differences in percentage of actions conducted in the nine business model canvas elements between dynamic and static use. The percentage of actions conducted in each of the elements was compared between the dynamic group and the static group. Differences in percentage-values between the two groups were the foundation for the statistical tests. Statistical tests were chosen based on the characteristics of the data, i.e. outliers, normal distribution, homogeneity of variances, and distribution shape. Independent-Samples T-Test was used for normally distributed data, without outliers and exhibiting homogeneity of variances. For data violating homogeneity of variances Welch T-Test was used. For data violating the assumption of outliers or normality Mann-Whitney U Test was used. Outliers are defined by SPSS Statistics as values more than 1.5 box-lengths from the edge of a box in a box plot. The box plots were visually inspected. Shapiro-Wilk test for normality was used to assess whether data were normally distributed, where significance values larger than 0.05 indicate a normal distribution. Similarly shaped distribution was inspected visually using histograms. An exact sampling distribution was used for U [17]. Independent-Samples T-Test and Welch T-Test evaluates differences in means between independent groups. Mann-Whitney U Test evaluates differences in medians between independent groups, if the groups have a

TABLE I. DESCRIPTIVE STATISTICS

Variable (BM Element)	Dynamic			Static			Difference Mean \pm Std. Error	Difference Median
	Samples	Mean \pm SD	Median	Samples	Mean \pm SD	Median		
KeyContribution	17	24.7% \pm 12.8%	23.1%	17	21.7% \pm 8.3%	21.1%	2.9% \pm 3.7%	2.0%
KeyMarket	17	17.2% \pm 5.6%	17.2%	17	20.8% \pm 10.8%	16.7%	-3.6% \pm 2.9%	0.5%
Distinction	17	21.0% \pm 11.6%	19.5%	17	22.8% \pm 6.9%	22.2%	-1.7% \pm 3.3%	-2.7%
EarlyMarketCustomer	15	5.6% \pm 2.8%	6.3%	15	6.2% \pm 3.5%	5.6%	-0.7% \pm 1.2%	0.7%
UniqueValueProposition	15	6.6% \pm 4.6%	6.1%	16	5.9% \pm 2.7%	6.4%	0.7% \pm 1.3%	-0.3%
ProductFeature	14	7.4% \pm 4.2%	6.6%	13	7.4% \pm 3.6%	6.8%	0.0% \pm 1.5%	-0.2%
Partner	17	9.3% \pm 6.8%	7.9%	13	6.8% \pm 3.6%	5.6%	2.5% \pm 2.1%	2.3%
HowToSell	16	7.3% \pm 9.2%	5.2%	16	7.2% \pm 3.0%	8.1%	0.2% \pm 2.4%	-2.9%
HowToGetPaid	15	4.6% \pm 3.6%	3.7%	16	5.9% \pm 3.3%	4.6%	-1.3% \pm 1.2%	-0.9%

TABLE II. STATISTICAL TESTING FOR DIFFERENCE IN PERCENTAGE OF ACTIONS CONDUCTED IN THE BUSINESS MODEL (BM) ELEMENTS, BETWEEN DYNAMIC AND STATIC SAMPLE

Variable (BM Element)	Dynamic		Static		Homogeneity of variances (Lavenes's Test for Equality)	Similarly shaped distributions	Statistical test	Sig. (2-tailed)
	Outliers	Normality (Shapiro-Wilk test)	Outliers	Normality (Shapiro-Wilk test)				
KeyContribution	Yes	No (p<0.05)	Yes	Yes (p=0.198)	N/A	Yes	Mann-Whitney U Test	0.563
KeyMarket	No	Yes (p=0.968)	No	Yes (p=0.074)	No (p<0.05)	N/A	Welch t-test	0.236
Distinction	Yes	No (p=0.001)	Yes	Yes (p=0.238)	N/A	Yes	Mann-Whitney U Test	0.193
EarlyMarket-Customer	No	Yes (p=0.322)	No	Yes (p=0.422)	Yes (p=0.506)	N/A	Independent-Samples T-Test	0.578
UniqueValue-Proposition	Yes	Yes (p=0.051)	No	Yes (p=0.606)	N/A	Yes	Mann-Whitney U Test	0.83
ProductFeature	No	Yes (p=0.107)	Yes	Yes (p=0.108)	N/A	Yes	Mann-Whitney U Test	0.905
Partner	No	Yes (p=172)	No	No (p=0.020)	N/A	Yes	Mann-Whitney U Test	0.385
HowToSell	Yes	No (p<0.001)	No	No (p=0.44)	N/A	Yes	Mann-Whitney U Test	0.287
HowToGetPaid	Yes	No (p=0.006)	No	No (p=0.031)	N/A	Yes	Mann-Whitney U Test	0.358

similar distribution shape. Table 1 contains descriptive statistics. Table 2 contains metrics associated with assumptions deciding which statistical tests to use, along with the corresponding test and result. As shown in Table 2, the nine elements are not statistically significant. Thus, the alternative hypotheses are not accepted, and the null hypotheses are retained.

B. Discussion

As the results describe statistical tests for all nine variables, i.e., the nine business model elements constituting the business model turned out not be statistically significant. This was based on two samples, one stratified sample for dynamic use of the business model canvas and one random sample for static use of the business model canvas.

As such, a distinction in focus on the different business model elements between those who use the business model canvas in a dynamic manner, compared to those who used the canvas only once could not be found. This might be due to a similar focus among entrepreneurs with a dynamic and iterative approach and entrepreneurs with a static approach to the business model. Their consideration of what the important elements are might be similar and therefore both groups have devoted similar attention to it. This could indicate that the behavior is not so different in the two groups of entrepreneurs in this aspect of developing a business. One can also speculate

if this is an appropriate way to distinguish between companies who exhibit a lean behavior and those who don't. There could be other aspects that are more representative of a lean behavior and therefore more interesting to investigate.

The total sample size of $N = 34$ cases is relatively small. This sample size does not allow for generalization. A larger sample size would give a more accurate result and representation of how the case companies use the canvas. Furthermore, if there actually is a difference in entrepreneurial behavior that is reflected in dynamic and static use of the Lean Business canvas this might show up in a larger sample size in terms of a different significance level. A larger sample size might have been statistically more significant.

The definition of static and dynamic use of the canvas as presented here might not be true for all startups. For younger startups it may be natural to revise the business model more often than mature startups, yet both companies might see themselves as dynamic. For developed startups quarterly or biannual revision of business model might still reflect a dynamic behavior, however, the dynamic sample selected here might not capture those companies.

This first attempt at empirical testing of entrepreneurial data considered Business Model and Business Idea. Product Development and Customer Interaction is also an important part of the equation as described in the introduction and should

also be considered in future work. It is important to retain this holistic perspective also in managing a startup. From general lean behavior principles it may be possible to derive company specific aspects, by which they can be compared to appropriately distinguish lean and non-lean startups.

V. CONCLUSION

A. Limitations

The study is limited by a small sample selection. Though results were not statistically significant, the sample size does not allow for generalizations had this been the case.

Despite the limitations, it is shown how one can begin to use data from the Entrepreneurship Platform in combination with existing entrepreneurial and business model research to further investigate entrepreneurs and startups. We do believe that careful statistical testing as we have conducted it can be used to analyze entrepreneurial behavior provided that the research question is properly operationalized into testable hypotheses. As such, it is and represents a step towards understanding entrepreneurship.

B. Concluding remarks

This white paper conducted for Lean Business encompassing a first attempt at empirical testing of data extracted from the Lean Business database. Lean Business adhere to the Lean Startup Movement, which advocates an agile behavior in terms of business model development and product development. Here, static business planning or development should be replaced with a continuous dynamic development, since it increases the chances of success. It is of Lean Business interest to test if the principle holds in a series of quantitative studies based on data collected from their database. This paper begins such an investigation by examining potential differences between companies with frequent changes, that is one with a dynamic approach, and companies who do not change frequently, that is a static approach. A sample have been constructed to represent a static approach and a dynamic approach to using the Business Model elements in their online platform. Information from case companies were extracted from the database, and statistically tested for differences. Statistical tests investigating differences in mean and median for independent groups were conducted. Statistical tests for all nine elements constituting the business model turned out not statistically significant. As such, we did not find a distinction in focus on the different business model elements between those who use the business model canvas in a dynamic manner (by an iterative development) compared to a static manner (single occasion use of the canvas). The statistical analysis conducted as a small, yet important step as a starting discussion for how data and empirical evidence can aid in understanding business

modelling, how business models develop and by doing so, understand entrepreneurship.

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