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Entrepreneurial Mindset

Defining the concept, how to measure it, how to teach it and its role in the venture creation process

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Doctoral thesis

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Abstract

The world is facing numerous challenges, and entrepreneurship represents one method for introducing solutions to solve these challenges. For this reason, entrepreneurship is more relevant today than ever. Yet when we examine those who want to be entrepreneurs, or generate entrepreneurial outcomes, we see that a great many of them do not succeed. When we dig further we see that there is a cognitive element to this, as nothing physically prevents people from becoming entrepreneurs. We posit that it is an entrepreneurial mindset ("EM") that allows some people to take entrepreneurial actions under circumstances of uncertainty in order to create ventures. This leads to the primary research question of this thesis, which is: what is the role of EM in separating those who take entrepreneurial actions from those who have the intention to take entrepreneurial action but never do?

In order to examine this research question, I first began by examining three sub-questions that inform our overarching research question. The first of these is: how do you define and conceptualise what is meant by an EM? In order to answer this, I begin with an overview of key literature on mindset and cognition. Two themes became apparent to me from reading literature on this topic. The first is that there has been thorough research into individual cognitive elements, such as biases, heuristics, beliefs, roles, schemas, identity, expert cognition, meta cognition and personality – yet none of these individually provides insights into what is EM. The second theme which comes through from examining existing literature is that existing conceptions of EM are focussed on what I describe as "high level descriptions": they describe broad outcomes such as a willingness to act under uncertainty, or an ability to identify and exploit opportunities. These conceptions are overly broad and are focussed on the expected outcomes of having an EM, instead of describing what an EM is. To resolve this gap between individual parts of cognition and high level broad descriptions, I set out to provide a conceptualisation of EM. I define EM as: *An automated non-conscious perspective including the sum total of cognitive processes; that lead to an individual's willingness to take action under uncertainty, make errors, learn from those failures and direct that learning to specific goals to best solve the entrepreneurial tasks within the process of venture creation (Lynch & Corbett, 2019)*. This new conceptualisation of EM is based on bringing across work from the field of cognitive psychology and synthesising prior research from outside of entrepreneurship. What separates the proposed conception of EM from prior literature is an acceptance that is not one thing or concept, but rather it is something far more fluid and changing. This conception allows for both mistakes and learning, and is important as a distinction from existing conceptions of EM.

Having conceived of what we[1] mean by EM, the thesis moves onto examining the second research question: how can we measure EM? We show that prior research measures something other than mindset, and it is often focussed on aspects of personality, despite entrepreneurship as field having moved on from personality as a crucial determining factor in entrepreneurial outcomes. Alternative measures also focus on individual elements of cognition, such as risk propensity, need for achievement or meta-cognition. While these elements all play a role in EM, they only partially contribute to our conception of EM. We therefor set out to test a novel method for measuring EM, using language as a proxy for cognition. This is based on the argument that what we talk about and how we talk about it reflects what we think about it and the way we think about it. Based on this argument, our research examines the ways in which expert entrepreneurs use language differently from less expert entrepreneurs. The result is five themes that are consistent with similar work on measuring how expert entrepreneurs think with regards to venture creation.

Having conceived of EM and developed a methodology to measure it, we then set out to examine how to teach EM. This is an important theme based on that bringing about change in the world requires more entrepreneurs to take more entrepreneurial action. This thesis is built around the idea that EM plays a role in giving individuals the mental resources they need to bring ideas into reality. Therefore, finding an appropriate pedagogy that fosters this is crucial. In examining the existing literature on pedagogy, we find that learning from experience has gained popularity, and that within this field, design thinking ("DT") as a practice orientated methodology can be useful for teaching EM. This leads to the third and final research question: why is DT a useful pedagogy for teaching EM? In investigating this research question I first describe our conception of DT, and explain how this contributes to having students practice the different elements of EM. We then delve into student reflections on DT to elaborate on what students receive out of this pedagogy. In order to provide some practical suggestions on how to teach DT, we also include a section on the practical aspects of organising teaching interventions based on DT. These suggestions are based on prior experience with teaching DT in the context of entrepreneurship.

Lastly, in order to answer the overarching research question and explain how EM plays a role in entrepreneurial action, I also describe the way EM influences an entrepreneur's world view, and their choice in responding to entrepreneurial stimuluses, such as opportunities. I show congruence between our conception of EM and existing literature and elaborate on the way EM impacts goal achievement/venture creation. I link EM with a model from cognitive psychology called the Rubicon model. This model shows the stages that people move through in their quest to achieve challenging

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[1] The use of "we"/"our" denotes work that was carried out in conjunction with others, the use of "I" denotes work carried out by myself in writing this thesis.

goals, and the role of mindset in this process. The model highlights the two key mindsets used by entrepreneurs: elaborative mindset and implementive mindset.

The thesis is based on 9 individual research articles. These articles use a variety of methods, including qualitative, qualitative, case studies, participant observation, surveys and interviews. The range of articles and methods provide a way to triangulate the perspectives discussed, and each article contributes to the research questions in different ways, with a sense of overlap often existing between the articles. As a body of work, this thesis represents contributions in the form of providing a new conceptualisation of EM and provides a synthesis of existing perspectives. If offers up several new models of the role of EM in influencing behaviour of entrepreneurs. The thesis also provides a new method of measuring EM and provides insight into how to teach EM in a way that has not been fully researched before. Like all pieces of research it also opens many new questions as well as providing new insights on old questions. This thesis plays a role in furthering our insight in the role of EM in creating entrepreneurial outcomes.

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1   The foundation and introduction to the thesis

1.1   Introduction

Entrepreneurship has more relevance today than ever before (Neck & Greene, 2011; Shepherd, 2015). As a species, humanity is facing many challenges: low global growth, environmental instability, increasing inequality, and sinking standards of living in some parts of the developed word. Governments are increasingly looking towards entrepreneurship in the hope that it will provide innovative solutions (European Commission, 2006). Entrepreneurship is perceived as having the unique potential to enable business growth and to contribute to solving major societal problems (Ireland, Hitt, & Sirmon, 2003; Kuratko & Morris, 2018). To quote Morris, Kuratko, and Cornwell: "*A new wave of economic development is sweeping the world, with entrepreneurship and innovation as the primary catalysts. Yet the entrepreneurial imperative involves much more than encouraging people to start new ventures. Rather, it encourages a mindset that centers on seeking opportunities, taking risks beyond security, tolerating failure, bootstrapping, creatively leveraging resources, and having the tenacity to overcome obstacles and push an idea to implementation*" (2013, p. x).

The need for more entrepreneurial outcomes to solve the challenges facing the world is apparent (Shepherd, 2015), and entrepreneurial mindset ("EM") is touted as playing a role in bringing about these entrepreneurial outcomes. Yet, when you ask those same people who promote an EM exactly what an EM is, we often see definitions that are remarkably similar to those above, things like: seeking opportunities, taking risks or leveraging resources – yet all of these do not occur inside the mind, and are simply different categories of actions. I do not wish to downplay the role of action, as entrepreneurship is ultimately about acting. It is insufficient to simply have good ideas, an entrepreneur must act on them in order to be an entrepreneur (McMullen & Shepherd, 2006). Yet, this provides no further insight or clue as to what is the specific mindset that allows individuals to act, or what takes place inside an entrepreneur's mind that causes them to act – in other words, as to the specifics of EM.

There are many who want to be entrepreneurs, or who are capable, but who for some reason never quite get there. By way of an example, attend any social gathering and when you explain that you study entrepreneurship, many of those you're talking with will express their desire to start a

business. If you meet these same people a year later, it's likely only a few of them would have acted to start their own business. To demonstrate this point, it is worth running a quick mental experiment

Assume a group of 100 nascent entrepreneurs were gathered, all of whom had been pre-selected based on having the same level of intention to start a business in the coming months. If this group was surveyed 12 months later, the group could be split into several sub groups. Those who still had the intention to start (but had not); those who had given up (without acting) and no longer had the intention to start; those who had started their business; and finally those who had taken action to start/had started, but had subsequently given up. Figure 1 sets out a visual representation of the change in the group.
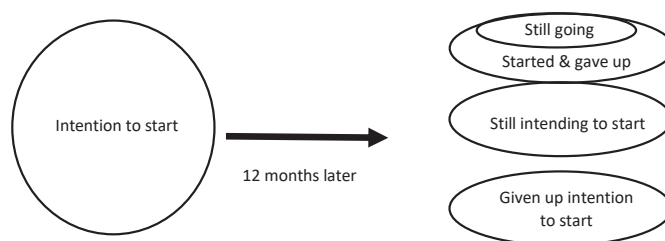
Figure 1 Example of how a group of nascent entrepreneurs could be classified after 6 months

Assuming that those gathered were all based in the same geographical region, this would eliminate any major differences in terms of environment, or access to opportunities. This places the level of analysis at that of the individual, and presumes that there is some difference between each of the final 4 subgroups that explains the outcomes, and presumes that the resulting difference is not due to luck or chance. The aim of this thesis is to explore that difference, using the concept of EM as an explanatory variable.

To begin the discussion on EM, we must first step back and examine intentions, as intentions are the bridge between action and mindset. Differences between intentions and outcomes are important because within the last three decades, research has indicated that intentions are a reliable (and for many the most effective) predictor of actual behaviour (Ajzen, 2011; Ajzen & Fishbein, 1980; Krueger & Carsrud, 1993; Shaver & Scott, 1991). In psychological literature, intentions have proven the best predictor of planned behaviour (Bagozzi, Baumgartner, & Yi, 1989), particularly when that behaviour is rare, hard to observe, or involves unpredictable time lags (MacMillan & Katz, 1992). As our mental experiment points out, that if we control for level of intention, environment, and access to opportunities, then what you are left with is some difference in cognition. That is, what makes the difference between those who take entrepreneurial actions and those who don't can be attributed in some way to what takes place between the ears.

Krueger (2007) summarises this well by saying that:

> *"Behind entrepreneurial action are entrepreneurial intentions;*
> *Behind entrepreneurial intentions are known entrepreneurial attitudes;*
> *Behind entrepreneurial attitudes are deep cognitive structures;*
> *Behind deep cognitive structures are deep beliefs." (P.124)*

If we can understand the deep cognitive structures and beliefs that exist in entrepreneurs, then we can begin to understand EM. This will provide a path forward for research, and greater clarity on what it is and how to teach EM to others (Krueger, 2007). The field of cognitive psychology defines mindset as: the sum total of the cognitive processes activated to best solve the task (Peter M Gollwitzer & Bayer, 1999). I therefore use mindset as the label to describe the sum of cognitive processes involved in taking entrepreneurial action under uncertainty. I argue mindset plays a crucial role in explaining the difference between those who have the intention to do something and never get there, compared to those who intend to and are successful in doing so. So, while intentions are the bridge between action and mindset, intentions are insufficient to explain the differences in action. We must dig further into the cognitive processes that make up EM.

1.1.1   Research Question

To guide the research into this topic, I begin by framing my research questions. The overriding research question is: W**hat is the role of entrepreneurial mindset in separating those who take entrepreneurial actions from those who have the intention to take entrepreneurial action but never do so.**

In order to fully examine this question, I explore the subject using three research questions that inform the answer to the overriding theme. I now set out these questions, by briefly positioning them within the context of existing literature.

1.1.2   RQ 1 – Reconceptualising the definition an EM

The concept of EM has been used by practitioners to describe a necessary competency, often listed as a learning outcome in course descriptions, and participants at scholarly conferences use the term widely and freely (Lynch & Corbett, 2019). Within literature we have seen a number of articles reference its existence, both in their titles and their topic of discussion. Neck and Corbett (2018) tell us that EM is at the core of entrepreneurship and is how we can help nascent entrepreneurs successfully develop their ventures. However, these same authors concede that top entrepreneurship researchers and educators conclude that it is "… unclear exactly what this skillset or mindset actually are" (2018: p. 20).

Despite its growing usage, there has been little attempt to define what is meant by an EM (Naumann, 2017). Within the entrepreneurship literature, there have been what we label as 'high level' descriptions of what kind of outputs an EM might produce, such as a growth orientation that emphasizes flexibility, renewal, and other related concepts (Ireland et al., 2003; McGrath & MacMillan, 2000; R. K. Mitchell et al., 2002). However, these high level descriptions only propose the ways individuals with an EM are expected to behave, and do not define or explain what an EM is or how it impacts the venture creation process. Hence, the label high level - it's as if they are viewing the phenomena from a high level: it is easy to discern what you are looking at, although the details and nuances are too distant to be described in a meaningful way.

At the same time, many scholars have made contributions by investigating distinct attributes of EM by borrowing concepts from psychology, such as heuristics (Busenitz & Barney, 1997), biases (Baron, 1998; M. Simon, Houghton, & Aquino, 2000), cognitive adaptability (Haynie & Shepherd, 2007, 2009) and meta cognition (Haynie, Shepherd, Mosakowski, & Earley, 2010; Haynie & Shepherd, 2009). However, the boundary conditions of these papers have them focus on individual attributes of an entrepreneur's cognition (and not the full construct of EM). These are the exact opposite of the high level descriptions mentioned so far, they are so detail orientated that it is difficult to get a full understanding of what is meant by EM. Extant literature explains well these different specific attributes of EM, while also exposing a need for greater clarity on the complete construct of EM (Grégoire, Corbett, & McMullen, 2011).

While there is a general acknowledgement that cognitive structures play a role (Krueger, 2007) there is still only superficial conceptualisations of what those cognitions are. I therefore set out to conceptualise what EM is, and how it contributes to individuals taking entrepreneurial actions under a cloak of uncertainty. This leads to the research question:

How do we define and conceptualise what is meant by an EM?

Visualising this research we present Figure 2.
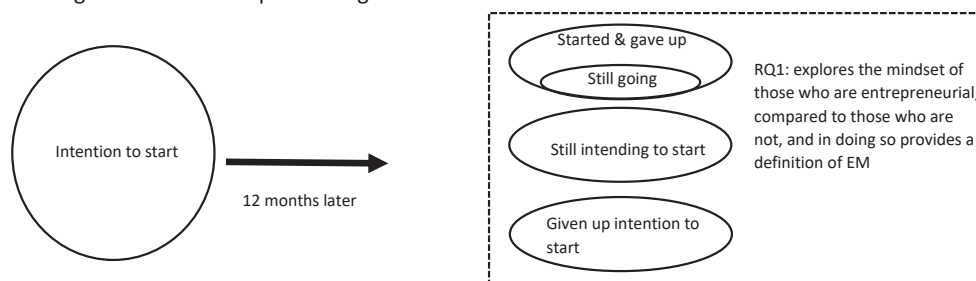
Figure 2 Visualising research question 1

1.1.3 RQ 2 How can we measure EM

Once we have conceptualised what we mean by an EM, the next logical step is to try to measure EM and see if we can find empirical evidence to support the conceptualisation we derive through answering the first research question.

A number of attempts have been made before to measure EM, such as Davis, Hall, and Mayer (2016) or Obschonka and Stuetzer (2017). However, many of these attempts focus either on personality traits, skills or learning outcomes. Yet, given the conceptualisation that EM is a about deep cognitive structures, these measurements are not consistent with the constructs they claim to be measuring (although they might be measuring something else of value).

We therefore seek out a novel method for measuring EM, that is consistent with the conceptualisation of EM being about deep cognitive structures. Measuring thoughts directly is currently not possible. While asking people what they are thinking is fraught with bias and issues such as people having insufficient self-insight to explain their thinking. We instead rely on the assumption that what we talk about and how we talk about these subjects reflects how we think (Gartner, 1993). We use language as a de facto measure for cognition and use a grounded approach to look for evidence of an EM. This lays the foundation for the second research question, which is:

How can we measure entrepreneurial mindset?

Visualising this research we present Figure 3.
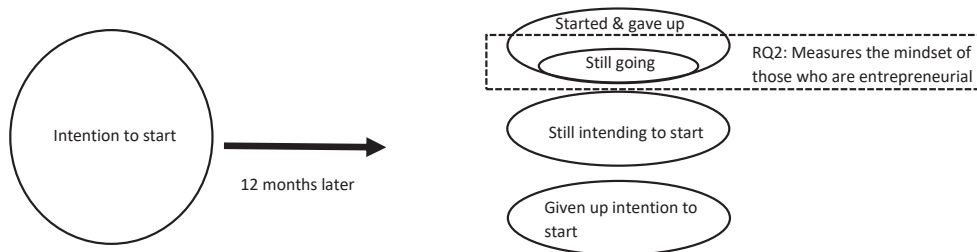
Figure 3 Visualising research question 2

1.1.4 RQ 3 What are the outcomes of teaching EM

There is a broad field of research that is purely focussed on entrepreneurship education. Within this field scholars are discussing how to teach entrepreneurship and which outcomes to expect from different teaching methods (Fayolle, 2013, 2018; Neck & Greene, 2011; Pittaway & Cope, 2007).

The literature surrounding teaching entrepreneurship is where EM has gained the most attention as a subject. Here there is an abundance of literature stating the need to teach EM, and the intention to

teach it, or in some cases claiming they have managed to teach EM (Bilán, Kisenwether, Rzasa, & Wise, 2005; Daniel, 2016; G. R. Mitchell, 2007).

As the research space on teaching entrepreneurship is a crowded one, we therefore limit ourselves to the niche of using design thinking ("DT") as a pedagogy for teaching students to have an EM. DT has been proposed as a way of teaching EM to students (Daniel, 2016; Neck & Greene, 2011; Nielsen & Stovang, 2015). DT has been gaining popularity within entrepreneurship education in recent decades (Huq & Gilbert, 2017; Lahn & Erikson, 2016), yet there is limited insight into how this is perceived from the students' side, and what the outcomes from this style of teaching are. The final research question is therefore:

Why is DT a useful pedagogy for teaching EM?

In answering this question we also provide concrete normative suggestions for how to teach DT, and use student reflections to justify why this pedagogy is relevant. We end with a cautionary section on the potential consequences of trying to influence students' mindsets.

Visualising this research we present Figure 4.
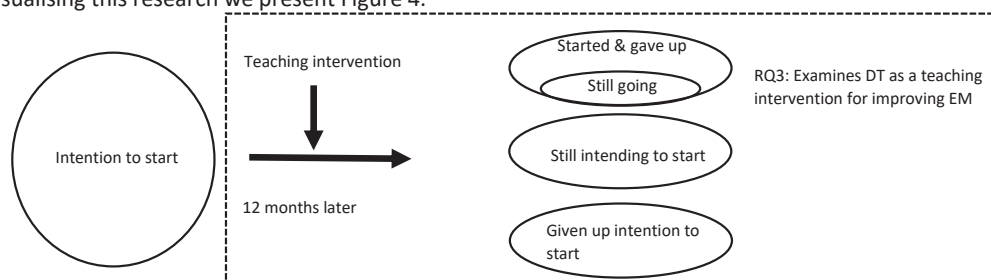
Figure 4 Visualising research question 3

While these research questions may seem broad, and arguably each question could form a thesis in or of itself, I see the need to look at all three questions together. The logic behind this is that answering question one by itself is of no interest, as merely describing an EM does not have any meaningful impact for society. It is only when we are able to teach EM to students that we are able to enact real change. However, question three cannot stand alone. In order to teach something, we must first know what we are trying to teach, hence question one: what is an EM? However, in order to know whether the teaching interventions are effective, we must have some way to measure EM. Hence the need for question two. When we know what an EM is and can measure it, then we can assess whether the teaching of EM has positive impact on students. In this way the research in this thesis can go on to have a practical impact on society by preparing and encouraging students to have an EM, which will in turn increase the entrepreneurial actions they take under a cloak of uncertainty. Entrepreneurship is not just about economic development and technology commercialisation;

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entrepreneurship is a force for bringing about transformation in society (Sarasvathy & Venkataraman, 2011). More than ever, we need entrepreneurs to be the catalyst for change given the challenges our society faces.

1.2   Outline of dissertation

This thesis has six chapters to delve into the answers to my research questions. This introductory chapter opens by examining briefly the field of entrepreneurship and the role of EM. In doing so we build three research questions by logically laying out the reason for the research approach. I then discuss the theory of science and our methods for investigating and answering the research questions. Chapter 2 then summarises the nine pieces of research written up in the form of conference articles and published articles. Each article is summarised with a description of the article, the research question addressed, methodology, findings and contribution to the thesis. Each article detailed in Chapter 2 is attached as an appendix to the thesis.

The following three chapters broadly follows the structure of the research sub questions. Each of these chapters has the same basic structure, which is that it opens with a discussion on the current theoretical perspectives, followed by a summary of the hole in the field of research. The chapters then proceed with a discussion of the research question, whereby reference is made to my own prior research. In this discussion I attempt to answer the research question for the chapter. The three chapters are Chapter 3: The conceptualisation of EM. Chapter 4: Measuring EM. Chapter 5: Teaching EM. To conclude the thesis there is a discussion of the overarching research question with reference to the discussion in the prior three chapters. The thesis finishes with limitations of the research, and suggestions for future research in the field, before providing concluding remarks and implications.

1.3   Philosophy of Science

> *Entrepreneurship is an applied discipline, yet we are teaching and researching as if it was part of the natural sciences (H. A. Simon, 1996).*

Popper (2005) arguably set the gold standard for what was considered good science, arguing that nothing can truly be proven, only disproven. His view was that science based on induction could only, at best, provide support for a hypothesis, and that a singular occurrence that contradicts a theory is sufficient to disprove it. While there is an inherent logic to this, it sets an impossible hurdle for the social sciences, whereby isolating and controlling for singular cause and effect is not realistic, and even if it was possible it would result in such contrived laboratory experiments with humans that the results would ultimately be meaningless due to them being so far divorced from reality. Given that theory is supposed to be a representation or map of how reality works, having such a disconnect between the map and reality would render the theoretical insights meaningless.

At best, social sciences can hope for correlation between phenomena (Lackéus, 2014; Shadish, Cook, Cook, & Campbell, 2002). Critics argue that the search for cause-effect is largely inappropriate, especially in the field of entrepreneurship and education where people's beliefs, hopes and intentions lead to contextual and largely non-causal practices (Biesta, 2007; Olson, 2004).

Criticism of this positivist point of view are not new, Michael Polanyi wrote of his criticisms of a purely positivist view of science at the start of the 20th century. He argued that personal commitments play a role in science and denied that the scientific method can yield truth mechanically (Polanyi, 2012). He also argued that the assumptions underlying critical philosophy are false, and undermine the commitments needed to advance science. This is particularly relevant in the field of innovation and entrepreneurship, where personal commitment to the unknown is required to move the field forward. Polanyi rejected both the empiricists who claimed all experience could be reduced to data and the notion that everything was based on perception. He identified the concept of "tacit knowledge", whereby we know more than we realise we know, and we know more than we can put into words or explain. In his later works, he criticised having a mechanistic view of the world, in which everything could be explained through simplified cause and effect (Polanyi, 1968). Instead, he emphased the concept of emergence, claiming that there are several layers to reality and causality. This is of particular relevance in the field of entrepreneurship given that the phenomenon can be studied at the level of individuals, teams, organisations, incubators, geographies or even of countrywide policies. There is a range of factors at play and to search for singular causes to explain entrepreneurial outcomes feels naïve at best, and delusional at worst. Therefore, there is a need to accept that phenomena can be viewed from multiple levels without there being conflicting logics (Aksoy et al., 2013).

My philosophical standpoint is closely aligned with the philosophy discussed above, whereby I posit that experience cannot be reduced to data. Rather, at best data can inform our understanding of a phenomena at the level it is being examined. However, viewing the same phenomena from a different level would yield a different explanation. Therefore, in examining the concept of EM, I accept that there is no one answer; instead there is a multitude of explanations. The analogy of the blind men examining the elephant seems appropriate here. There were several blind men, each examined a different part of an elephant, and in doing so came up with very different explanations of what an elephant is based on their experience. Each is correct in describing their own part, but all are incorrect in explaining what an elephant is. In the same way, researchers can contribute a better understanding of individual parts while not explaining the entirety of that being studied.

Finally, there is the element of practice to consider with regards to the philosophy of science. While it might be intellectually stimulating to argue over how we know knowledge to be true, there is little relevance in these arguments to the average entrepreneur starting their business. To them, what is important is not how we know (or even what we know), but rather what works. Researchers in our field have become so divorced from our subject of study that we seem to be of little relevance to those who actually practice entrepreneurship.
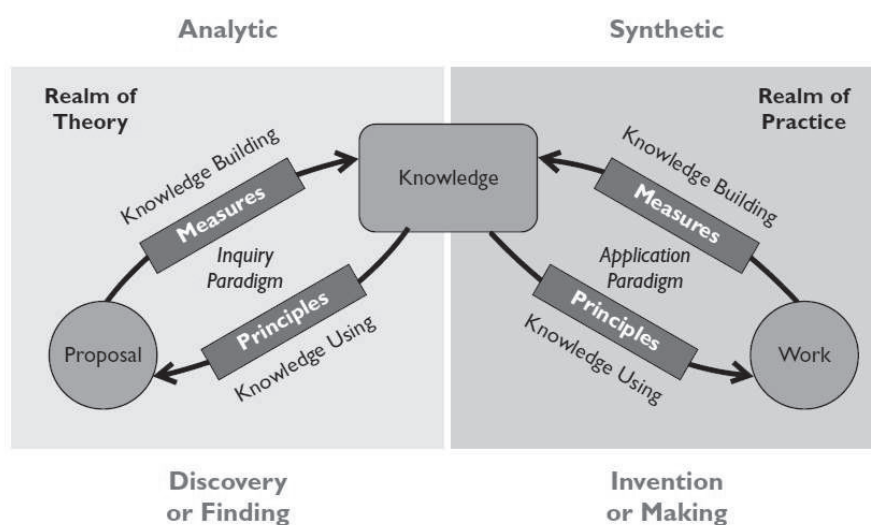
Figure 5 Building and using knowledge (Beckman & Barry, 2007), originally in (Owen, 1998)

The issue is that there has been a separation in the field of knowledge being generated in the realm of theory (see Figure 5) versus that which is generated through the realm of practice. This is due to an issue of agency – that is, a separation between those of us generating knowledge in the field of theory compared to those generating knowledge through the field of practice. As researchers we can philosophise about entrepreneurship, but we have no skin in the game (Taleb, 2018). The knowledge we generate creates a risk for entrepreneurs if they choose to follow it and it turns out that the advice from research resulted in generating results other than expected. We as researchers have no exposure to these risks and can easily pontificate as to how entrepreneurs "should" be behaving. Yet if this advice turns out to be false we suffer no consequences, and can attribute the unexpected results to the messiness of working in the social sciences.

Further exacerbating this situation is the power structures that exist within academia that impact what constitutes knowledge, what incentives exist for doctoral students, and the gate-keepers of knowledge in the form of academic journals. In the process of generating the body of work for this PhD, I have come across fewer than a half a dozen articles that have some form of practical

importance for an average entrepreneur. Yet, as a field we still seem to perceive ourselves as producing relevant research that is still relevant for practitioners (Wiklund, Davidsson, Audretsch, & Karlsson, 2011). To me the largest source of knowledge that appears to be relevant for actual entrepreneurs seems to come from the meritocratic sources of blogs, podcasts and to a lesser extent 'how to' books produced by those with a track record of doing.

Should we be concerned by this lack of relevance to entrepreneurs? I believe we should, as we should leave philosophising to philosophers, and instead recognise the practical reality of entrepreneurship, and focus instead on generating knowledge that is measured in terms of its quality based on its usefulness to practitioners of entrepreneurship, not as based on peer reviews of other academics sitting in their offices with little to no exposure to the actual field of entrepreneurship. This argument about the failure to connect theory to the concrete reality of everyday life is not a new one, and dates back at least to the philosophy of pragmatism movement that began in the 1870s. Particularly comforting is the perspective of William James, who states that the truth or meaning of a statement is to be measured by its practical consequences. He argued that truth was a relative term, which was dependent on the user's perception of what truth was. In this sense, he argued you could either say it is true because it useful, or that it is useful because it is true. The implication is that searching for truth cannot be disconnected from usefulness, and usefulness is decided by those who use the "truth" found through knowledge generation. The argument is circular in nature, albeit has an important lesson for the author: research is only meaningful to the extent that it is useful. In this sense, the quest for understanding EM and measuring EM is only useful if it leads to changed behaviour in terms of teaching others to have an EM, and that this in turn is predicated on learning to have an EM leading to individuals generating better entrepreneurial outcomes.

Returning to the gold standard set by Popper, data is collected to build theory. Theory is considered useful in the extent that it can predict or inform us about future states or provide some form of guidance about the most desired course of action. However, underlying this perspective is a hidden assumption. That assumption is that the future reflects the past. If we stop to consider this, then we can see that this assumption is tenuous at best. The story of the turkey is an eloquent analogy: to the turkey the farmer is a benevolent and generous provider of food, shelter and protection. All the data the turkey collects supports this perspective, until the evening of Thanksgiving, at which point the turkey becomes sacrificial. The futility of predicting the future is therefore obvious, as is the fallacy that Popperism can yield meaningful predictions about the future (Taleb, 2007).

Frank Knight was an economist who made the distinction between risk and uncertainty (Knight, 2012). He argued that there was difference between risk and uncertainty: risk was something that could be calculated as long as the right information could be gathered. Whereas uncertainty is when it is not possible to know all the information needed to understand the odds. Knight labelled this as true uncertainty and points out that it is not possible to measure. Mathematical work by Taleb (2007) shows that Knightian uncertainty as a concept does not go far enough, and rather the future is unknowable. Instead, what we experience in the world is true uncertainty in the sense that we cannot guarantee any connection between the past and future events. This might seem like splitting hairs but is of philosophical importance. If we accept that the past does not determine the future, then we must also accept that theory as a model or map of the future is inherently flawed. This is important because we use theory and predications as a kind of map to steer future actions. Taleb (2007) argues that this leads to a false sense of security as we steer by a map (made based of prior roads we have driven) instead of steering by looking out the front window. He goes on further to argue that it is not just that the map is lacking in important details, the map itself is not for the territory where we are navigating and is therefore patently wrong. Again, using an analogy, Taleb asks whether we would prefer a pilot flies a plane based of an incorrect map, because that is the best they have, or the pilot to fly based off looking at what they can see ahead of them.

Taking this a step further, entrepreneurship as a field has the express purpose of ensuring that future states do not reflect past states (Sarasvathy & Venkataraman, 2011). The purpose of entrepreneurship is to act on opportunities and to bring them into existence; this act of creation ensures that the status quo is not continued. Underlying this perspective is that the future is not set, but rather something that emerges based on an interaction between an internal state and the external world (H. A. Simon, 1996). That is, entrepreneurs desire a future state, and through interacting with the external world they attempt to bring it into reality. Therefore, the logical assumption that the past leads to the future begins to break down in the face of this perspective that the future is created through an emergence of individual desires being inflicted on their external realities. Under a positivist perspective we can study how this has occurred in the past, although we cannot say anything about how this will occur in the future.

Applying these perspectives to the typical topics of discussion around the philosophy of science, that of reliability and validity, I can begin to summarise my own perspective on this. On the topic of reliability, if we assume that the future will not reflect the past, then concept of reliability has little meaning. The thing we can state with certainty (or reliability) is that the future will not reflect the past. In this sense, striving for the unachievable seems pointless, if not foolhardy.

Validity of the findings then might be summarised as the accuracy of the data in explaining the observed outcome. As discussed, searching for a singular explanation of social science phenomena sets an unrealistic view of the cause and effect nature in relation to humans. The phenomenon can be explained from multiple levels of analysis. As such, searching for valid findings in this context takes on the meaning of how closely explanations fit the observed phenomena. Given the ability to view these phenomena from varying perspectives or levels of abstraction, it is impossible to comment on the subjective truth or validity of findings.

I therefore summarise this section by reference to pragmatic truth, in which the study of entrepreneurship should stay focussed on what works, based on this craftsmanship perspective in which knowledge is built up through experience – a perspective which has long since fallen out of favour with university institutions and the gate keepers of knowledge connected to them. As the opening of this section says, entrepreneurship is not a natural science, but an applied discipline. I am of the opinion that we need to treat entrepreneurship as a form of tacit knowledge, closely resembling craftsmanship, that likewise needs to be cultivated through practice and experience.

Although, in complying with the requirements set out by the gatekeepers of knowledge, I have produced multiple pieces of research that follow a more traditional philosophy of science, and the next section sets out the details of the methods used to do so. Although I fear the pieces of research fail to live up to my own criteria for knowledge, which is: "Is it useful for those who practice?"

1.4 Methodological considerations

During the four years carrying out research connected to this thesis, a range of research methods have been used in order to gather data and insights into the research questions. Using a mixed method or triangulated approach allowed me to examine the phenomenon of EM from different angles. This approach also recognises that there are limitations in each methodology, and by applying multiple research methodologies I hoped to build a more robust understanding. These methods have contributed to a number of articles, nine of which have been selected for use in this thesis. This section covers the methods used for the articles and the thesis. While the articles are summarised in the next chapter, for ease of reference we provide a table of the nine articles here.

Table 1 Summary of research articles

Article:	Title:
1	Entrepreneurship: What separates those who do from those who don't
2	Levels of internal resistance
3	Entrepreneurial mindset(s) and cycles of learning
4	The language of successful entrepreneurs: an empirical starting point for the entrepreneurial mindset

5	Entrepreneurial mindset: an empirical starting point
6	Examining entrepreneurial motivations in an education context
7	Educating entrepreneurs in practical methods with design practices as a guide
8	Combining technology and entrepreneurial education through DT
9	Promoting strategic entrepreneurship at the firm level

In brief, the methods applied are: participant observation, case studies, surveys, interviews, quantitative measurements, qualitative coding and interpretation of data. Each of these has contributed to my overall understanding and informs the discussion of the research questions. In order to provide more insight into how each method has played a role, I have provided a brief description of the methods used in this thesis.

1.4.1.1 Participant observation

The use of participant observation and ethnographic methods in general are not new to innovation and entrepreneurship studies (Hoholm & Araujo, 2011; Ness, 2017). It makes sense that we would borrow established methods from disciplines engaged in human research (Hanington, 2003), given that entrepreneurship is largely focussed on humans in the process of venture creation. As a result, there has been calls to make greater use of ethnographic methods for studying innovation and entrepreneurship that allow for exploring concepts in greater depth and that create rich material (Van Maanen, 2011; Watson, 2011). With phenomena such as entrepreneurship, it is not the same as typical social science studies that measure 'input' and resulting 'output' to demonstrate cause and effect (Hoholm & Araujo, 2011). Simply measuring hard facts would be insufficient to demonstrate the nuances of the factors that play a role in influencing EM, and ethnographic studies offer a way to provide 'thick descriptions' of the social contexts being studied (Geertz, 1973).

Participant observation has been used in the form of teaching entrepreneurship and innovation courses at Universities, start-up ecosystems and corporate companies. A non-exhaustive list is included below:

Table 2 Non-exhaustive list of teaching experience

Location	Course	Year	Role
HiØ, Fredrikstad	Creativity & Entrepreneurship	2016, 2017, 2018, 2019	Lecturer, mentor
HiØ, Fredrikstad	Student Entrepreneurship	2016, 2017, 2018, 2019	Lecturer, mentor
HiØ, Fredrikstad	Innovation & Entrepreneurship	2017, 2018, 2019	Lecturer, mentor
NHH, Bergen	DT: Strategic design for innovation	2017, 2018, 2019	Guest lecturer

Corporate Training, Olso/Singapore	Leadership Potential	2017, 2018, 2019	Facilitator, mentor
Smart Innovation Norway, Østfold	Pangstart Incubator	2017, 2018, 2019	Mentor
BI University, Oslo	Bachelor level entrepreneurship courses	2019	Lecturer, mentor
UiT Tromsø	Corporate entrepreneurship	2015	Teaching assistant, mentor

These teaching experiences, and specifically observing students learn the process of entrepreneurship and how to be more innovative has informed both the research question about defining EM (RQ1), but also how best to teach EM to students (RQ3). Particularly useful has been the more informal mentoring roles of helping groups and individuals with their businesses. This has played a role in the kind of abductive reasoning that allows new propositions and paths of research to formulate in the researcher's head.

Table 2 covers the main teaching roles I have held over the last four years, however, there have been a number of shorter engagements that at times have been equally informative, such as being involved in innovation jams at places such as NMBU, BI Business School and Kirkenes Businessgarden (Kirkenes Næringshage). Each engagement was an opportunity to observe differences in individuals between those who managed to take action versus those who for whatever reason did not.

The observations from the teaching at UiT Tromsø and the corporate training have fed directly into two articles (articles 8 and 9).

1.4.1.2   Case studies

A case study approach (Yin, 2009, 2011) has been used for two of the articles in this thesis (article 8 & 9). Data collection in a case study works on the principle of triangulation, applying multiple sources of evidence in order to search for convergent points between different sources, and thereby strengthening validity (Yin, 2009). Sources of data we have used include emails, reflection circles, written learning journals, course descriptions, meetings with company representatives, written course feedback, observations (detailed in the prior section), interviews and informal conversations. The approach has been to cast a wide net in terms of data collected, and to see what is relevant. Carrying out research in real-time means that it is not always clear what is relevant at the time, and often the significance of data gathered is only apparent at a later stage (Hoholm & Araujo, 2011).

One of the main benefits of the case study approach is the richness of the material that it allows you to gather. Having multiple sources of data also allows the researcher to look for congruence

between differing data sources to support validity. However, case studies normally have the down side of low generalisability given the specifics of the cases involved.

1.4.1.3 Surveys

Surveys have not been the main basis for this thesis, however, they have been used in order to better understand students' motivations with regards to entrepreneurship, and their experiences of receiving entrepreneurship education in general (article 6).

The survey used was given to students participating in an "innovation competition" where they were presenting the results of their businesses they had started in the prior semesters and were competing with other students from different universities in Norway. The purpose of the survey was to better understand their perceptions and motivations in regard to the education they were receiving.

I have a personal bias against surveys, hence their limited use in this thesis. As I perceive surveys as generally just being confirmatory and used to supported pre-conceived notions. In addition, they do not allow for rich data to become apparent, limiting the depth of insights that can often be achieved through using them.

1.4.1.4 Interviews

Interviews make up a large part of the empirical data used in this thesis, particularly in regard to the research carried out for the second research question (how can EM be measured). I relied on interviews carried out by others that had been filmed and transcribed. These came from cleverism.com and mixergy.com. The reason for using interviews conducted by others was twofold. First, it allowed access to entrepreneurs who it would otherwise have challenging to come in contact with, and second, it made for an efficient process in terms of gathering large amounts of text data that had been spoken verbally by entrepreneurs. This text data formed the basis of analysis for measuring EM using a grounded perspective. The interviews therefore contributed to articles 4 and 5.

I used purposeful sampling (Patton, 1990) to choose the interviews (from Cleverism.com and mixergy.com) for inclusion in the studies. We selected information rich cases for which we could learn the most from, as opposed to a random sampling of entrepreneurs. In doing so, the researcher examines specific interests in the phenomenon, selecting cases of some typicality, but leaning towards those cases for which we can learn the most (Stake, 1995). In this case we were interested in entrepreneurs who had been successful in their startups. Success in this case related to having received equity financing above a certain amount and were still operating as a business.

The transcripts of the interviews were checked for consistency against the audio files for the first five interviews, and no differences were detected. The transcripts were then scrubbed to remove the interviewers' questions and comments. In addition, the introductions such as "My name is…, and I am the CEO of…" were removed, along with the closing comments that typically followed the format of "thank you for taking the time today…".

1.4.1.5   Quantitative approach

Based on the interview transcripts collected online, these were compiled into language databases. Where all the spoken words were gathered into files representing control and test groups, based on arbitrary criteria described in the relevant articles (articles 4 and 5). Then a language analysis tool (Wmatrix) was used to compare differences between the control and test groups in terms of language used by entrepreneurs. Only differences in language use that were significantly different between the control group and test group were analysed. Significance was set for article 4 at 99.99% and with a minimum word usage of 15. This left a pool of 373 words that would form the basis of analysis for both articles 4 and 5. These words alone provided little insight by themselves and required coding by the researchers involved.

1.4.1.6   Qualitative coding

 Two types of coding were used to contribute to this thesis, one type for articles 4 and 5, and another for article 8. For the first type, comparing differences in language use between the control and test group of entrepreneurs led to the aforementioned pool of 373 words that were significantly different. These words were coded into themes by myself in an attempt to create groupings out of the words. This required looking at the words in their context to see how they were being used (see Table 3 for an example). After going through this list of words, an initial list of themes was generated. These themes were then reviewed for similarities and overlap, resulting in a reduced list of themes. These themes form the basis for the later discussion of language use differences between successful entrepreneurs and their less successful counterparts.

Table 3 Example of words examined in context (Lynch, Kamovich, Andersson, & Steinert, 2017)

…ing on it. Why? Because I want to **build** WhatsApp for this thing, I want to…
…e part of the culture, you have to **build** as well as to get these people to un…
…ill start up and it was very fun to **build** something out of nothing and we sort…
…al thought was we would go back and **build** a community of software engineers bu…
…because I have the idea. But let's **build** a company together. So that's the ki…
…same time. That's why we decided to **build** a new solution from scratch , to add…
(note: the analysis tools limits the context to 80 characters including spaces)

There is an additional type of coding that forms the basis for part of the discussion relating to student reflections on DT as a pedagogy (article 8). The coding for article 8 was more involved and required the input of two other researchers (Kjersti Longva and Uladzimir Kamovich). We carried out the coding in two stages: first, two of the researchers coded five essays separately, allowing the data to speak to us, and creating codes as we worked. We then compared codes and cross-references the codes between the two researchers. The remaining essays were then coded. The third researcher then carried out a second round of coding using focussed coding. The objective of focussed coding is to look for recurrent patterns and conceptual similarity among codes (Saldaña, 2015). Coding is a highly iterative process where it is necessary to revise and refine categories and themes throughout the analysis process, the main features of the process can be described as: 1) developing categories from the recoded material, and 2) structuring the categories to arrive at broader themes (see Figure 6).

Coding stage	Reflection essays	Weekly reflection diaries
First cycle coding: **Descriptive coding**	Individual coding of five essays → Cross-referencing and creation of common codes → Individual coding of 22 essays using common codes → Discussion of codes and crosschecking of ambiguous and uncertain cases	Individual coding of six diaries using common codes →
Second cycle coding: **Focused coding**	Focused recoding of essays and diaries → Developing categories from the codes → Developing themes from the categories	

Figure 6 Coding process used in Lynch, Kamovich, Longva, and Steinert (2019)

Having detailed the differing methodologies used during the last four years, we now move onto explaining how these were used to generate discrete pieces of research. The next section therefore provides a summary of nine pieces of research carried out over the last four years. While there was additional research carried out during this time, I have only included those articles that appear to be of particular relevance for the research questions laid out in this thesis.

1.5   Summary of the chapter

This chapter began by introducing the problem statement, which is that the world is facing many challenges, and entrepreneurship is one of the catalysts that can potentially create and implement solutions to these challenges. There are many people who want to engage in entrepreneurship in order to assist with societal transformation, yet they fail to get started. When we remove extraneous factors like education, access to capital, or access to opportunities, then what we are left with are internal factors. When we examine these factors we see that the best predictor of actions is the intention to act, yet it is unclear what underlies these intentions. The answer we propose is cognitive patterns that collectively are known as EM. In order to explore this concept, we set out a primary research question, which is: what is the role of EM in separating those who take entrepreneurial actions from those who have the intention to take entrepreneurial action but do not? In order to fully answer this question, we set out three further research questions, that when paraphrased focus on what is EM, how do we measure it, and how can design be used to teach EM. In order to provide context, I have used this chapter to introduce my philosophy of science, and the methodologies used to answer the research questions. The philosophy of science section concludes that the future is something that cannot be predicted, but rather something that emerges based on people's internal desires that transform into actions that in turn influence the future. As such, recognising the future will be different from the past suggest that we should, at the minimum, be cautious about any attempts to use data to generate theories about what the future will look like. Accepting this disconnect between future and past means we instead focus on a more pragmatic approach where we define knowledge as true based on its 'usefulness'. These perspectives mirror some of those perspectives held by those who also research intersection between design and entrepreneurship, such as Saravassy, Simon, Leifer and Steinert. The methodologies used in this thesis are also outlined and include case studies, interviews, quantitative and qualitative methods, participant observation and surveys. Chapter 1, as it stands, provides the framework on which the remaining five chapters

are built, before addressing each of the research questions in chapters 3 through 6. The next chapter introduces the research behind this thesis.

2 Research underpinning this thesis

This chapter provides a summary of the research carried out during the last four years and links my articles together by first discussing the contributions that the articles and this thesis make to the field of entrepreneurship. Then these articles are mapped against the research questions in order to provide some insights into the way each article contributes towards answering the research questions.

2.1 Contributions

The intended theoretical contribution of this thesis is to provide a clearer conceptualisation and definition for the concept of EM. In doing so we create a synthetic consensus amongst entrepreneurship literature and extend the theoretical clarity of the concept of EM by bringing across new perspectives from the field of cognitive psychology.

We raise an important question regarding the difficulty of measuring mindset at the right level of detail. This is based on the fact that much research has been done into specific elements of cognition, however, this does not reflect the fluid and changing nature of EM. In addition, there has been many high level discussions around what behaviours EM is likely to lead to. However, this level of analysis is likely too broad to be useful to entrepreneurs. Therefore, one contribution is to raise awareness of this challenge for the field of entrepreneurship and highlight that resolving this dilemma would provide a fruitful path forward for the field.

The research also provides a new methodological approach to measuring the concept of EM that provides insights into how language can be used as a de facto measure of thought patterns. As thought itself cannot be measured directly (with current technology), we are pressed to find alternatives that can inform our perspective of what these mindsets look like.

The research is intended to provide an empirical basis to support the above conceptualisation of mindset, in the hope that theory matches with data collected from a grounded perspective. While these initial insights are rather tentative, they do point towards a path for future research.

I provide insights into how EM can be taught using DT as a practice. There has been little in the way of research into how students receive DT as a pedagogy. We therefore aim to inform on what students feel they have learned, and to inform on the ways in which taking DT courses leads to behaviour changes.

The final contribution is that we show how EM acts as a lens that filters out or enhances opportunities, which in turn trigger responses in entrepreneurs in the form of taking action. This

stimulus/response perspective demonstrates the role EM plays in separating those who take action from those who do not. It brings together all of the elements discussed in the thesis by drawing on the elements of cognitive choice and shows that the entrepreneur's mindset allows them to learn in their quest for goal achievement.

Collectively these contributions progress our understanding of the concept of EM, and in doing so hopefully moves the field forward.

Visualising these contributions below shows the ways individual research articles have contributed to answering the research questions. We provide a summary of each article in a later section (see section 1.3).

These contributions come from nine pieces of research which are summarised in the next section (see section 2.2). In order to visualise these articles in relation to the research question, I have created Figure 7, which maps the articles in relation to the research questions.
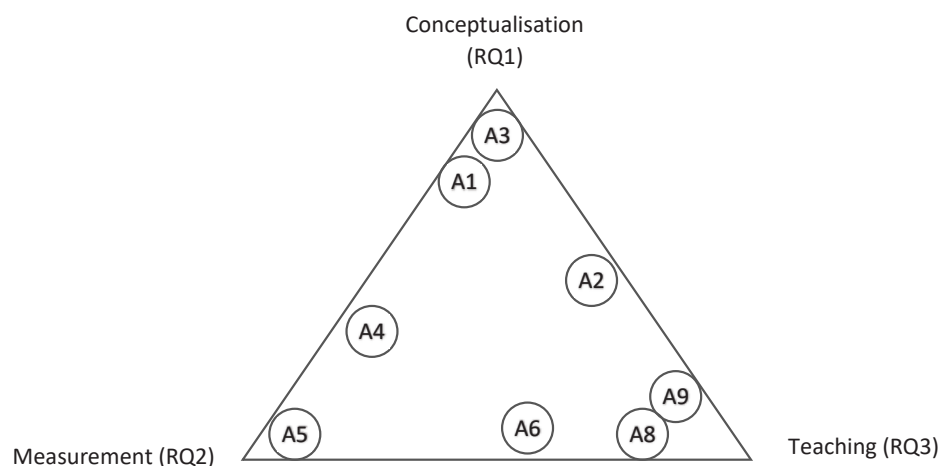
Figure 7 Articles in this thesis and their relation to the research questions

The first three articles are conceptual in nature. Article 1 deals with the role of EM in separating those who take entrepreneurial actions from those who don't. Article 2 links different elements of EM together into a model that can be used for teaching interventions, and therefore contributes to two research questions. Article 3 is purely theoretical and builds our conception of what EM is.

Article 4 uses a grounded empirical approach to explore both measuring EM, but also conceiving what it is, and therefore contributes to two research questions. Article 5 is purely focussed on examining the findings of Article 4, but with a differing context. Article 6 digs into what those who

study entrepreneurship find motivating, and therefore has some influence on what is taught, as well as informing what we can measure in the future. The final two Articles (8 and 9), delve into how EM can be taught using DT as a pedagogy.

2.2 Research papers summary

2.2.1 Article 1: Entrepreneurship: What separates those who do from those who don't
Published: Conference proceedings for The 4th International Conference on Design and Creativity, 2016.

2.2.1.1 Introduction and research question
This article examines the question of what separates those who have the intention to start but do not manage to from those who have the intention and mange to start. The article sets out some assumptions that guide the discussion towards cognitive or psychological elements, and that the level of analysis is set at the level of the individual. The purpose of the article was to delve into existing theoretical perspectives to highlight what the current conversations in academia were saying in regard to the question of what separates those who take entrepreneurial action from those who only have the intention.

2.2.1.2 Theoretical orientation
The article draws on a wide range of work from the field of entrepreneurship and at times cognitive psychology. Specifically, it delves into personality, intentions, perceptions of reality and beliefs. The article uses existing literature to generate a synopsis of existing perspectives within the field of entrepreneurship.

2.2.1.3 Methodological approach
The article is theoretical in nature, and therefore builds on the work of other researchers.

2.2.1.4 Findings
The article reflects the fact that it was an initial publication in my PhD, and as such is equally about finding my place within the field of entrepreneurship. The article identifies the need to dig further into psychological literature to better understand the deep cognitive structures of entrepreneurs. It also highlights that prior research in personality do not offer a way forward in understanding what drives some people to be entrepreneurs, while others get stuck along the way.

2.2.1.5 Contribution to the dissertation
The article contributes to the dissertation by highlighting the need for further research in the field of cognition and EM. The article raises more questions than it does satisfying answers. However, it does create boundaries for the ongoing research by ruling out certain avenues of research such as the personality or traits perspective. The main contribution is therefore to clarify the path forward for ongoing research into EM.

2.2.2 Article 2: Levels of internal resistance in entrepreneurship

Published: GSTF Journal of Business Review, 2018

2.2.2.1 Introduction and research question

This article was inspired by experience with teaching students, when I noticed that some students understood what needed to be done, and at some levels even wanted to continue pursuing their entrepreneurial ideas, however, for some reason were stuck or sat fast in their process of starting. Therefore, I decided to examine the concept of internal resistance, and what psychology could offer in the way of guidance for overcoming this resistance. The research builds a model of differing levels of internal resistance, and how this relates to the field of entrepreneurship.

2.2.2.2 Theoretical orientation

The article draws on work from the field of psychology, in particular the work of J. O'Connor and Seymour (2011) who created a model for guiding intervention with clients who were facing resistance to change. The article draws on existing work in the field of entrepreneurship to integrate the model.

2.2.2.3 Methodological approach

This article uses research from the field of psychology and entrepreneurship to synthesise new perspectives.

2.2.2.4 Findings

The research builds a model of differing levels of internal resistance, and how this relates to the field of entrepreneurship. The results of this work are a model that can help guide interventions for those who teach entrepreneurship.
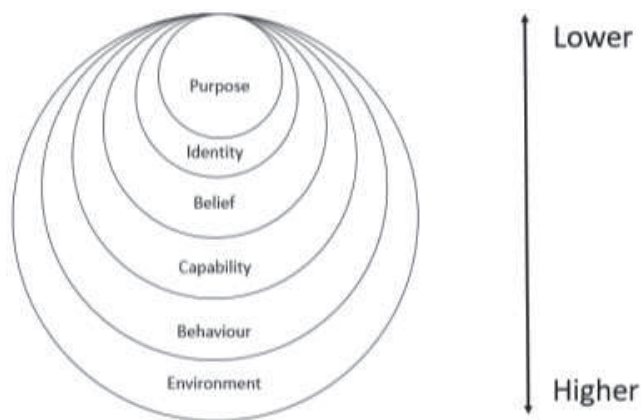
Figure 8 Levels of internal resistance (Lynch, Steinert, & Andersson, 2018)

The model sets out six different levels at which entrepreneurs might face internal resistance, with the lowest levels being the easiest to change and the highest levels being those that would require

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additional work to bring a shift internally. As can be seen in the model, the lowest level relates to the external environment the entrepreneur is in and can easily be changed by shifting to a new environment where there is greater support for the entrepreneur to act entrepreneurially. The second level relates to behaviour or actions: in this case, the entrepreneur is not in the habit of taking action. The next relates to the entrepreneur's perceived capabilities to carry out the task at hand. Beliefs relate to deep seated beliefs about what is desirable and achievable, as well as beliefs around self-efficacy. Identity relates to how the entrepreneur sees themself, which is an important factor for controlling behaviour. The final level is the purpose or calling of the entrepreneur to create some kind of entrepreneurial outcome. As the model suggest, the deeper into an individual's cognition we delve, the deeper the potential for finding possible elements of resistance that may need to be dealt with before the entrepreneur can proceed with their venture.

2.2.2.5   Contribution to the dissertation

While the article is clearly set at the level of the individual, this is the sole piece of research within the thesis that makes the connection between the external environment and the internal environment of the entrepreneur. This thesis has set boundaries in stating that it is focussed only on the internal world or mindset of the entrepreneur. Yet it would be too great a simplification to deny the existence of the connection between the outside world and internal world.

This article sets out the interaction between different elements of mindset, such as capabilities, beliefs and identity (which are elaborated upon in the next chapter). In doing so, it acknowledges these links exist, and are not discrete and separate from one another. As such, dysfunctional beliefs or negative identities might be sufficient to stop an entrepreneur, and therefore need to be considered in any discussion around supporting the mindset of an entrepreneur.

2.2.3   Article 3: Entrepreneurial mindset(s) and cycles of learning
Reviewed: Journal of Business Venturing, 2019

2.2.3.1   Introduction and research question

The purpose of this article is to define what is meant by EM. The concept has received considerable attention within the field of academia but has so far eluded definition. This is despite a large body of work existing in the field of cognitive psychology that defines mindset, and how mindset plays a role in impacting things like goal selection and enactment. In order to draw on this wealth of knowledge from the field of cognitive psychology, this article brings across concepts of mindset and apply them to the field of entrepreneurship.

2.2.3.2   Theoretical orientation

The article is based on theory from the field of cognitive psychology that has been synthesised into a perspective that is relevant to the context of entrepreneurship.

The article is theoretical in nature, and draws on the established body of work from entrepreneurship and cognitive psychology. In doing so, it builds on the work of other scholars to suggest a way forward for the field of entrepreneurship, which seems to have reached an unacknowledged impasse in using the term EM without acknowledging what it means. This article resolves this undefined concept and in doing so opens up new grounds for research.

2.2.3.4 Findings

The article provides a clear definition of what is meant by EM. While the definition is not succinct, this in itself points to the fact that EM is a complex concept that resists being turned into a formulaic or prescriptive concept.

2.2.3.5 Contribution to the dissertation

This article forms the backbone of this thesis and informs the remainder of the work. In this sense it represents the major contribution of the entire thesis. It does this by defining what this thesis is about: EM. Without a clear definition of what you are attempting to research, it becomes difficult to research the said concept.

The definition is enlightening in itself and points to a concept that is fluid, and changing, and updates over time, with context, experience, and in response to the specific task at hand. In this sense it resists a formulaic or reductionist attempt to distil it into something simple. This is important in informing how we research and teach the concept.

2.2.4 Article 4: The language of successful entrepreneurs

Published: Conference proceedings for the 12th European Conference on Innovation and Entrepreneurship, 2017

2.2.4.1 Introduction and research question

Having conceptually acknowledged the existence of the concept of EM, we are thereby pushed to begin to find empirical evidence to support the assertion that EM exists. While there have been a number of attempts made to measure this through self-reported surveys, there remain a number of concerns with regards to methodological validity. In order to avoid these methodological traps, we opted to take a more grounded approach, using language as a de facto measure of cognition. This is based on the premise that language reflects what we think about and the way we think about it. The purpose was therefore to take a grounded approach to see if we could find evidence of EM in the language used by entrepreneurs. In order to ensure that we landed on the EM that best supported entrepreneurship, we draw on earlier works within the field of entrepreneurship that says expert entrepreneurs think differently from average entrepreneurs. If we are to teach people to be entrepreneurs, then we want to ensure that we are teaching them to be highly successful

entrepreneurs. To use a sporting analogy, if we are to teach people to be athletes, then we want to teach them the right techniques to ensure that they have the best chance of being successful in their chosen sport. As such, it is worth examining the top athletes in that field to ensure we learn from the best. Following the same logic, we set out to study the EM of successful entrepreneurs. This of course raises a dilemma of how to define success. We choose an arbitrary measure here and said that those who had attracted seed funding over US$20 million and had more than 30 employees would fit the definition of being successful by most people's standards as they had managed to convince outside investors, and employees that their entrepreneurial company was worth the risk of betting on.

The article examines the research question, how do successful entrepreneur's language patterns (and therefore thinking patterns) differ from a more general pool of entrepreneurs.

2.2.4.2   Theoretical orientation
The article uses language as a de facto measure of cognition. This is based on work in other domains demonstrating the connection between cognition and language. It has been argued that language makes possible what one can think and feel, and that limits in language may even limit what one can think of (Ahl, 2003). At the extreme, some claim that if we do not have a word for a feeling, then we cannot experience it (Gergen, 1991). While not all have such an extreme standpoint, many in the field of linguistics accept that the structure of language and the structure of thought are inextricably linked (Bruner, 1991). Based on this premise, we set out to measure language used by successful entrepreneurs as a way of measuring cognition.

The article is exploratory in nature and takes a grounded perspective, not setting pre-conditions on what the researchers hope to find.

2.2.4.3   Methodological approach
Interviews from 51 successful Silicon Valley entrepreneurs were amalgamated into a single text document. This document was compared to a similar text document (or corpus) from 98 interviews with a more general population of entrepreneurs. The test document consisted of 187,842 words compared to the control document of 840,000 words. The comparison of the two documents using Wmatrix revealed a number of differences in language use, when filtering for words that had been used more than 15 times, and had a significance level of being 99.99% or higher. These results were then coded into themes to look for patterns within the results. The coding was subjective in nature, and was based on the researcher coding interpretations or meanings to the words that had been identified as significantly over used, or underused, in comparison to the control text.

2.2.4.4   Findings

The findings from the analysis revealed 373 words that were significantly underused or overused. These words were then coded into five themes that formed the main discussion in the article. These themes were action orientation; future orientation; collective thinking; customer orientation and growth. These codes were completely subjective, and might have been synthesised into different themes if analysed by another researcher.

2.2.4.5   Contribution to the dissertation

The article makes two contributions to this dissertation, one empirical and the other methodological.

The empirical contribution is in providing support for the assertion that there is a difference in cognition between successful entrepreneurs and general entrepreneurs. This lends support to the existence of EM, and in particular the existence of expert EM. Finding differences between the way successful entrepreneurs talk and the way the general population of entrepreneurs talk signifies that there is a cognitive difference in the way these two groups think. The study itself is exploratory and does not land on definitive answers as to what these differences might be, however, it points in the direction of future research.

The second contribution to this thesis is by providing an additional methodological approach to studying EM. To our knowledge, using language as a de facto measure for EM in this way has not been done before, and therefore represents a contribution to the field of entrepreneurship. While the article was short in nature it suggest there is promise for using more in-depth language analysis to better examine what differences exist between successful entrepreneurs and other groups such as entrepreneurs, or the general population.

2.2.5   Article 5: Entrepreneurial mindset – an empirical start point

Published: Conference proceedings for The International Society for Professional Innovation Management, 2017

2.2.5.1   Introduction and research question

This article recognises that empirical evidence of an EM is still relatively scarce within the extant entrepreneurship literature. There have been attempts to measure EM, such as through personality traits and skills (Davis et al., 2016). However, there are issues with these studies in that they have different starting points for what they conceive as EM. While the theoretical field has moved on from thinking that personality traits represent EM, the empirical field has been lagging in this regard. Scholars with these theoretical perspectives have accepted that cognitive structures are a more promising path forward for examining EM (Baron, 1998; Busenitz & Barney, 1997; Krueger, 2007).

Accepting that past measurements were not well suited to the task of measuring cognitive structures, the purpose of this study was therefore to test a new methodology for examining whether evidence of EM could be found through examining the language of successful entrepreneurs. The study builds on earlier work (Lynch, Kamovich, et al., 2017) that found differences in language use between successful entrepreneurs and their less successful counterparts. In order to do so, it takes the earlier findings, develops them into hypotheses and tests these hypotheses against a new data set to see if there is evidence to support the hypotheses, and whether previous insights were generalizable to a new data set.

2.2.5.2 Theoretical orientation

The theoretical orientation of the article is based on the premise that EM is a deep cognitive structure, and that language represents what we think about and how we think about it.

Prior work, Lynch, Kamovich, et al. (2017) had found five themes that appeared to be significant differences in language use (and therefore cognition) between successful entrepreneurs, and less successful entrepreneurs (as defined by an arbitrary financial definition). These five themes were: successful entrepreneurs used more action orientated words, are more focussed on the future, referred to themselves and their team in a collective sense, are more focussed on the success of their customers, and see outcomes in terms of learning and growth (instead of success or failure).

2.2.5.3 Methodological approach

In order to test these hypothesis, an online database of interviews with entrepreneurs (including video and transcript) was downloaded. This allowed a group of 30 test interviews, and a control group of 26 interviews. The words used by each group were collated, and Wmatrix was used to look for statistically significant differences in word usage between the two groups. The significant words were then compared to a list of words that were expected to be found if there was support for the hypotheses.

2.2.5.4 Findings

A total of 66 words were searched for in support of the five hypotheses. 59 of these words were found to exist within the statistically significant group of words found by the Wmatrix tool.

Table 4 Summary of findings from (Lynch, Tuema, Andersson, & Steinert, 2017)

Hypothesis	Words Present	Words Missing	Consistent	Consistent %	Inconsistent
Action Orientated	15 out of 17	2	10 out of 17	59%	5 out of 17
Future orientation	18 out of 19	1	12 out of 19	63%	6 out of 19

Collectivism	14 out of 15	1	11 out of 15	73%	3 out of 15
Customer focussed	7 out of 8	1	5 out of 8	63%	2 out of 8
Growth perspective	5 out of 7	2	1 out of 7	14%	4 out of 7
Totals	59 out of 66	7	39 out of 66		20 out of 66

In order to judge whether the words supported the hypotheses or not, they were compared to whether the words were expected to be overused or underused by the test group (relative to the control group). Less than 50% consistency was considered not to support the hypothesis, between 50% – 70% was considered weak support, and above 70% was considered support for the hypothesis. As the Table 4 shows, there was weak support for three of the hypotheses, and support for one.

2.2.5.5   Contribution to the dissertation

This article extended the initial work carried out in Lynch, Kamovich, et al. (2017) by examining whether the method of measuring language could be useful in measuring EM. However, this article raised a number of issues. The first is it demonstrated the difficulty of using this kind of method for testing hypotheses with regards to language use. The study did its best to take a scientific approach to testing hypotheses and looking for support for them. The reality was the method did not feel appropriate or well suited to the task at hand.

The use of language to examine differences in cognition seems suitable for exploratory studies, such as those carried out in Lynch, Kamovich, et al. (2017). However, the main contribution to the thesis might be to demonstrate the limits of using language analysis to search for cognitive differences.

While we demonstrated some results, there should be a large amount of caution applied in interpreting these results. This was due to the small scale of the words examined.

Science is based on experimentation, and as such not all tests or paths taken in the quest for knowledge will be fruitful or a success. This article represents one of those paths that was tried, but did not yield results that were worthy of continuing the exploration. However, it did suggest that there are differences in language use between successful and less successful groups of entrepreneurs. These differences should be explored further, and the use of language as a measurement tool should not be abandoned, but rather used with caution and in conjunction with other methods.

2.2.6   Article 6: Examining entrepreneurial motivations in an education context
Published: Proceedings of the 21st International Conference on Engineering Design, 2017

There has been a strong push to train more engineers in entrepreneurial skills (Duval-Couetil, Reed-Rhoads, & Haghighi, 2012; G. R. Mitchell, 2007; Täks, Tynjälä, Toding, Kukemelk, & Venesaar, 2014; Vest, 2005). Professional institutions representing engineers, such as the European Society for Engineering Education (2012), the National Academy of Engineering and the American Society for Engineering Education have also called for educating engineers with a focus on entrepreneurship, creativity and innovation (Dabbagh & Menascé, 2006; Rover, 2005). There is a growing recognition that scientific and technological skills alone are no longer enough to prosper as an employee in the 21st century (King, 2012; Litzinger, Lattuca, Hadgraft, & Newstetter, 2011). Engineers cannot solely rely on their technological knowledge but will also be expected to have skills in areas such as problem solving, creative thinking, written and oral communication, and teamwork (Jonassen, Strobel, & Lee, 2006; Passow & Passow, 2017). It is no wonder then that entrepreneurship education is being pushed on engineering students due to its reputation as transformative, social, imaginative, emotional and experiential learning (Rae, 2003).

However, in order for education to be effective it must also take into account students' motivations. There has been little written on whether engineering students are motivated to study entrepreneurship, and what their perceptions of the topic are. Experience in teaching engineering students suggests that at times they can be resistant to the topic, and the response can range from hostile to enthusiastic. In order to gain a clearer understanding of the topic, this study was carried out in an exploratory manner to better understand students' motivation with regards to the topic.

The research questions were what are students current perceptions around their capacity to start a business, and what factors do they find motivating for them with regards to starting their own venture. Answers to these questions are important given that finding alignment between student motivations and the experiential learning they need to embark on will be crucial in order for that learning to be a success.

2.2.6.2   Theoretical orientation

The design of the study is based around the Theory of Planned Behaviour (Ajzen, 1991), which says that individuals' intentions to carry out behaviour are motivated by two key elements: desirability and feasibility.

2.2.6.3   Methodological approach

In order to examine students' perceptions of desirability and feasibility a survey was carried out of students from two Norwegian universities who were enrolled in an entrepreneurship course. Although both sets of university students were enrolled in engineering programmes, entrepreneurship was not their core study competence. The students were approximately two thirds

of the way through a bachelor level course and had been engaging in early stage entrepreneurship activities such as pitching, writing brief business plans, and making prototypes.

The study used a total of 14 questions, and was designed by a doctoral student in the field of psychology. The survey was not based on previously validated metrics or studies, but instead chose questions that aimed to identify what students' perceptions were with regards to specific topics related to the Theory of Planned Behaviour. In total 60 students answered the survey, although not all students completed all the questions, resulting in some questions having as few as 53 responses.

2.2.6.4   Findings

The questions can be split into two categories, those related to perceived feasibility, and those related to desirability. Starting with perceived feasibility, the majority of students (63%) felt they did not have enough information to start their own business. Furthermore, an even larger percentage felt they lacked sufficient information to start the business they were currently working on (68%).

The second set of questions related to typical motivations that individuals have for becoming entrepreneurs, and used a Likert scale that gave students options to select which motivations they (dis)agreed with. The interesting results from this was the low percentage of students who were involved in entrepreneurship because they thought it was easier to earn money than having a job (9%), and that no one in the survey strongly agreed that they were more likely to make more money as an entrepreneur. The two strongest factors attached to motivation to be an entrepreneur seemed to relate to the challenge of it, and the opportunity to learn more (than just having a job). Lifestyle reasons seemed to also be a strong motivating factor.

2.2.6.5   Contribution to the dissertation

Given the purpose of the article is to examine the motivations of students studying entrepreneurship, the main contribution of the article is therefore beginning to piece together what factors educators should focus on in order to ensure that education is in alignment with factors that keep students motivated.

An interesting finding from the article is the students' lack confidence in their abilities to be entrepreneurs. Given that these beliefs play a large role in whether students will be motivated to form the intention to start, it signals that a crucial role of entrepreneurship education is to boost students' sense of confidence. Consistent with boosting their sense of self efficacy, which again is associated with strongly predicting success in those who have goals (Bandura, 1994).

The other factor that has implications for entrepreneurship in general is that those who formed the basis of the study did not find financial rewards to be motivating towards entrepreneurship at all.

2.2.7 Article 7: Educating entrepreneurs in practical methods with design practices as a guide

Published: Proceedings of NordDesign, 2016

2.2.7.1 Introduction and research question

The article argues that entrepreneurs need to practice in order to build up their EM, however, exactly what they should be doing is unclear from existing literature. Drawing on established literature, the article argues that there is a need to learn theory and practice at the same time in order to support the development of an EM. It then goes on to argue that DT is a potential pedagogy for doing this. It argues that the similarities between design and entrepreneurship means we should borrow heavily from design in developing a pedagogy that supports entrepreneurs to go through several different ways of thinking. The paper then sets out a clear description of the way design methods can be applied to teaching entrepreneurs to practice the venture creation process.

2.2.7.2 Theoretical orientation

This article borrows from several theoretical fields, but draws particularly from DT, and entrepreneurship pedagogy articles, especially those with a cognitive perspective.

2.2.7.3 Methodological approach

The article is theoretical in nature, and is based on constructing arguments from pre-existing research to support the author's point of view that design represents a valid method for teaching students to be more entrepreneurial, especially with regards to having students develop the cognitive aspects of entrepreneurship. The article uses synthesised coherence, by citing works that are usually not seen together.

2.2.7.4 Findings

While there was no data per se to support this article, the main argument of the article is that DT represents a good pedagogy for having entrepreneurs practice being entrepreneurial. The article provides concrete teaching suggestions for how this can take place, with references back to existing theoretical perspectives. In this sense the article combines theory with normative suggestions for teaching entrepreneurship.

2.2.7.5 Contribution to the dissertation

The article contributes to this thesis by laying out the foundation for the connection between design methods and entrepreneurship. This perspective might not be obvious to those unfamiliar with both fields, and one could be forgiven for thinking the fields are entirely different. However, the article argues that there is an overlap between the two. The article discusses what DT is and includes suggestions for how to teach the individual steps. These suggestions form the basis for discussing the pedagogy used for training EM in later sections.

2.2.8 Article 8: Combining technology and entrepreneurial education through DT
Published: Journal of Technological Forecasting and Social Change, 2019

2.2.8.1 Introduction and research question
The prior paper argues that design can be a useful method for teaching entrepreneurship, and with it EM, to students. However, empirical evidence to support this claim is thin within existing literature. In order to examine this topic, DT as a pedagogy was explored to better examine what students received out of taking a DT course that focussed on identifying entrepreneurial opportunities.

The article was exploratory in nature, and explored what students received out of the course, not whether the course was effective or better than other methods of teaching entrepreneurship. The purpose was to direct future research into what should be examined when studying whether DT can represent an effective way to teach entrepreneurship.

2.2.8.2 Theoretical orientation
The study takes a constructivist point of view of education, and viewed the student experiences as being an important factor in considering whether DT is an appropriate pedagogy for teaching engineering students entrepreneurial skills and mindset.

2.2.8.3 Methodological approach
The study made use of learning journals that were kept by six students, as well 27 end of course reflections written by students. In total 229 pages of written material were coded for themes from the course. Emergent coding was used (Figure 6), in order to allow the data to speak to the researchers, and as much as possible pre-conceived notions of what we were looking for were avoided.

2.2.8.4 Findings
The findings were grouped under four main categories, these were: that the students found the course challenging, that they developed tangential skills, developed core knowledge, and that the learning had real life applications.

The students' reflections largely focussed on how challenging they found the course, and generally the challenges related to the complexity of the task they were assigned, the challenges associated with interpersonal dynamics, and challenges relating to time constraints. The reflections around tangential skills related to learning outcomes that the students said they experienced that were outside the typical learning outcomes described in course descriptions. These were things like team skills, empathy for others, communicating effectively, and learning how to better handle ambiguity and uncertainty. Another main finding from the reflections was that students learn the key concepts associated with DT. While obvious, it is worth mentioning here that the course was effective in teaching students a new way of working. The final category related to its real world application.

Many of the students expressed the relevance of the course to challenges they were facing right now in their private and work life. In addition, many students commented on how they could see the course as being relevant for their future careers. In this way the reflections taken together point towards DT as an effective method for engaging students in experiential learning and resulted in learning outcomes that the students were generally positive towards.

2.2.8.5 *Contribution to the dissertation*

The article made a contribution in to this thesis by examining one way we can encourage students to behave more entrepreneurially. The express purpose of the article was to explore what students got out of such a course, and in that sense we can see that they received experience at dealing with challenges, working in teams, and dealing with uncertainty and ambiguity. If we relate these experiences back to the prior article we can see that these are many of the skills that students need in order to gain a greater sense of confidence in their ability to act entrepreneurially, and deal with the uncertainty and ambiguity that comes with entrepreneurial projects. It also lends empirical support to the assertion of the earlier article, that design methods have a place in teaching entrepreneurship.

The article also makes a contribution in introducing the concept of tangential learning. This concept is based on the idea that what students get out of learning often goes far beyond what we might prescribe as course objectives. If we prescribe EM as a course objective, it might not be certain that we can guarantee this as a learning outcome. However, if we set up challenges, have students work in teams and deal with ambiguous and uncertain paths forward, then we can be certain that learning of some kind will occur, and that this learning will stand them in good stead for their lives outside of a university classroom.

2.2.9 Article 9: Promoting strategic entrepreneurship at the firm level

Accepted: International Journal of Product Development, 2019.

2.2.9.1 *Introduction and research question*

EM is considered a key strategic asset for firms that can be leveraged to create a strategic advantage (Hitt, 2000; March, 1991; Shepherd, Patzelt, & Haynie, 2010). This is because long term survival of a firm requires balancing identifying new opportunities and acting on them against paying attention to existing business operations (March, 1991). The EM of staff plays a role in helping firms identify and act on potentially profitable ideas. This article sought to understand the ways that training could be used to influence staff's EM using DT as a pedagogy. In order to examine this question, the article uses a case study of staff training at a large organisation.

2.2.9.2 Theoretical orientation

The article takes a constructivist point of view, whereby staff are considered to be capable of learning to be more entrepreneurial and develop ideas, and apply DT training in a way that makes them engage in new behaviours. The article uses the theoretical lens of strategic entrepreneurship (Hitt, Ireland, Camp, & Sexton, 2001). Strategic entrepreneurship says that EM, as well as entrepreneurial culture, entrepreneurial leadership and strategic management of resources are all required antecedents in order to create a competitive advantage for a firm (see Figure 9).
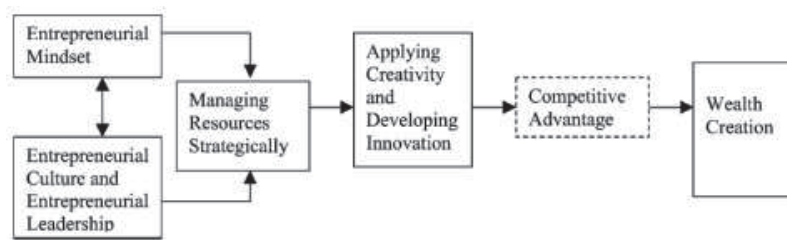
Figure 9 A model of strategic entrepreneurship (Ireland et al., 2003)

The article

2.2.9.3 Methodological approach

The article uses a case study of staff training at a large organisation in a traditional heavy-industry that is attempting to make the transition to be a more digital orientated organisation with the desire that services represent the large majority of its future revenues. The staff training was used to facilitate this shift, and therefore the case depicts the staff training as the input that shifts the status quo, and uses changes in behaviour as the outcome to measure the effectiveness of DT as a training method for having an increase in EM as measured by entrepreneurial behaviours.

The case covers two batches of trainings carried out over two years, as well as discussions with participants, and others from the organisation. It primarily relies of data volunteered by participants about how they had changed their behaviours during work. In addition, there was participant observation from the authors who were involved in the training, but were not primarily responsible for its outcomes. The data is presented in the form of vignettes that represent typical feedback from participants about how the training had been useful.

2.2.9.4 Findings

The article focuses on six vignettes that highlight the outcomes of the training. These vignettes cover: cross-cultural communication; new workflows; conflict de-escalation; prototyping; work habits one year after; and product development. Each of these vignettes highlights a different way the participants in the training have used the methods they learnt from DT to change their work habits.

The training proved to be successful in many ways, if measured from these individual behaviour changes. However, there were other factors that prevented a true change in the way participants operated at work. Viewing the results from the perspective of the strategic entrepreneurship model above; the training was successful in terms of having individuals develop an EM, having them become entrepreneurial leaders, and in having them initiate an entrepreneurial culture. However, the final antecedent of strategic management of resources was left unchanged. The result was that people continued in their original roles, without a mandate of how to work or behave differently.

The research demonstrates the point that it is insufficient to have entrepreneurial staff, they must also be managed as a strategic resource and given the space to identify and develop opportunities that are in the company's best interest.

2.2.9.5 Contribution to the dissertation

This article makes a contribution to the thesis in explaining what DT is, and in explaining how it can be used to develop an EM. The article also contributes by examining a context that is outside the traditional university context, by examining training in a corporate context. It also supports earlier conceptual papers (such as article 7), and strengthens earlier findings that support DT as an appropriate method for training individuals to have an EM (see article 8 in addition). The article also discusses important contextual issues when setting up training for a company.

2.3 Summary of chapter

Having summarised all nine research articles and their contribution to this thesis, we can now begin to examine each of the research questions, using the data gathered in the nine articles to support my discussions and conclusions. The nine articles cover a range of questions and use a range of methodologies. Using this broad range of approaches allows us to examine the overarching issue of EM from different angles, allowing for a more intricate discussion of the research questions.

3 Theoretical conceptualisation of entrepreneurial mindset

3.1 The conceptualisation of EM

Having introduced the articles and research associated with this thesis, I now move to examining the first research question in detail. The aim of this chapter is to answer the first research question, which is: **How do we define and conceptualise what is meant by EM**. In order to do this, I set out existing theoretical perspectives as they relate to what mindset is, and the differing elements of entrepreneurial cognition. There is a diverse field of theory, ranging from individual elements of cognition, to generalist descriptions of the outcomes associated with EM, to descriptions of personality as connected to entrepreneurship. We examine a range of existing theory, both to show the breadth and diversity of existing perspectives, but also to build a broader context that we can later place our conception of EM into. Once we have summarised many of the main perspectives in entrepreneurship that are connected to mindset, we then shift to examining mindsets as conceived outside of the field of entrepreneurship. Our discussion in relationship to the research question then focusses on bringing across these perspectives from outside of entrepreneurship and applying them to the context of entrepreneurship. In doing so, we are able to answer our first research question by defining EM. However, stating simply what we conceive of EM is insufficient to fully answer our research question, so we delve into the ways in which EM is fluid and changing, and show how EM comes to bear on the venture creation process.

3.1.1 Individual elements of mindset

When reviewing the state of art on EM it becomes apparent that most articles view EM from a cognitive perspective (Haynie et al., 2010; Mathisen & Arnulf, 2013; McGrath & MacMillan, 2000; McMullen & Kier, 2016; Naumann, 2017; Shepherd et al., 2010). Other authors have taken a more traits-based view (Ashourizadeh, Chavoushi, & Schøtt, 2014; Davis et al., 2016; Neneh, 2012). However, there is no common understanding of what is meant by the concept of EM, and no consensus of its attributes (Naumann, 2017). A review of the EM literature revealed 7 distinctive attributes that seemed to form the basis of EM within existing literature (Naumann, 2017). These were (1) metacognition, (2) cognitive adaptability, (3) prior knowledge, (4) alertness, (5) heuristic-based decision logic, (6) cognitive tuning and goal orientation as well as (7) social interaction. While the review by Naumann (2017) represents a good starting point for grouping the different elements of cognition and EM, my own reading of the literature would add in additional items including identity, personality traits, beliefs, biases, roles, schemas, and scripts. In addition, I choose to delimit the boundaries of what is included in EM, and in doing so choose to exclude alertness; cognitive tuning and goal orientation; and social interaction. We exclude alertness based on the argument that it is an outcome of EM, not a cause. Cognitive tuning and goal orientation we consider falls under the

conception of EM as described in later sections by the research carried out by Mathisen and Arnulf (2013). While social interaction, as defined by Naumann (2017), in our opinion falls under the remit of networks and outside the scope of discussions around EM. These distinctions might seem arbitrary in nature, however, all research has boundaries, and in stating these boundaries, we move on to discussing the relationship between the elements mentioned above.

We have a diverse field of theory, covering heuristics, biases, schemas, alertness, cognitive styles and meta-cognition. This reminds us of the parable of the blind men examining the elephant (Gartner, 2001). Each man provides a detailed description of the particular part of the elephant they are touching. Naturally, the description provided by the man touching the trunk varies with the one touching the tusks, who in turn provides a different narration from the one touching the feet. The point of the parable being that no one individual is wrong. As Gartner points out when exploring entrepreneurship theory development, each theorist contributes in describing the whole, but each individual's perspective does not fully describe the complete phenomenon.

Table 5 Overview of individual elements of cognition

Term	Description
Biases	Systematic errors in decision making
Heuristics	Rules used for simplifying decision making
Beliefs	Cognitive structures that shape how input is interpreted
Roles	Perceptions of how a person should behave when engaging in a role
Schemas	Cognitive routines of how to perform tasks, especially familiar tasks
Identity	Perception of an individual's sense of self, of who they are
Expert scripts	Schemas built up through experience, allowing expert performance of tasks
Meta-cognition	Thinking about thinking, or self-awareness of cognitive processes
Personality	Overall description that makes up who we are

In order to give these differing perspectives on individual elements of cognition, we provide a brief overview of these items. While no one perspective represents EM in its entirety, they do provide insights and value by informing our overall picture of what is meant by EM.

3.1.1.1   Biases & Heuristics

One of the early cognition concepts applied to entrepreneurial cognition was that of heuristics and biases. Scholars argued that entrepreneurs often encounter situations where biases and errors in thinking are likely to occur, and argued that these biases explained why entrepreneurs thought the way they did (Baron, 1998; Busenitz & Barney, 1997; M. Simon et al., 2000). Examples included

where entrepreneurs were overloaded with information; when emotions are running high; when individuals are facing situations that are new to them; and when filled with uncertainty (Baron, 1998). Busenitz and Barney (1997) noted that while biases might sometimes lead to suboptimal decisions, overall they lead to positive outcomes for entrepreneurs. Further building on the realm of cognition Busenitz and Barney (1997) suggested that heuristics could be an efficient way to make decisions, as seeking out all information in order to make rational decisions would often be too costly for entrepreneurs. Entrepreneurs used these ways of thinking to simplify their world view, and avoid cognitive overload.

Biases and heuristics literature focus on decision making, and as such misses other equally important aspects of EM, such as entrepreneurial alertness which precedes decision making (Gaglio & Katz, 2001; McMullen & Shepherd, 2006). We point this out not as a criticism of the heuristics and biases literature, but emphasise the point made by Grégoire et al. (2011) that cognition literature focusses on individual parts rather than how they are interconnected, such as what the precedents are before entrepreneurs arrive at the point where they are making decisions using heuristics.

3.1.1.2   Beliefs

As discussed in the introduction, intentions are one of the best predictors of entrepreneurial behaviour (Krueger, Reilly, & Carsrud, 2000). When examining the antecedents to intention, we end up with a belief/desire configuration (Ajzen, 1991; McMullen & Shepherd, 2006). Although, desires are ultimately a construct of beliefs about what an individual thinks is desirable, and is therefore not a separate construct. Regardless, the importance of beliefs to entrepreneurial actions is clear (Krueger, 2007). Krueger (2007) argues that underlying entrepreneurial actions is deep cognitive structures, which are anchored in beliefs. The role of beliefs is also implied in discussions around opportunities, for example, in the McMullen and Shepherd (2006) model of action under uncertainty, entrepreneurs make decisions about which opportunities match their own personal criteria. Knowing exactly how an opportunity will materialise is an act of imagination, and therefore requires belief in the likely outcomes.

These beliefs are often anchored in some initial belief, although they are often learned and re-learned over time causing them to become reinforced (Krueger, Kickul, Gundry, Verma, & Wilson, 2009). A constructivist point of view holds that these beliefs are updated over time and can change through learning and developmental experiences. The implication is therefore that education can play a role in influencing these beliefs, that ultimately influence and lead to entrepreneurial action.

The world and corresponding stimulus are more than a human can consciously pay attention to (Dweck, 2006). As such, there is a simplification that occurs, whereby we pay attention to some

items, emphasise some of them and ignore other inputs. The result is simplification of the external reality. The mental models we build up to support these simplifications are ultimately built on the foundation of beliefs about what we see, and the interpretation we make of those external inputs (Rhinesmith, 1992). Overall, you might label beliefs the most basic building blocks of cognition. What is interesting with this, is that the external stimulus is less important than the lessons we derive from them (Erikson, 1980). In acknowledging this gap between external reality, and our internal maps or mental models, we begin to acknowledge that what we decide to do is based as much on the fiction we create within our own heads as it is to do with the external reality. In this sense, beliefs influence what we see and how we interpret it, and this in turn influences what actions we believe are desirable and achievable and in turn influences the actions we decide to take (Ajzen, 1991; French Ii, 2016).

3.1.1.3 Roles, Schemas

If beliefs are the building blocks of cognition, then roles and schemas are the combination of beliefs as they relate to perceptions on how to carry out tasks, and what is expected of those who carry out certain tasks. Schemata are abstract expectations about how the world generally operates, built up from past experiences with specific examples (Fiske & Taylor, 2013). More concretely, people who are an expert at certain tasks develop domain specific knowledge structures or mental schemas (Lord & Maher, 1990). These mental arrangements or structures confer the ability to outperform those without similar mental structures. These schemas have three subsets: arrangements, willingness and ability (Corbett & Hmieleski, 2007). Arrangement schemas relate to mental maps of the human and physical resources that individuals have available to use for entrepreneurial activities. Willingness scripts relate to opportunity seeking, commitment tolerance, and opportunity pursuit (R. K. Mitchell, Smith, Seawright, & Morse, 2000). The main point though, is that these schemas are an arrangement of beliefs into an understanding or mental model about how it is to carry out the act of entrepreneurship. Research in the entrepreneurial cognition domain has demonstrated that entrepreneurs tend to draw from similar sets of event schemas when considering whether to start a new venture (Corbett & Hmieleski, 2007).

3.1.1.4 Identity

An identity is when a schema related to a role is internalized into a person's sense of self concept (Stryker & Burke, 2000). A role is a set of socially held expectations attached to positions external to an individual. However, when a role becomes internalized with regards to themselves, then it becomes an identity (Murnieks & Mosakowski, 2007). This is of relevance to entrepreneurship, because being an entrepreneur has certain socially held expectations about what it means to be an entrepreneur. Expectations attached to being an entrepreneur include things like "identifying,

evaluating and exploiting opportunities" (Shane & Venkataraman, 2000, p. 218). In becoming an entrepreneur, it is likely that an individual internalises these behavioural expectations into their sense of self (Murnieks & Mosakowski, 2007).

This is important because identities motivate behaviour (Burke, 2004). In fact, some claim that identities are the primary source of motivation for human behaviour (McCall & Simmons, 1966). Specifically, identities are important motivators because they fulfil our need for self-verification or consistency (Swann Jr, Pelham, & Krull, 1989). That is, we are motivated to take actions that are consistent with our self-picture of who we are (Burke, 2004). If we take actions that are inconsistent with our sense of self identity, then these may lead to feelings of confusion, inefficacy and distress. Self-verification is a kind of control mechanism, whereby individuals attempt to align feedback about one's actions with the standards or expectations associated with an individual's own sense of identity (Burke, 1991, 2004). In a study of entrepreneurs, those surveyed all confirmed they had an "entrepreneurial identity", and for 80% of them this entrepreneurial identity was one of the top three most important identities. The implication being that once an entrepreneurial identity has been formed, then individuals will be motivated to take actions to maintain this identity, using actions as a feedback mechanism to inform them whether they are being entrepreneurial or not (Murnieks & Mosakowski, 2007). In this sense, identity is similar to EM, in that it is cognition that motivates individuals to behave in a way that they view as being consistent with being an entrepreneur. It is also self-regulating, and updates as new feedback is received. So unlike biases, habits or heuristics, it is more likely to change and update over time.

3.1.1.5   Expert entrepreneurs

Krueger (2007) held that cognitive psychology and constructivism offered a path forward for exploring entrepreneurial thinking and how this changed as entrepreneurs move towards a more professional, expert mindset. He argued that there was a difference in cognition between novice entrepreneurs, and expert entrepreneurs, and that researching expert entrepreneurs would allow us to move forward as a field. He characterised successful entrepreneurs as being able to be characterized by an expert mindset. Although, not all people who engage in entrepreneurship eventually become expert entrepreneurs (Krueger, 2007). The argument being then that researching the deep structures in these individuals would provide insights on how to train others in this expert mindset.

Research also indicated that expert entrepreneurs consistently and reliably follow recognizable, if highly complex, cognitive behaviours and processes (Baron & Henry, 2010; R. K. Mitchell, 2005). In drawing on research from the field of expert performance, experts' knowledge base often does not differ from that of novices, rather they typically organise or structure their knowledge differently

(Ericsson & Charness, 1994). Put differently, how people connect dots will vary from one another, however, as they become more expert in their domain they will begin to connect the dots differently than they did before when novices (Baron & Ensley, 2006).

A common sense approach to who is, and who is not an expert entrepreneur, makes categorisation possible. However, specifically stating the cut-off criteria is somewhat a larger challenge. For example, should we base it on the number of firms started? Starting more firms is not necessarily a signal of expertise if all the prior attempts have gone bankrupt. Alternatively, Mark Zuckerberg, the founder of Facebook and the only person under 50 on Forbes 10 richest people list (2018) has ostensibly only started a single firm and would therefore fail the criteria of being an expert entrepreneur should this be the cut-off. Should we then base the "expert" criteria on financial results? This is despite repeated finding showing financial incentives are not motivating factors for entrepreneurs (Lynch, Slåttsveen, Lozano, Steinert, & Andersson, 2017; Neck & Greene, 2011).

The implication of the literature on expert mindsets is that it is not just about having an EM, but rather there are differing entrepreneurial scripts and schemas, that allow for expert performance. This assumption underlies much of the work of this thesis, where it is presumed that not all cognition is of equal value, and that therefore the concept of learning about EM is equally about learning what leads to expert performance.

3.1.1.6   Meta-cognition

One specific sub-field of the study of cognition in entrepreneurship, is that of meta-cognition. Meta cognition might be summarised as thinking about how you think and has some sub-elements such as awareness of your thought process. This is important because of the role of cognitive adaptability in ensuring entrepreneurial success, which in turn is dependent on meta-cognition (Haynie & Shepherd, 2007). EM as defined by Haynie et al. (2010) is "cognitive adaptability, which we describe as the ability to be dynamic, flexible, and self-regulating in one's cognitions given dynamic and uncertain task environments (p. 218).

Building on this definition, they go on to describe an entrepreneur as a "fully engaged thinker who has multiple cognitive strategies available, and chooses among them based on goals, motives and needs" (Shepherd et al., 2010, P. 218). These authors argue that a metacognitive lens allows for a dynamic consideration of how cognition functions, and how this impacts heuristics and decision making strategies. In addition, how these change and update during the venture creation process.

Meta-cognition plays a role in informing cognition, the role of meta-cognition then is to update the mental models or mindsets that an entrepreneur has. This "update" comes in the form of feedback

from knowledge, experience, the external environment, personal motivations/goal orientations, and feedback from monitoring prior decisions (Haynie et al., 2010; Haynie & Shepherd, 2009).
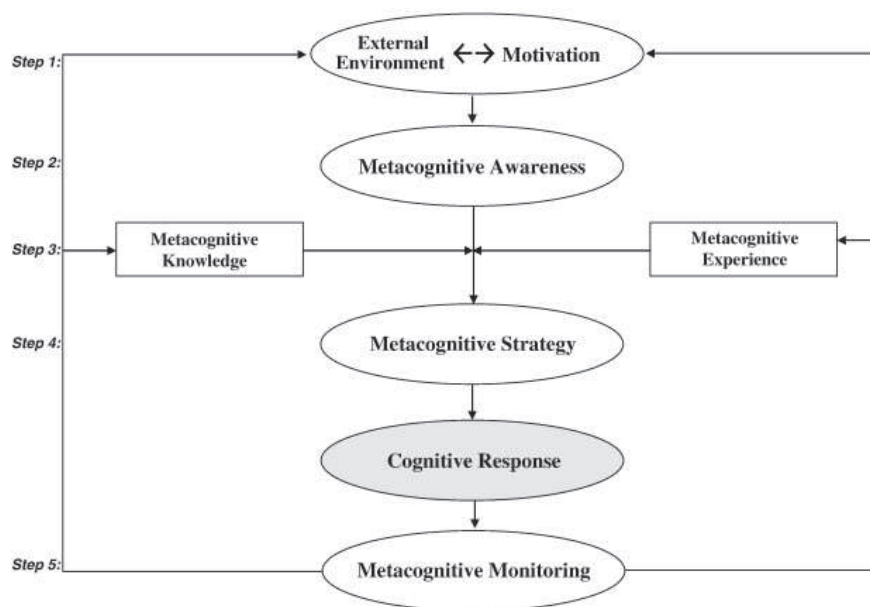
Figure 10 A situated metacognitive model of the EM (Haynie et al., 2010)

Meta-cognition makes specific the fact that cognition is not fixed or set, but rather changes with the inputs mentioned above. This is crucial for entrepreneurial success given that the environment in which entrepreneurs operate is not static and unchanging. This perspective is included in my own conceptualisation of EM.

While I have briefly described individual elements of cognition that contribute to the concept of EM, we now shift our focus to personality which is more an overarching concept, and we discuss it's impact on EM.

3.1.1.7 Mindsets connection to personality

Personality is not the same as personality traits (McAdams & Pals, 2006). If we examine the entirety of our identity and how we behave, then we can break down our personality into five levels, for which our personality traits are only a single level and not even the most significant level with regards to controlling behaviour (McAdams & Pals, 2006). For the remainder of this section we rely on McAdams and Pals (2006) perspective on personality unless stated otherwise. At the broadest level, humans share a general design, which might be viewed as being relatively homogenous, but at the same time provides the framework for humans' psychological individuality. As social creatures we have socially consequential variations of which humans have evolved to pay attention to as these

are the most important for group life. These form the broader levels in terms of individual differences and are described as the big five personality factors. These big five are relatively robust and have significant empirical backing. These dispositional traits provide a sketch or outline of who a person is, characteristic adaptions fill in the details as contextualised in time, situations and social roles. Goals, strivings, coping mechanisms, values, beliefs, representations of salient relationships, and other motivational, developmental, and social cognitive versions of a person's characteristic adaptions are activated in response to, and shaped by, everyday social demands. Integrative life stories address how a person makes sense of his or her life as a whole and is a process of meaning making. Personality though is developed and exhibited within a cultural context that influences the development of traits, adaptions and life narratives. Culture then provides the rules for the phenotypic expression of trait tendencies, and influences the content and timing of character adaptions, and provides the canonical narratives with which people make sense of their lives. The interrelation of these items is visualised in Figure 11. The point to emphasise here is that most daily behaviours are connected to characteristic adaptions (not personality traits).
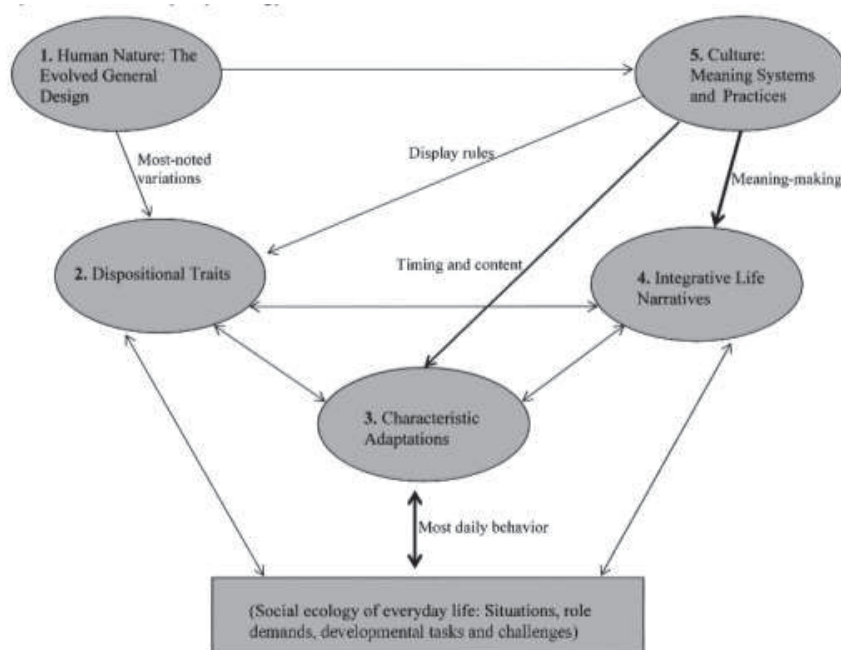
Figure 11 Five principles of personality: A schematic (McAdams & Pals, 2006)

The above model seems ripe for application to the context of entrepreneurship. Obschonka and Stuetzer (2017) attempted to do this using a model by McCrae and Costa Jr (1999) [which is virtually

identical to McAdams and Pals (2006) model]. However, Obschonka and Stuetzer (2017) seem to misrepresent an important tenet of the models. They claim that entrepreneurial outcomes are decided by genetics that in turn cause depositional traits (i.e. big five factors). This is a gross misreading of the personality models, both of which say that behaviour is determined by characteristic adaptions (not traits), and that traits only partially influence those characteristic adaptions. McAdams and Pals (2006) goes so far as to say that characteristic adaptions "may have a life of their own, developing in a way that is only remotely, if at all, connected to the big five" (P.209).

Characteristic adaptions are the parts of personality that control behaviour (McAdams & Pals, 2006) and mindsets are responses to patterns and environments that have been experienced before (Humphrey, 1951). Mindsets are those characteristic adaptations that relate to particular tasks that an entrepreneur might be trying to solve. This is consistent with situated cognition perspective discussed by Haynie et al. (2010). In that cognitive processes emerge, develop, and are displayed within a socio-cultural milieu…" (Allen & Armour-Thomas, 1993). Our particular context of interest is entrepreneurial environments, whereby the response is automated and non-conscious (Humphrey, 1951). Mindset closely aligns with characteristic adaptions, given they are contextualised in time and situations (Peter M Gollwitzer, 1990).

Everyone's mindset is likely to be unique, as a field we have long given up the quest for the singular version of what an entrepreneur is like (R. K. Mitchell et al., 2002), and now accept that the variation amongst entrepreneurs is as wide as the variation amongst non-entrepreneurs and entrepreneurs (Gartner, 1985). No method will be capable of grasping the subtle differences amongst human experience Cope (2005). In saying that, we are at the same time of the opinion that entrepreneurs are likely to have commonalities in their mindsets. This premise underlies much of the entrepreneurship literature, that there is some existing commonality. Many of these commonalities will be shaped or informed by the cultural context. Past empirical research has shown that entrepreneurs across many different national cultures use similar cognitive scripts (R. K. Mitchell et al., 2000) which stands to suggest that we would expect to see similarities in mindset across national boundaries and cultures. We acknowledge the individuality of these mindsets, while also suggesting there are often commonalities.

3.1.1.8   High level descriptions

As mentioned in the introduction, there has been an increase in the number of articles using the term EM and using what I label as high level descriptions of the concept. In referring the parable of the elephant whereby many authors have contributed to specific descriptions of elements of an EM, similar to describing different parts of the elephant. The high-level descriptions are more like the

consequences of the elephant, or the actions of the elephant. They tend to focus on what results from the elephant, rather than describing what the elephant is.

Rather than delving into each high-level description in detail, I instead opt to summarise some of descriptions from existing literature in Table 6. This table highlights the similarities and differences, although for the purpose of this theoretical review, it is sufficient to highlight that these examples examine what is expected from an EM, as opposed to what an EM is, or what entrepreneurial cognition leads to these desired results. We do not mean this as a criticism of these articles, as the articles did not have the express purpose of conceptualising EM.

Table 6 Prior descriptions of EM (Lynch & Corbett, 2019)

Author	Description
McMullen & Kier (2016, p. 664)	"ability to identify and exploit opportunities without regard to the re-sources currently under their control", only working when entrepreneurs experience promotion focus
Shepherd, Patzelts, & Haynie (2010, p.62)"	"ability and willingness of individuals to rapidly sense, act, and mobilize in response to a judgmental decision under uncertainty about a possible opportunity for gain"
Haynie & Shepherd (2007, p. 9)	"ability to adapt thinking process to a changing context and task demands"
Ireland, Hitt, & Sirmon (2001, p. 968)	"growth-oriented perspective through which individuals promote flexibility, creativity, continuous innovation, and renewal"
McGrath & MacMillian (2000, p. 15)	"ability to sense, act, and mobilize under uncertain conditions"

3.1.1.9 Effectuation as operationalised EM

Traditional perspectives on entrepreneurship emphasise the entrepreneur knowing what they want to do, planning to do it, and then acting on it. This has been labelled a causative perspective, in which the entrepreneur uses causation to create a desired outcome based on planning and enacting that plan. However, this perspective has been called into question through the perspective of effectuation (Fisher, 2012; Sarasthvathy, 2008; Sarasvathy, 2001).

Effectuation uses design principles for transforming the existing environment into a new future in the face of ambiguous goals (Sarasthvathy, 2008). In that design is about the interaction between the internal perspectives and the external environment, and through this interaction bringing about changes in the external environment through purposeful interaction (H. A. Simon, 1996). Importantly this perspective on entrepreneurship is based on how expert entrepreneurs actually think. The

theory was developed through having expert entrepreneurs talk aloud as they made decisions under uncertainty.

The findings from the research were grouped into 5 themes, labelled as: bird in the hand, affordable loss, crazy quilt, lemonade, and pilot in the plane. Each of these reflected the way entrepreneurs think, and while exploring EM was not the stated purpose of the research, the correlations to EM are too similar to dismiss. The research provides normative suggestions for how entrepreneurs should think and act. This in itself is relatively unique for the field of entrepreneurship, that for the most part largely stays focussed on discussing 'what is', instead of venturing into "what" entrepreneurs should do.

The five principles in detail are:

Bird in the hand. Which is about beginning with the means at hand, instead of going out and searching for the resources that might be needed for a business, instead you begin with those resources you already possess (Fisher, 2012). This involves examining who the entrepreneur is, what they know, what they have, who they know. Then making use of these means to create new means.

Affordable loss. This reflects that in starting a new business it occurs under situational uncertainty. As such, the point is to make small investments, thereby limiting the potential for losses that you can afford. In making these small investments, additional information can be gained, and you can leverage the contingencies that exist.

Crazy quilt. This principle recognises that entrepreneurship and venture creation is not a solo activity and does not occur in a vacuum. It is therefore necessary to leverage others means, and to create value networks through collaboration. In addition, much of this takes place as pre-commitments, whereby the entrepreneur reduces risk through seeking collaborators to support initiatives.

Lemonade principle. This is a recognition that the future is uncertain, therefore it is important to leverage contingencies to make the most of situations regardless of what might occur.

Pilot in the plane principle. This is about controlling that which is inside your control and using this sense of control to bring into existence the desired outcomes (in collaboration with others).

Combined, these principles are used by expert entrepreneurs in a cyclical fashion to increase their means and change direction as necessary as new information becomes apparent or as the

environment changes. This is represented in Figure 12, and shows how an entrepreneur does not act in a linear manner, but rather the approach updates as they interact with a business opportunity. The model put forward by Sarasvathy and Dew (2005) has several elements in common with the Meta Cognition model (Haynie et al., 2010), in that it is cyclical in nature, focusses on learning through the process of active experimentation with responses/actions combined with monitoring leading to new means.
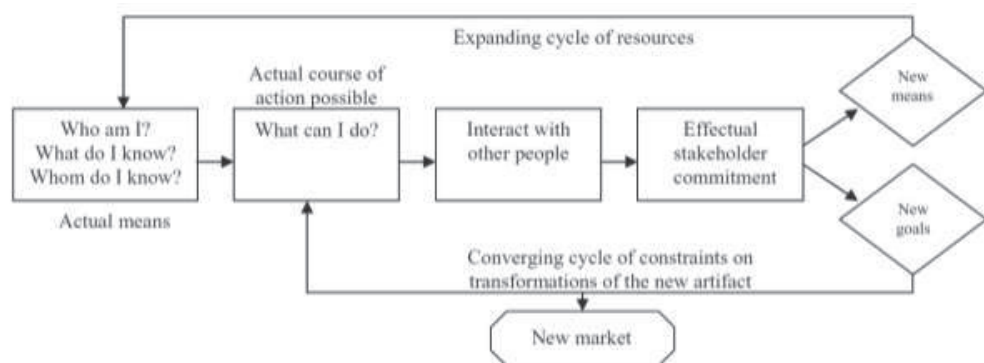
Figure 12 Effectual approach to entrepreneurship (Sarasvathy & Dew, 2005)

The purpose of Sarasvathy (and colleagues) research on effectuation was not to develop a model of mindset, but instead to develop entrepreneurship as a method. The research questions we aim to answer in this thesis ultimately have the same purpose, which is to develop a conceptualisation of EM that can then be taught to students, leading them to take more entrepreneurial actions. We therefore see the value in drawing on the research of Sarasvathy – even though the summarised findings of her work focus on normative outcomes of what entrepreneurs do. These normative outcomes are still based on how entrepreneurs think about opportunities and how this thinking differs from others.

When you first glance at the model above, the process appears to be a simple OODA loop (espoused by John Boyd) or any other kind of process map, and not necessarily something connected to cognition or EM. However, the methodology used to build the theory is based purely on the cognition of those who are expert entrepreneurs. The theoretical stance of Sarasvathy is also built upon the work of H. A. Simon (1996), who emphasised the role of design in creating the desired outcomes, and that the process of designing artificial artefacts (such as business) necessitated this interaction between the external and internal. The above perspective is equally about this interaction between the internal thought process of the entrepreneur and the external environment whereby the entrepreneur is trying to design a business. We return to the connection between design and entrepreneurship in later sections.

We do not always need to reinvent the wheel in entrepreneurship research, and it can therefore be useful to look outside our field for work that might be of relevance. The concept of mindset has a strong history in the field of cognitive psychology, and there is a wealth of research that can be drawn on to support our conception of EM. The original conception of mindset comes from the work of Wurzberg School of Psychology and work done there in the early 20th century (Peter M Gollwitzer & Bayer, 1999). The word "mindset" gives away the focus of the original work, which was studying how the mind became set on finding solutions to a challenge (Cohen-Kdoshay & Meiran, 2007). The early researchers proposed that becoming intensely involved in a task initiates cognitive procedures to assist with task completion. Leading to the definition of mindset as: the sum total of the cognitive processes activated to best solve the task (Peter M Gollwitzer & Bayer, 1999).

While this base definition still holds today, the concept of mindset has been influenced and only subtly changed by a wealth of research. A review of the field of mindsets revealed a relatively consistent conceptualisation of mindset congruent with that proposed by Gollwitzer and colleagues (French Ii, 2016). Drawing on the review by French Ii (2016), within the field of cognitive psychology, mindset has been described as:

- "the general cognitive operations with distinct features that facilitate a given task" (Torelli & Kaikati, 2009, p. 232)
- The "activation of different cognitive procedures[…] which affect how people interpret subsequently encountered information" (Nenkov, 2012, p. 616)
- Mindset "is evidenced by the effect of performing a cognitive or motor activity on the likelihood of performing a similar behaviour in a subsequent unrelated situation […] it reflects the activation and use of a cognitive procedure" (Xu & Wyer Jr, 2011, p. 921)

This consistency of definitions has led to an impressive body of empirical work supporting how mindset influences behaviour, perception, attitude and mood (French Ii, 2016; Peter M Gollwitzer, 2012). The work of Peter M. Gollwitzer, Heckhausen, and Ratajczak (1990) lead to the conception of different types of mindset; specifically implemental and elaborative, and the role these played in goal attainment. They built a model of action, called the Rubicon model, which shows the ways in which mindsets change and play a role in goal achievement. In order to apply it to the field of entrepreneurship, we apply this model under *6.1.1 Mindsets in relation to goal achievement*.

Even earlier than the Rubicon model, was work carried out by Humphrey (1951) who showed that tasks become automated and disappear from consciousness in subjects who repeated tasks during reaction studies. This has significance because it demonstrates that mindset can often be

unconscious cognition impacting our behaviour. A mindset can be described as where the mind is already set on finding a certain outcome and is a type of pattern recognition where people then respond in an automated way based on prior experiences (Cohen-Kdoshay & Meiran, 2007). Yet, it differs from habits in several important ways. Habits are indifferent to outcomes (or in the case of addiction persist even in the face of negative outcomes), while with mindsets people are more likely to change strategies if the desired outcome is not being achieved (Mathisen & Arnulf, 2013). The second major difference is that mindsets are more sensitive to intuiting environmental factors that may impact on the perception of the situation, sometimes requiring considerable cognitive effort, in this way they more closely resemble tacit knowledge (Mathisen & Arnulf, 2013). This cognitive effort though is normally when achieving the desired outcome is considered uncertain or difficult (Peter M Gollwitzer, 1990).

Parallel to the work on mindsets in the field of psychology has been research carried out within the field of social psychology and organisational research. These streams have not always referenced mindset founded upon the Wurzberg School definition, and have therefore developed differing conceptions (French Ii, 2016). However, these differing definitions enrich our overall understanding of mindset and are therefore worth detailing here. In these fields, mindset is considered to be the filter through which an individual views the world, a predisposition to perceive and reason in certain ways (Rhinesmith, 1992). A sort of lens that blocks out certain information, distorts inputs, and emphasises some data. This allows the world to be simplified in a way that is more manageable (Rhinesmith, 1992) because these filters (Gupta & Govindarajan, 2002) and heuristics (Oyserman, Sorensen, Reber, & Chen, 2009) simplify the world and impact what we do and do not pay attention to.

Taken together, these differing definitions and body of empirical work provide a strong starting point from which to build our own conception of EM. In later sections, we incorporate these perspectives into a new conception of mindset, while referencing existing work within the field of entrepreneurship.

3.1.1.11 Summary of prior theoretical work connected to mindset

This section covering prior theory relating to EM, its precedents and connected elements, has traversed a wide field of theory. Integrating all of these perspectives into a singular definition of EM presents a challenge. However, removing any one element from this discussion would begin to erode the complexity of the concept, and do EM a disservice. The opening sections revealed a surfeit of theory relating to specific elements of cognition or mindset. These covered elements like beliefs, heuristics, scripts and schemas. We likened these elements to being like describing parts of the elephant. Each part has value and is correct for the specific element that it examines, yet they do not

adequately describe the entire phenomenon. Next, we showed the role of personality in influencing behaviour, and the placement of EM as part of personality, but not fully explained by the concept of personality. Then we discussed prior work on mindsets, showing that with the exception of Mathisen and Arnulf (2013), there has been little in the way of research drawing on mindset from the field of cognitive psychology. Instead most conceptions have focussed on the outcomes of entrepreneurial behaviour, or the outcomes of those with an EM. These conceptions we described as high level. Sticking with the elephant metaphor, the high-level descriptions are like explaining the impact the elephant has on the surrounding environment, without again describing the elephant itself. Within the field of entrepreneurship we have a plethora of literature examining individual elements of cognition, and a number of articles stating the outcomes of EM, but a gap in the literature explaining what EM is. I therefore looked outside the field of entrepreneurship and referred to cognitive psychology where there is a wealth of existing research. We do not need to reinvent the wheel and can instead build on this wealth of research and apply it to the context of entrepreneurship in order to develop our conception of EM.

3.2   Discussion of RQ 1: Define

The prior section clearly lays out the multitude of perspectives on mindset, and highlights the importance of cognitive structures in the role of EM (Krueger, 2007). These perspectives highlight that there are still only superficial conceptualisations of what those cognitions are. I therefore set out to conceptualise EM, and how it leads to individuals taking entrepreneurial actions under a cloak of uncertainty. This leads to the research question: **How do we define and conceptualise what is meant by an EM?** In attempting to answer or at least discuss the first research question the basic flow is that we present the current perspectives on mindset as summarised from prior psychological literature. I then synthesize this into a definition relevant for entrepreneurs that it is relatively simple, but that hints at the underlying complexity of EM. Then I describe how mindset changes depending on the challenge at hand. With a short discussion on the difficulty of theorizing at the right level of detail with regards to mindset.

3.2.1   Applying Mindset to entrepreneurship

In order to start the discussion of what an EM is in terms of cognition, we can begin with a more generalised discussion of what is mindset based on research from outside the field of entrepreneurship. There is a broad range of work already focussed on this (see section 3.1.1.10), and a quick summary reveals the following 8 points. Mindset is:

- The sum total of cognitive processes activated to best solve the task.
- Cognitive procedures that affect how information is interpreted (Nenkov, 2012).

- Mindset impacts behaviour, perception, attitude and mood (Peter M Gollwitzer, 2012).

- Mindset as a filter. A sort of lens that blocks out certain information, distorts inputs and emphasises some data and allows the world to be simplified (Rhinesmith, 1992).

- Simple tasks become automated, and non-conscious and stimulus automatically generates prescribed conduct (Humphrey, 1951).

- The mind is already set on finding a certain outcome and mindset is a type of pattern recognition, where people respond in automated ways based on past behaviour (Cohen-Kdoshay & Meiran, 2007).

- It is goal directed in nature, and people will likely change strategies if the desired outcome is not achieved (Mathisen & Arnulf, 2013).

- Sensitive to environmental factors that may impact perception of the situation (Mathisen & Arnulf, 2013).

Taking all of these perspectives and condensing them into one concise description is not easy. However, we attempt to do this and at the same time apply it specifically to the context of entrepreneurship. In doing so, we synthesise a new definition of what an EM might be. We use this as a start point for our discussion of how EM impacts venture creation and expand on it in greater detail in the following sections. To begin with, our conceptualisation of EM is:

> *An automated non-conscious perspective including the sum total of cognitive processes; that lead to an individual's willingness to take action under uncertainty, make errors, learn from those failures and direct that learning to specific goals to best solve the entrepreneurial tasks within the process of venture creation (Lynch & Corbett, 2019).*

This perspective, although simplistic in its conception hints at a certain level of complexity. The complexity relates to the fact that it is not stable, changes through learning and with differing contexts. It also points to the fact that EM plays a role in the process of venture creation. In order to delve into these features we expand on these points in the coming sections. In doing so we highlight the depth of this perspective, and highlight the complexity involved.

3.2.2 Evidence of mindset shifting

I choose to focus here on two broader categories of mindset, that particularly relate to entrepreneurship – elaborative and implementive mindset (Mathisen & Arnulf, 2013). Elaborative mindsets focus on exploring or thinking about a topic. As the name suggest they focus on elaborating on a concept and trying to come up with new or creative perspectives. Implementive mindsets as the name suggest is more about implementation and acting on achieving the task at hand. Alternatively, you might label this the execution mindset, where the mindset is focussed on achieving outcomes. As

the matrix below shows, the way each mindset impacts start-up rates either individually or together is different (Table 7).

Table 7 Mindsets impact on entrepreneurial outcomes (Lynch & Corbett, 2019)

	HIGH IMPLEMENTATIONAL	LOW IMPLEMENTATIONAL
HIGH ELABORATIVE	1 • Start-up rate: high • Learning through experimentation • Role: Serial entrepreneurs, likely to be lead founder or only founder	3 • Start-up rate: low • Overthinker – paralysis through analysis • Possibly fear of failure affects "just doing it" • Role: Likely to need a co-founder with strong implementation skills
LOW ELABORATIVE	2 • Start-up rate: high & multiple • Learning through failure • Role: Likely to need a co-founder to pace him/her; and elaborate early on	4 • Start-up rate: unlikely • Low active thinking and elaboration • Lack of action; little implementation • Role: Likely to be team member but not founder

The table is particularly interesting for several reasons. The first shows that overthinking can lead to a lower likelihood of starting, likely causing a kind of paralysis through analysis. The other interesting finding is that high implementational and high elaborative mindsets combined form the best chance of starting a new venture. This goes against theoretical predictions as interpreted by Mathisen and Arnulf (2013). Mathisen and Arnulf (2013) interpret the theory of mindset (Peter M Gollwitzer, 1990) as saying that when people set out to achieve goals they first experience a stage of elaborative mindset, until they select a goal, at which point the mindset becomes interpretative.

My interpretation on the work of Peter M Gollwitzer and Bayer (1999) is different. I believe they were saying that people move back and forth between implementive and elaborative mindsets as needed. While elaborative mindsets might not be needed at all when tasks are easily achieved and have no cognitive load. Alternatively, when the goal is interrupted the model leaves open the possibility of shifting back and forth between the two mindsets.

What Table 7 shows though, is not just that it is possible to have both mindsets but rather it appears to correlate with having a positive benefit on start-up activities. In an attempt to show when this might be possible, we have made a diagram demonstrating how this shift from elaborative to implementive and back again might occur (Figure 13). The figure maps out the same four perspectives as the quadrant in Table 7 in showing how these four perspectives translate into

differing approached to taking action, or not taking action, in order to generate entrepreneurial outcomes.

1   Elaborative → Action → Interruption → Elaborative → New Action → Desired outcome

2   Action → Interuption → Undesired outcome

3   Elaborative → Elaborative → No outcome

4   Neither serious elaboration or action → No outcome

Figure 13 Possible combinations of elaborative and implementive mindset and the likely outcomes

While the diagrammatic above represents the process as a linear like process with a start and finish and ordered steps, the reality will often be more chaotic. Anyone who has ever done any thinking before can likely relate to the fact that solving challenges does not feel like a clean, clear process, but rather one in which you might loop over the same thought process again and again until a sudden fresh perspective might reveal itself. Returning to the data in Table 7, I propose this is one of the reasons why those who have both high elaborative and high implemental mindsets have the highest level of start-up activity as they are able to move back and forth between these mindsets allowing them to solve issues as they occur, and then move back to implementation. In section 6.1.2, I go into detail in explaining the ways in which EM plays a role in taking entrepreneurial action and, in particular, the role of EM in venture creation. However, for now if we refer back to the first model that separated those with the intention to begin an enterprise into the four groups based on outcomes, we can begin to connect this to our matrix in Table 7 to show the correlation between mindset and outcomes.

Intention to start

12 months later

Still going
Started & gave up

Still intending to start

Given up intention to start

1. High elaborative / High implementive

2. Low elaborative / High implementive

3. High elaborative / Low implementive

4. Low elaborative / Low implementive
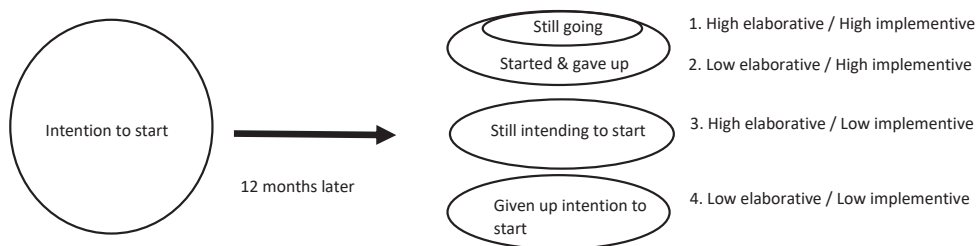
Figure 14 Connecting EM to outcomes

In linking these perspectives, it is the high elaborative and high implementive mindset (1) that allows entrepreneurs to start, encounter problems, learn from them, try new approaches and continue to

make progress towards their entrepreneurial goals. As per our definition, this becomes a non-conscious, automated approach over time, but in the initial stages this might require significant conscious cognitive effort. We elaborate in on this connection between the non-conscious/conscious elements of EM in the next sub-section. While those with high implementive, but low elaborative mindsets (2) will be able to start but will likely encounter problems. Their inability to see new approaches or options mean they get stuck repeating mistakes, or unable to move past hurdles. Those with high elaborative but low implementive (3) perspectives will likely have many ideas about what they could do, and how they could start, but never actually cross over to starting. While finally those with low elaborative and low implementive (4) are unlikely to have started and will have given up the intention to start, and likely be focussed on a new idea or project at the end of the time period. These outcomes are consistent with the data collected in Mathisen and Arnulf (2013).

3.2.3 Conscious versus non-conscious elements of EM

Prior reviews of our work on EM (Lynch & Corbett, 2019) have criticised our definition for what some readers see as a contradiction between the non-conscious elements of EM compared to the conscious elements of EM. In order to tackle this criticism and show that there is no contradiction in our definition, we aim to elaborate on the connection between conscious/non-conscious automated elements here.

As the original conception of mindset says, a mindset begins to occur when a task becomes familiar and an individual's mind is set on finding the desired outcome (Humphrey, 1951). If the task is familiar, and completion of the task is easy, then an individual does not use any cognitive effort. That is a non-conscious perspective ensues, and the individual generates the desired outcome (Peter M Gollwitzer & Bayer, 1999). In entrepreneurship, this is where the use of heuristics and scripts come into play. An entrepreneur uses heuristics in a non-conscious way to generate the desired entrepreneurial outcomes. However, these are useful only when goal achievement goes smoothly, and the desired outcome occurs.

What separates our conception of EM from prior conceptions is what happens when the desired outcome is not achieved the first time – which is almost always the case in entrepreneurship. Given that entrepreneurship is largely concerned with operating in uncertain situations (McMullen & Shepherd, 2006), heuristics are of limited use. Therefore, when problems are encountered, the heuristic-like non-conscious perspective ceases to be useful in generating the desired outcome. In fact, entrepreneurs continuing with the established pattern of thinking that is producing negative outcomes and not learning from mistakes is associated with psychopathy (Walker, 2015). Instead, what happens is that an entrepreneur should direct their attention to learning and updating their perspective in order to generate new cognitive choices.

The tendency to learn instead of giving up may be non-conscious and automated, however, the reflecting and learning, and choosing the next steps, is likely to be far from non-conscious. In this sense, it will likely take significant cognitive effort for the entrepreneur to decide what to do next and may take significant cognitive effort to act under uncertainty with the new course of action. If the chosen (new) approach serves the purpose of generating the desired outcome, and the entrepreneur repeats the thought process over time, then it may begin to move from conscious to a non-conscious perspective and the new knowledge will be incorporated into the entrepreneur's set of non-conscious automated responses.

This progression from conscious to non-conscious over time is a crucial part of our conception of EM, as is the regression from non-conscious to conscious thinking when the desired outcome is not being achieved. It is this ability to be flexible in the approach that grants an entrepreneur greater freedom to generate the desired outcomes in the long run. An entrepreneur should expect disruptions, it is how they deal with these disruptions that separates those who are successful from those who give up.

In this way, EM as we define it incorporates both non-conscious and conscious thinking depending of the situation, whether goal achievement is threatened and the success of past attempts. Our conception of EM is different from heuristics in that it is open to learning, it changes and can be updated. Our conception is different from meta-cognition, as it is not just about monitoring thoughts, and reflecting on them, but equally about the conscious generation of new options.

3.2.4 Mindset as a predictive theory

Developing good theory requires striking a balance between specificity, and generalisability. If a theory is too generalizable, then it will be applicable to a wide range of situations but will be of little predictive value. However, if a theory is too specific, it will provide a high degree of predictability, however, will be of little consequence due to the specific circumstances to which the theory relates seldom occurring. In this way the balance between these two says that a theory should be often applicable, and provide a reasonable level of predictability, while leaving open the possibility for situations to occur that run counter to the theory. This proves tricky in deciding whether the context was outside that which the theory applies, or whether the theory has in fact just been falsified.

This is of particular importance with relation to EM. As prior conceptions of EM have described it as a broad concept that is applicable in most situations (see McGrath's definition for example). However, this raises the issue of the theory not being able to be falsified as the definition/proposition put forward by McGrath is un-testable. We have seen more specific investigations of elements of EM, and the impact on the venture creation process. In particular, we have seen a focus on elements like

beliefs, intentions and self-efficacy. These elements provide reasonable amounts of predictive power. However, they lack generalisability.

One of the issues with the concept of EM, has been the use of the term EM as a highly generalizable term, yet, when we examine the empirical research from cognitive psychology into mindset, we see that each of these tests are highly specific. Coming back to the proposition that mindset is the sum of cognition best suited to solve the task at hand we can see that as the tasks change, so too will the cognition needed to solve the task.

This is specifically relevant for entrepreneurship as the process of starting a venture requires hundreds if not thousands of separate tasks to successfully launch a new venture. As such, the cognitive processes needed to start a venture is likely varied and wide ranging. This creates an issue for answering the question of what is EM. As the answer depends on the task being solved within the venture creation process. We therefore suggest that EM is in fact a cover all term used to describe many different cognitive processes used to solve the many varying tasks of venture creation.
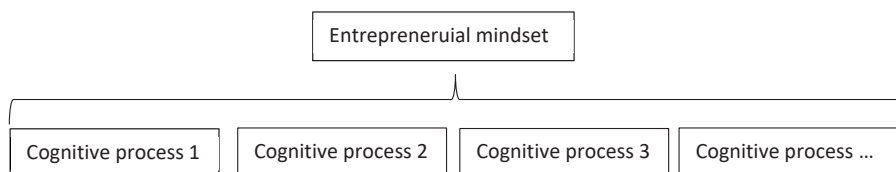
Figure 15 Representation of EM as multiple cognitive processes

While focussing on these specific cognitions might allow us to provide some predictive value, the result would be limited in applicability given the uniqueness of the context in which the study would need to be carried out. Some work has been done around expert scripts in this regards (Sarasthvathy, 2008).

3.3   Summary of chapter

I started the discussion of the research question by summarising the key points around mindset based on existing research from outside the field of entrepreneurship. I then synthesised a new definition that brought together the 8 points that I considered significant based on this prior research. Our definition of EM is: *An automated non-conscious perspective including the sum total of cognitive processes; that lead to an individual's willingness to take action under uncertainty, make errors, learn from those failures and direct that learning to specific goals to best solve the entrepreneurial tasks within the process of venture creation (Lynch & Corbett, 2019).*

Having provided a simple conceptualisation, I then discussed the two basic mindsets of implementive and elaborative mindset. Crucial to the conceptualisation of EM though is the cognitive flexibility that comes with attempting to achieve a goal. Using these two types of mindset, I showed that it is important that entrepreneurs do not get stuck on any one way of thinking, and that they can learn from setbacks and failures in order to choose better tactics in order to move past prior hurdles. There are elements of EM that are both conscious and non-conscious, and these are dependent on the newness of the situation, and whether the desired outcome the entrepreneur is trying to achieve is perceived as challenging.

In summary, this section describes EM as something flexible and changing. Not a single way of being, but rather something that changes as the context and tasks at hand change. EM is adaptable and ultimately something that can be improved through learning from experience and failure.

4 Measuring entrepreneurial mindset

4.1 Theory on measuring mindset

Having noted the differing theoretical perspectives of EM in general, and developed our own conceptualisation of what EM is, we now shift the focus to measuring EM. Attempts to measure EM are not new and there has been a number of efforts which we detail here. The focus of this chapter is to answer the research question: **How can we measure EM?** Generally, when you measure something, you know what you are trying to measure (with the exception of grounded theory research). Yet, the research we delve into has not paid particular attention to first conceiving what they mean by EM. Often articles discuss measuring EM and leave the reader to interpret what EM is based on by what is measured. We start this chapter by summarising different attempts at measuring EM, and related forms of cognition.

Attempts at measuring EM, or how entrepreneurs are cognitively different from non-entrepreneurs, has generally focussed on personality trait-based measures (Brandstätter, 2011; Caird, 1991; Davis et al., 2016; Nicholson, 1998; Obschonka, Silbereisen, & Schmitt-Rodermund, 2011; Obschonka & Stuetzer, 2017). One of the more thorough attempts that have been made at measuring EM has come from outside of the field of entrepreneurship, and carried out by psychology scholars (Davis et al., 2016). In their article, *Developing a new measure of EM: reliability, validity and implications for other practitioners*, they take a bottom up approach. First identifying any possible factors that might be relevant for measuring EM. Interestingly, they choose to include personality traits in this measure despite the field of entrepreneurship having abandoned the traits perspective (Haynie et al., 2010; Mathisen & Arnulf, 2013). Davis et al. (2016) side with Rauch and Frese (2000) in arguing for the importance of traits to the existence of an EM.

Davis et al. (2016) acknowledge it is not just personality traits that are relevant, but in addition more malleable skills. They landed eventually on measuring a mix of skills and personality traits.

Personality Traits	Skills
Independence	Future focus
Preference for limited structure	Idea Generation
Non conformity	Execution
Risk acceptance	Execution
Action orientation	Optimism
Passion	Persistence
Need to achieve	Interpersonal Sensitivity

Table 8 Factors measured in Davis et al., 2016

Most of these factors measured have already received considerable attention within literature (Davis et al., 2016). To evaluate the validity of these factors, they carried out several tests and validation

methods. Although they noted that there was weaker support for personality traits than there was for the skill-based factors. When entrepreneurs were measured against managers, entrepreneurs scored higher than managers did on every factor, except for interpersonal sensitivity, which met with the authors' expectations. These differences were statistically significant for all factors except need for achievement and future focus.

Davis et al. (2016) calls for future research to explicitly compare skills versus personality traits to see which has the bigger explanatory factor. The other thing they point out is for future research to examine whether teaching interventions impacts on their measure of EM.

While not specifically setting out to examine the correlation between skills and personality traits, one study approached the subject from an interesting, albeit potentially ethically challenging point of view. White, Thornhill, and Hampson (2006) examined the link between testosterone and the propensity to establish new ventures. They found that high levels of testosterone correlated with the likelihood of venture creation. Their reasoning for this correlation being of importance was that testosterone reflects a propensity to carry out risky behaviours, and given the riskiness of entrepreneurship, that those with high levels of testosterone would therefore be more likely to carry out the risky business of creating a new venture. They acknowledge, however, that while the relationship is significant, there is a number of other factors at play. That is likely nature and nurture that play a role in leading one to become an entrepreneur. In a later article, the same authors suggest that combining testosterone, and family involvement in entrepreneurship increases the predictability of whether one goes onto being an entrepreneur (White, Thornhill, & Hampson, 2007). The relevance of this to EM, is that our personality traits as well as our nature likely play a role in its development. So while the nature element is unpopular within entrepreneurship literature, those studying our field from the outside such as psychologists, consistently seem to be finding evidence that EM is at least partly impacted by what one is born with. To what extent is open for debate.

That there is divide between what entrepreneurship scholars are interested in (meta-cognition, biases, heuristics, etc.) versus what the field of psychology is measuring in relation to entrepreneurship raises an interesting question. Is it that entrepreneurship scholars do not understand the psychological constructs that are being measured? Alternatively, is it that the field of psychology is misguided in their approaches to measuring what they think of entrepreneurs? One of the main features of this thesis is to argue that both sides could do a better job of measuring EM.

Many scholars have chosen to focus and measure specific parts of entrepreneurial cognition. An example might be Palich and Bagby (1995) who focussed on just measuring entrepreneurs attitudes and propensity to take risks. This research found that entrepreneurs categorise things differently, by

focussing on the positive attributes of opportunities not just the risks. These findings were supported in a separate piece of research that entrepreneurs are not risk takers, but rather they used different heuristics leading them to perceive the situation differently (Busenitz & Barney, 1997). Continuing the stream of research focussing on measuring risk perceptions, M. Simon et al. (2000) found that cognitive biases led entrepreneurs to perceive situations differently, and therefore are overconfident and believe in the illusion of control with regards to their ability to influence outcomes. While these measurements contribute to understanding specific elements of entrepreneurial cognition, they are still only part of the story, and are framed within existing psychological constructs. As such, they do what they claim to do – which is measure specific elements. Yet they lack providing an overall measurement of whether someone has an EM.

Kickul, Gundry, Barbosa, and Whitcanack (2009) sought to measure how cognitive styles impact the venture creation process. Cognitive styles are high order heuristics that individuals use when they approach, frame and solve problems (Brigham, De Castro, & Shepherd, 2007). These cognitive styles are relatively stable, and place people on a spectrum between intuitive versus analytic. Where people with intuitive cognitive styles prefer more open ended approaches, are non-conformist, rely on random methods of exploration and work best on ideas requiring a broad perspective. While those with analytic styles favour more structured approaches, are generally more compliant, prefer systematic methods of investigation and are more comfortable with sequential analysis (Brigham et al., 2007). The authors argued that there were cognitive styles that were better suited to differing stages of the venture creation process.

In addition, most of these measurements view cognition as being static, or fixed (this might have been unintentional). However, recognising the fluidity of entrepreneurial cognition, Haynie and Shepherd (2009) set out to measure the meta-cognition of undergraduate business students. The way they measured this was through a 36- item scale. The scale focussed on measuring the 5 items that they set out as being important for measuring EM in the form of meta-cognition. These 5 items, in simplified terms, are: goal orientation (influenced by the environment); self-awareness; prior experiences; generating choices; and monitoring of outcomes. These paint a more holistic picture of the cognition that aims to be measured, however, it feels relatively high level, or surface based, and does not say much from a normative point of view as to what the "right or appropriate" cognition might be. It just assumed that those who can apply meta-cognition will make the correct choices in their entrepreneurial efforts.

Perhaps the most in-depth attempt to date comes from Mathisen and Arnulf (2013) who borrow heavily from cognitive psychology (Peter M Gollwitzer, 1990; Peter M Gollwitzer & Bayer, 1999).

Their theoretical starting point most closely matches my own in their attempts to look for detailed cognition that represents EM. They use a quantitative 16 item scale to search for two differing types of mindset (implementive and elaborative). While I agree with their theoretical standpoint, they lack some acknowledgement of the role that monitoring and meta-cognition plays in enabling the fluidity of EM as a construct. Although they partially acknowledge that EM is not just one thing, but at least two differing or competing kinds of cognition. My own perspective is not that they are competing, but rather that they are complementary.

Table 9 Summary of prior research measuring elements of EM

Author	Topic	Findings
Davis et al. (2016)	Skills & Personality	Measured a mix of personality characteristics and skills
Palich and Bagby (1995)	Risk	Cognitive categorisation causes entrepreneurs to see positives in opportunities (as well as risks)
Busenitz and Barney (1997)	Risk	Dues to heuristics entrepreneurs perceive risk differently
M. Simon et al. (2000)	Risk	Biases cause entrepreneurs to be overconfident due to illusion of control and law of small numbers
Haynie and Shepherd (2009)	Meta-cognition	Measures 5 items: goal orientation; self-awareness; prior experiences; generating choices; and monitoring of outcomes.
Mathisen and Arnulf (2013)	Mindset	Compares elaborating and implementational mindsets, and correlates these with the founding of new companies.
Kickul et al. (2009)	Cognitive styles	Measuring cognitive styles; examining differences in analytic and intuitive styles (as separate indexes) in connection toe entrepreneurial intentions
Sarasthvathy (2008)	Entrepreneurial cognition	Entrepreneurial decision making in relation to opportunities, and synthesised this into normative advice.

In summary, in the above literature there is little in the way of innovative approaches to measuring EM. The articles reviewed rely primarily on responses to survey questions. Thereby making them dependent on the congruence between individual's perceptions of themselves, versus how they might actually be. In addition, they are dependent on snapshots in time. Lastly, many of them deal with specific parts of cognition, such as risk propensity, or meta-cognition, and as such do not cover the full spectrum of what we define as EM. Our conception of EM is such that it requires a new approach to measuring EM that acknowledges its fluidity and ability to change. Having highlighted this gap within existing literature, we move to a discussion about how EM might be measured in a different way.

4.2 Measuring cognition

As per the earlier discussion, EM is based on cognition. At present, technology is insufficient to allow us to measure accurately thoughts within entrepreneurs' heads. The current resolution of MRIs is such that we can tell which part of a brain is active, but not at a resolution that is more informative for studying mindset. Therefore, studies to date measuring EM have focussed on self-reported results. This brings with it a host of methodological issues. As discussed in Davis et al. (2016), there can often be a gap between how people perceive themselves, and how they really are. The larger this gap, the more noise that will be introduced into survey results. In addition, individuals are seldom able to give full explanations of their actions or intentions; all they can offer are accounts, or stories, about what they did and why, yet these are notoriously unreliable (Cope, 2005).

One novel approach that has been used in other fields has been to study cognition through language use. This is based on the argument that language reflects what we think about and how we think about it. Language plays a role in forming an individual's reality construction (Ahl, 2003). "Language circumscribes (and makes possible) what one can think and feel and imagine doing" (Ahl, 2003, p.63). Conversation is the most important vehicle of reality-maintenance, according to Berger and Luckmann (1991). In the linguistics literature, linguistic relativity (popularly known as the Sapir–Whorf hypothesis (Whorf & Chase, 1956)) argues that the structure of a language affects the ways in which its speakers conceptualize their world. For example, studies have shown that people find it easier to recognize and remember shades of colours for which their spoken language has a specific name (d'Andrade, 1995).

Other studies using language as a measurement for cognition/mindset has produced some interesting results. Through analysing twitter accounts and utilising machine learning Wang, Mahmud, and Liu (2016) ere able to predict users cognitive styles. The accuracy was in the range of 60-70%, suggesting room for improvement but is still a demonstration of being able to understand the way users think through analysing language use. Language has also been used to detect psychosis. to predict with greater accuracy and earlier than experts when a patient had the onset of psychosis. While both studies are based on the language of individuals, shared language can also impact organisations.shared language can also impact organisations.

Examining the working language of a company and the impact this can have on planning for the future, Liang, Marquis, Renneboog, and Li Sun (2017) found that language played a role. Their study examined whether the working language impacted the amount invested in corporate social responsibility and research and development. Some languages force a separation between future and the present tense of words. Liang hypothesised that separating the future tense and the present tense in a language reduces the cognitive importance of the future, and therefore results in a

reduction in investment in the future due to its perceived distance. They examined over ten thousand companies, over a period of 15 years, across 114 countries. They found support for their theory that the working language of companies did impact planning for the future. So, it is not just the language of individuals that has an impact, but rather collective language in an organisation can impact firm-wide decisions.

The argument that language can inform our sense of reality is the basis of the field of linguistics and the concept of linguistics has yet to be used to inform or measure EM, thus suggesting that there is opportunity to use language analysis. Using language for gaining insight into how entrepreneurs think has arguably led to one of the more interesting theoretical breakthroughs in the field of entrepreneurship and led to the creation of the theory of Effectuation. This was based on talk aloud protocols of 45 expert entrepreneurs. The criteria for being experts was that they had been a founder for over 10 years, started at least two companies, and had taken at least one company public. Talk aloud protocols are not new, and in a review of prior talk-aloud studies found over 200 of them from other fields (Sarasthvathy, 2008). While similar to EM, effectuation was conceived from a subtly different starting point, which was to examine the way in which entrepreneurs would assess opportunities. However, the result is an operationalised perspective on how expert entrepreneurs think about starting ventures, and in this way closely aligns with EM. I therefore see this as supportive of the notion that language can be used as a measure of EM.

4.3   Discussion of RQ 2: Measure

Having briefly touched on some common perspectives to measuring EM, I now shift the focus to discussing the second research question, which is: how can we measure EM? What we define as EM obviously dictates what we try to measure. However, the relationship might also be conceived of as reciprocal, in that what we measure as being present in entrepreneurs' cognition, might also inform what we conceive as being an EM. As discussed earlier, the traits-based approach to measuring EM has been largely dismissed or is out of favour within entrepreneurship scholarship community.

The death of the traits approach has left a gap with regards to how to best measure EM. Although, this gap somewhat unsurprising given the lack of consensus as to what EM is in the first place. Given this lack of clarity, we attempted to carry out a grounded approach to measuring EM amongst those entrepreneurs who had been successful. The theoretical start point for this was the work of Krueger (2007) who suggests that expert entrepreneurs think differently from their less successful counterparts. In particular they have expert scripts that they rely on in order to make sense of the world and to help guide their decision making process and therefore their actions.

Measuring cognition is challenging due to not currently being able to measure thought processes, and we must therefore rely on subjects communicating what they think. Typically, we would rely on surveys to measure the factors we wanted to understand. However, this requires knowing what you want to measure before you measure it, as well as issues around self-reporting surveys in general. Lastly, asking participants to rate themselves, or to answer what they think about topic, would require them to have a sufficient level of insight into how their own cognition works, which is not always the case.

Therefore, I attempted to bypass these methodological issues through measuring natural language use. This was based on the premise that what we talk about and how we talk about it reflects our cognition. At the time, I was unfamiliar with the methodology behind Saravasthy's work on effectuation. Although, with hindsight, I can see that the methodology shares many similarities with her work. She relied upon talk-aloud protocols, whereby participants would discuss what they were thinking as they went through a decision making process. We opted for a more natural approach, and therefore took interviews with entrepreneurs whereby they were participating in semi-structured interviews about their companies. The language patterns in these conversations were analysed and examined at the level of word usage. Ideally, the analysis would have been at the level of sentence structure and themes. While it is possible to do this, there are challenges with getting the level of analysis correct and making sense of the resulting data.

One of the challenges in using this methodology, is to understand at what level to set a cut-off for the words to be analysed. Ideally, we were looking for words that were being significant over-used or under-used in comparison to the control group. The test group was made up of 51 interviews, and we were therefore looking for words that were relatively commonly used. In order to do this, we only analysed words that had been used a minimum of 15 times. This number was arbitrary and sought a balance between generating a large enough pool of words whose usage was significant at the 0.01% level. This resulted in a pool of 373 words that had been significantly over used or underused. The words alone though were relatively uninteresting, so for each word, we attempted to code a meaning for the word. In order to do this, we would examine examples of the ways the words were being used (see Table 10 for an example).

Table 10 Example of words examined in their context (Lynch, Kamovich, et al., 2017)

…ing on it. Why? Because I want to **build** WhatsApp for this thing, I want to…
…e part of the culture, you have to **build** as well as to get these people to un…
…ill start up and it was very fun to **build** something out of nothing and we sort…
…al thought was we would go back and **build** a community of software engineers bu…
…because I have the idea. But let's **build** a company together. So that's the ki…
…same time. That's why we decided to **build** a new solution from scratch, to add…

(note: the analysis tools limits the context to 80 characters including spaces)

Seeing the individual word used in context allowed me to create a code that seemed best suited to summarise the way it was being used. There were times when this was confusing and uncertain, and other times when it felt obvious the way in which it was being used, and therefore what code to assign to it. The approach is a mix of quantitative and qualitative, and in coding the words we acknowledge that the codes assigned are entirely subjective. Having created a number of codes, these codes were reviewed a second time for similarities and to see whether some of these should be combined or split up into sub codes. The result was 5 themes that appeared to emerge from the codes/data. To demonstrate one of the themes, this is included below (Table 11).

Table 11 Words coded as action orientated (Lynch, Kamovich, et al., 2017)

Word	Number of times used	% of total usage	Number of times used (control group)	% of total usage	+ indicates used more often (compared to control group)	log-likelihood value*
build	230	0,13	65	0,01	+	488,76
use	283	0,16	336	0,04	+	236,17
building	149	0,08	162	0,02	+	137,01
built	88	0,05	51	0,01	+	134,09
will	415	0,24	994	0,13	+	96,51
using	124	0,07	161	0,02	+	92,89
launched	53	0,03	27	0	+	86,98
creating	42	0,02	23	0	+	66,18
created	39	0,02	22	0	+	60,4
able	228	0,13	285	0,04	+	179,03
solve	73	0,04	17	0	+	165,15
create	107	0,06	62	0,01	+	163,06
going to	431	0,24	1232	0,16	+	53,47
start	187	0,11	433	0,06	+	47,89
first	340	0,19	944	0,12	+	47,62
make it	71	0,04	113	0,01	+	39,82
can	965	0,55	2271	0,29	+	236,14
* Significance: 99th percentile - 1% level; p < 0.01; critical value = 6.63 99.9th percentile; 0.1% level; p < 0.001; critical value = 10.83 99.99th percentile; 0.01% level; p < 0.0001; critical value = 15.13						

The method seemed appropriate as an exploratory approach or grounded approach to identifying themes that might represent EM as measured through language use. In using this methodology for the first time, I was surprised by the strength of the significance of the words, and in connection to this the themes when these were grouped together. I was curious whether we could find support for

the same themes in a different data set. As I felt that the data set was only on the cusp of being large enough, and I would have liked greater insight into the contents of the control group.

The control group was a body of text gathered at Lancaster University, as part of work carried out by Mudraya, Rayson, Cave, and Whitehouse (2005). In total, the corpus consisted of 98 interviews and contained a total of 840,000 words. This contained 44 interviews with restaurant businesses (331,000 words), 21 with manufacturing for outdoors (210,000 words), 10 on entrepreneurial learning (188,000 words), 10 on entrepreneurial failure (60,000 words), 11 on small businesses in general (28,000 words) and 2 on family businesses (23,000 words). The corpus was intended to represent a broad coverage on language used by entrepreneurs. While not specifically stated, we presume the interviews were with people from the UK. This lack of insight into the actual contents of the control group was concerning for me, as I wanted to ensure that any comparisons between the test and control group were in fact valid.

While I thought the method was somewhat robust, I saw room for improvement, and therefore we attempted to test whether we could find evidence for the same 5 themes in a different data set. So instead of taking a grounded approach, whereby the data would speak to us, we instead set up 5 propositions and attempted to find evidence to support these propositions in a different data group.

In order to do so, we took 70 interviews and created a control group and test group out of these 70 interviews using financial metrics as the dividing measure. The result was a control group of 26 interviews, a test group of 30 interviews, and the remaining 14 were not used, as we needed a buffer between the two groups, so that we could arguably see a difference between these two groups. Again the purpose of splitting these two groups was to search for evidence of differences in EM between successful entrepreneurs and less successful entrepreneurs in the way they thought.

4.3.1   Results from the second iteration

In order to continue the work of the prior study (Lynch, Kamovich, et al., 2017), we decided to test the five themes that emerged from the study. The themes were that those with an EM were action orientated; future orientated; collectivist; customer focussed; and growth mindset. While the intent behind this part of the research was clear, the execution of it in a way that felt robust was difficult. We returned to the original codes used in Lynch, Kamovich, et al. (2017), and found the 66 words that made up the basis for the 5 themes. Then these words were compared to the control group in the new data set to examine whether they were underused or overused to an extent that was statistically significant.

Table 12 Summary of words searched for in relation to the hypothesis (Lynch, Tuema, et al., 2017)

Hypothesis	Words Present	Words Missing	Consistent	Consistent %	Inconsistent
Action Orientated	15 out of 17	2	10 out of 17	59%	5 out of 17
Future orientation	18 out of 19	1	12 out of 19	63%	6 out of 19
Collectivism	14 out of 15	1	11 out of 15	73%	3 out of 15
Customer focussed	7 out of 8	1	5 out of 8	63%	2 out of 8
Growth perspective	5 out of 7	2	1 out of 7	14%	4 out of 7
Totals	59 out of 66	7	39 out of 66		20 out of 66

Unsurprisingly, not all of the words we searched for were present, and of those that were present not all were consistent with the hypothesis. We were therefore forced to create an arbitrary scale by which we could assess whether the hypothesis was supported or not. We opted for less than 50% of the words being present (and significant) as not supporting the hypothesises, 50 – 70% of the words being present as being weak support, and above 70% as support for the hypothesis. In the end we found support only for the collectivist perspective. While we found weak support for action orientation, future orientation and customer focus; and no support for the hypothesis around growth perspective.

There were additional issues with this study that were unforeseen at the commencement of the study. The first was that some of the themes were reliant on a small number of words. Take for example the theme of Growth perspective; we were only using 7 words as a benchmark for this theme. In hindsight, it was obvious that this was not robust. In addition, we were uncertain whether the split between the test group (successful entrepreneurs) and the control group (entrepreneurs) was really significant enough to say something about the scripts. The control group was those who had a business with less than US$3million in revenue, yet many people would still consider this to be successful. In addition, financial goals are often not what motivates individuals to be entrepreneurs (Lynch, Slåttsveen, et al., 2017; Neck & Greene, 2011).

Overall the method applied to testing the hypothesis did not feel well suited to the task at hand and felt like too many arbitrary decisions were required to be made with regards to what was to be included and excluded. We therefore think that the methodology is best suited to an exploratory approach for identifying themes for further research on EM. Although, as a methodology for testing specific hypotheses it does not seem well suited.

In using words as a measure of EM there is room for improvement through using entire sentences and automatic tagging of words for themes. As doing so would reduce the reliance on the subjective

coding that is necessary with the current methods. It might also mean that more robust testing can occur, as this offers what appears to be a fruitful path for better understanding EM. I therefore argue that it holds promise as a method for measuring EM, however, it requires further refinement from the way I have utilised it in these studies.

4.4   Summary of chapter

Existing methods appear to be focussed around using self-reported survey answers to create insights around what other authors consider to be EM. Many of these are focussed on personality, skills, and elements of cognition, such as need for achievement or risk propensity. While these authors have contributed to discussions around what is EM, their methodology seems to leave space for developing a quality measurement of EM.

In seeking a method that was consistent with our conception of EM, I choose to focus on language as a de facto measure for cognition. This was based on the argument that what we talk about, and how we talk about it, reflects how we perceive reality, and therefore provides a window into our cognition.

We carried out two studies in this area (Lynch, Kamovich, et al., 2017; Lynch, Tuema, et al., 2017), the first was grounded in its approach without pre-conceived ideas of what was being sought out, other than differences in language use between successful entrepreneurs and less successful entrepreneurs (Lynch, Kamovich, et al., 2017). This study revealed 5 themes that were then tested in a follow up study (Lynch, Tuema, et al., 2017). The follow up study was based on the same theoretical position, but instead sought to either support or disprove the 5 themes from the prior study. The results strongly supported one of these themes, with weak support for three themes, and no support for one of them. The methodology though had room for improvement, which is to be expected with new methodologies, as developing them requires an iterative process in order to refine them.

While the methodologies provided superficial answers as to what is an EM, they also signal that there is potential in them, and that they should be developed further. However, in providing an answer to the research question: **How might we measure EM?** I fall short of providing a clear answer to this question. However, we do provide some insights into how language may assist in the process. However, in reconciling our conception of EM with this question, we also land on the conclusion that perhaps measuring EM is a somewhat fruitless task. Given that EM is fluid and changing, what we measure in one moment will no longer be the same as soon at the entrepreneur begins to tackle new challenges and learns from these, causing their cognition to be updated (Lynch & Corbett, 2019). This points to a more deeply philosophical challenge, of how to do you measure something that changes

form constantly. I do not pretend to have an answer to this question, but the insight may point to why so many authors have previously managed to come up with unconvincing answers to the same question. It also informs our conception of how EM plays a role in venture creation and suggests we can find similarities in cognition between successful entrepreneurs, although the highly context specific nature of cognition makes codifying these similarities difficult.

5 Teaching entrepreneurial mindset

5.1 Introduction to teaching EM

Having discussed the first two research questions about what an EM is, and how it can be measured, we can now address the third research question, which is: **Why is DT a useful pedagogy for teaching EM?** This question may not seem to flow naturally from the prior two research question, and it may not be apparent to readers what DT has got to do with EM. In order to make this connection clear, we begin by examining the existing theory on teaching entrepreneurship, which leads into a discussion on the best methods for having students practise having an EM. What emerges from this theoretical discussion is the perspective that design as a field, and DT as a pedagogy has something to offer with regards to supporting efforts to instil an EM into students. These theoretical perspectives are then built upon in the discussion section where I try to answer the research question in detail.

5.2 Theory on teaching EM

5.2.1.1 Entrepreneurship education pedagogy

The debate over the best way to educate entrepreneurs, and in the process teach EM to students, is far from settled. We therefore start by broadly discussing the different ways to teach entrepreneurship before delving deeper into arguments for the most appropriate way to teach EM.

In reviewing the current teaching methods for entrepreneurship, Pittaway and Edwards (2012) created a basic typology describing the different methods through which entrepreneurship could be taught. This typology describes three basic forms of pedagogy, these are: About; For; and Through. "About" forms of pedagogy focus on theoretical driven approaches that teaches students about what other entrepreneurs do or have done before. "For" types of pedagogy provides information relevant for entrepreneurs that will provide them with additional skills for carrying out entrepreneurship. While "through" forms of teaching entrepreneurship have students go through the entrepreneurial process having them learn themselves as they go. While these typologies are simplistic, and often there will be somewhat of an overlap, we still think they provide a start point for discussing how we might teach EM. In order to argue for what is the most appropriate out of these three forms of teaching, we must first step back and examine how learning takes place, in order to say what represents the best way to learn/teach.

In discussing how learning takes place, one of the early pedagogical perspectives highlighted that students learnt best through experiencing the phenomenon they were learning about (Kolb, 1984). Kolb's perspective was useful in pointing out the connection between actively encountering and experimenting, combined with abstract conceptualising and reflective observation where learners went through differing stages in order to learn. However, building on this work, it was Burgoyne

(1995) who highlighted that learning is often not a solitary activity, but one that occurs through the meeting of minds as students' learning takes place in a social context, where their shared experience impacts on both what they experience and how they make sense of that learning (Figure 16).
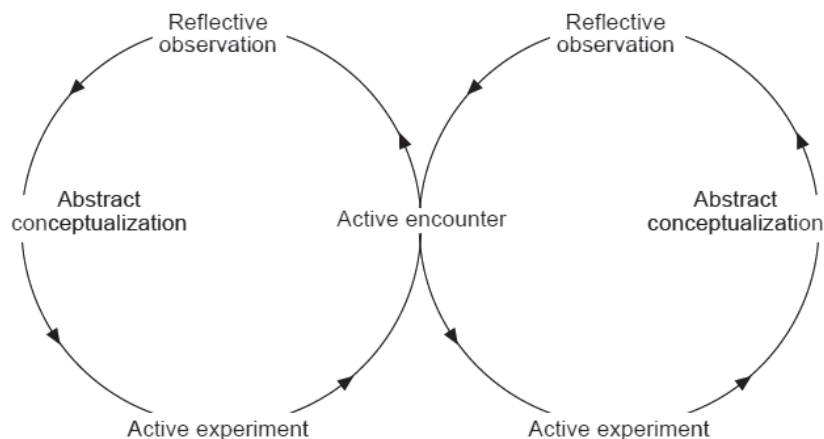
Figure 16 Social learning cycle (Burgoyne, 1995)

It has been argued that learning from experience (LFE) is a superior form of learning (Burgoyne, 1995; Kolb, 1984). This is based on the logic that LFE is more closely associated with deep learning, or broadly put tacit and affective knowing, or sometimes cognitive knowledge. This is due to LFE requiring learners to take a role through active interpretation of the experiences they engage in, instead of just internalising pre-created knowledge. This argument is particularly relevant where the context that the learning is occurring in is changing or updating rapidly, as pre-formed knowledge will expire more quickly here, and loose its value or even becomes dangerously misleading (Burgoyne, 1995). Given that entrepreneurship is focussed on acting on opportunities in unknown environments, it would seem that this form of learning through experience is particularly relevant. If entrepreneurs are to operate in the space of the unknown, or in new environments, then pre-formed knowledge about how to act will likely be of little use – as this was knowledge formed and codified for a different context.

This likely explains why LFE has been adopted by the entrepreneurship pedagogical community, many of whom advocate for action based and experiential approaches to developing competencies (Gibb, 2008; Neck & Greene, 2011; Neck, Greene, & Brush, 2014). These perspectives are about teaching aspiring entrepreneurs how to learn through active experimentation and reflection in order to make sense about how to proceed forward. This type of learning calls for group orientated, project based, hands-on and context laden approaches to learning (Lackéus, 2014). Even the EU with

its consensus approach to making recommendations has supported this call for teaching EM in this way (European Commission, 2006).

Lackéus (2014) points out though, few have accounted for when, how and why such learning environments contribute to the development of entrepreneurial competencies. Lackéus (2014) argues that learning takes place through emotional events (both positive and negative). Through a small sample size of three students, Lackéus explored which events in a practise based entrepreneurship course led to emotional reactions. The most common events were interacting with the outside world (predominantly positive), confusion and ambiguity (predominantly negative), and team work (both positive and negative). The author argued that the most common entrepreneurial competencies developed from these events were entrepreneurial self-efficacy, self-insight and entrepreneurial identity (all elements of cognition). The authors argue that these emotional experiences are what make the process of learning valuable, even though not all emotions are positive. It is this sense of meeting challenges and overcoming them that helps build a sense of self efficacy in students (Bandura, 1994).

While the entrepreneurship community generally supports LFE, and research has supported the idea that learning occurs through reflecting and sense making about emotional events, these perspectives only speak indirectly to educating individuals to have a more EM. Instead we turn our focus more towards cognition. One perspective on this relates to training individuals to have an expert EM. Krueger (2007) states that learning takes place through "developmental experiences", that is, we have experiences that are often "crises" and these represent opportunities to develop our cognition and it is through our sense making perspective that we learn a new mindset (Ericsson & Charness, 1994; Krueger, 2007). Crucial here is the insight that it is not the experiences that are critical, but the lessons learned from them (Krueger, 2007). As such, the role of the teacher in this setting is to play a role in helping students make sense of their experiences in a constructive manner (not a destructive manner). For example, helping students realise that a lack of sales is not a failure, but rather an opportunity to examine why sales are not being made, and to iterate through cycles of learning about what the root cause of the lack of sales is. These lessons learned through experiences are what lead to beliefs, and ultimately what form the deep structures of our cognition (Krueger, 2007). Although educators are themselves hostage to their own deep cognitive structures and may struggle with their own limitations impacting the sense making process. As such, Krueger (2007) suggests the use of experts in teaching is not just justifiable, but arguably essential.

In helping students to develop expert EM, we need to create experiences that allow them to practise (Baron & Henry, 2010; Krueger, 2007; Neck & Greene, 2011). Problem based learning or having

students go through the experience of being entrepreneurs is recognised as one way to do this, however, what represents "good" practice is seldom discussed (Baron & Henry, 2010). In order to set up good practice, Baron says:

> "deliberate practice involves the following key features (e.g., Ericsson et al., 2006; Colvin, 2008):
>
> 1. Deliberate practice is highly demanding mentally, requiring high levels of focus and concentration. Crucially, for deliberate practice to be effective, persons performing it must be fully absorbed in their efforts to improve and focus all their effort and attention on the task in question (Ericsson et al., 1993).
>
> 2. It is designed specifically to improve performance—to strengthen it beyond its current levels. Areas of weakness must be identified and strenuous efforts must be made to improve these. Merely repeating aspects of performance or information that are already well established is insufficient.
>
> 3. It must continue for long of periods of time. Basic research on expert performance suggests that the benefits it generates cannot usually be attained with less than 10 years of continued, vigorous effort (e.g., Ericsson, 2006).
>
> 4. It must be repeated. This is one reason why attaining truly excellent levels of performance requires long periods of time; deliberate practice must continue and be repeated many times (the precise number of repetitions depends, in part, on the specific skills being mastered) to produce lasting, stable benefits.
>
> 5. It requires continuous feedback on results. This should be continuously available, either from others or from the tasks themselves.
>
> 6. Pre-performance preparation is essential. Before beginning, individuals must set appropriate goals—ones that are specific and relate to the skills being practiced and acquired. These should involve not merely outcomes, but also the processes involved in reaching predetermined goals.
>
> 7. It involves self-observation and self-reflection. Individuals hoping to achieve expert levels of performance in any field must closely observe their own behaviour and monitor their performance and progress. This is a key aspect of metacognition—individuals' knowledge and understanding of their own cognition and performance.
>
> 8. It involves careful reflection on performance after practice sessions are completed. Recently achieved levels of performance must be compared with goals so that further practice can be adjusted to achieve maximum results." (P. 51).

Some of these requirements set a high bar for what constitutes practice, however, they represent a yardstick by which we can begin to design pedagogy around. "Entrepreneurship is complex, chaotic and lacks any notion of linearity" Neck and Greene (2011, p. 55) and entrepreneurship educators accordingly have the responsibility to deliver courses that provide the space for students to practice developing the skills that they need to excel in the highly uncertain and ambiguous environments. Giving them the opportunity to practice and develop an expert mindset in a safe environment is therefore a key aim of pedagogy. While the above guide to practicing provides some insights, it is still unclear specifically what we should be having entrepreneurs practice (Baron & Henry, 2010). In order to examine what we should be having students' practice, and how to teach this practice, we turn to design as a field to draw inspiration.

5.2.2 Design as a pedagogy

"In our quest to define, understand, and even measure the EM, the world of design is a good starting point for our inquiry" (Neck & Green, 2011, P. 65).

Entrepreneurship is an applied discipline, yet we are teaching and researching as if it was part of the natural sciences (H. A. Simon, 1996). While the field of entrepreneurship has come a long way in the last 20 years since Simon wrote this, the perspective of treating entrepreneurship like a science is still far too common in my experience. Entrepreneurs think and act in many ways that are similar to designers (Neck & Greene, 2011). These similarities are that design is about trying to shape and create outcomes in the external world based on internal perceptions (H. A. Simon, 1996). Entrepreneurship is also about acting on opportunities under an umbrella of uncertainty (McMullen & Shepherd, 2006), we therefore need to train entrepreneurs to be comfortable with uncertainty. One particular school of thought that appears comfortable with ambiguity and uncertainty is design (Nielsen & Stovang, 2015). Design is a process of divergence and convergence requiring skills in observation, synthesis, searching and generating alternatives, critical thinking, feedback, visual representation, creativity, problem-solving, and value creation (Beckman & Barry, 2007). Neck & Greene (2011) explain this difference between treating entrepreneurship as a process compared to a method, and in doing so attempt to show the similarities between entrepreneurship and design as a method (see Figure 17).

Entrepreneurship as a Process		Entrepreneurship as a Method
Known inputs and outputs	●·········●	A body of skills or techniques
Steps	●·········●	Toolkit
Predictive	●·········●	Creative
Linear	●·········●	Iterative
Precision	●·········●	Experimentation
Tested	●·········●	Practiced
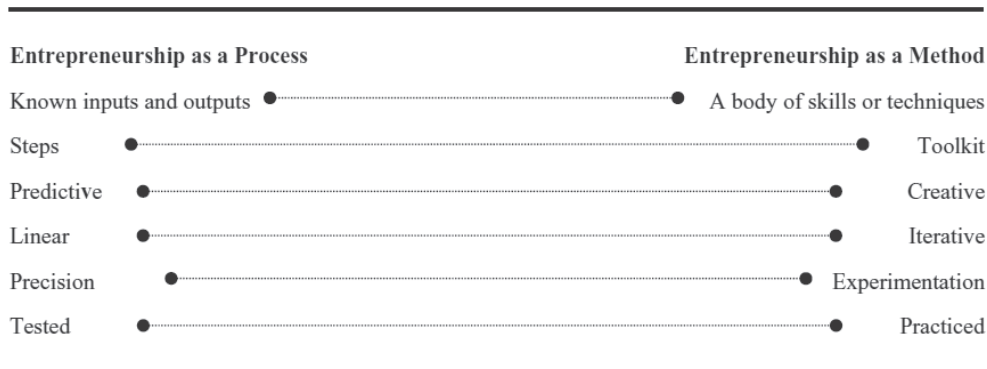
Figure 17 Process versus method (Neck & Greene, 2011)

One particular application of design methods that has been applied to fields outside of design is that which has become known as design thinking ("DT"). DT as a pedagogy has been put forward as one way to teach students to be more entrepreneurial, and develop an EM (Neck & Greene, 2011; Nielsen & Stovang, 2015). In order to elaborate on how DT can play a role in training students to have a more EM we shift our focus to research question 3. Before doing so, I briefly summarise the arguments made in this section. There are different approaches to teaching entrepreneurship, however, the entrepreneurship community is slowly building a consensus that learning to be an entrepreneur requires learning from experience. This often means having emotional experiences whereby the space to reflect and make sense of this leads to learning. Mirroring this is the perspective on expert mindsets, that says these experiences when treated as practice allow individuals to build cognitive scripts, beliefs, and ultimately expert EMs. Design has been put forward as one methodology for creating the space to practice these entrepreneurial experiences, as design and entrepreneurship have a lot of similarities. DT in particular has been put forward as one promising pedagogy for training EM. We therefore begin our discussion of research question 3 with these prior theoretical perspectives in mind.

5.3   Discussion of RQ 3: Teach

Having discussed various theoretical perspectives on pedagogy relation to entrepreneurship, and teaching EM in general, we now turn to the third research question and discuss the work carried out in investigating this question. In order to elaborate on the question of how best to train individuals to have an EM, we now return to our definition of what having an EM means. EM is defined by us as: *An automated non-conscious perspective including the sum total of cognitive processes; that leads to an individual's willingness to take action under uncertainty, make errors, learn from those failures and direct that learning to specific goals to best solve the entrepreneurial tasks within the process of venture creation (Lynch & Corbett, 2019).* Teaching efforts should therefore be aimed at cultivating

this mindset in students. In order to discuss this, we specifically focus on answering the third research, which is: **Why is DT a useful pedagogy for teaching EM?**

Dissecting the research question above requires us to translate our definition of EM into learning outcomes. We therefore set out the following 6 desired learning outcomes (LO):

- LO1: To develop an automated/non-conscious entrepreneurial approach[2] to challenges
- LO2: To learn to apply appropriate cognitive processes for the task at hand
- LO3: Develop a willingness to act under uncertainty
- LO4: Willingness to experiment, make errors in the process, to reflect and learn from mistakes.
- LO5: Capacity to apply previously learned insights into future actions
- LO6: To practice venture creation

The second part of the question is why is DT useful for achieving the above outcomes. In order to answer this question, we first lay out our perspective on what is DT, and the connection to EM. We then provide student reflections to provide context for what students receive out of DT as a pedagogy. We then move to normative suggestions for how best to teach EM. Finally, we end with a discussion on the potential risks of trying to intervene in a student's deep cognitive structures in an attempt to influence their mindset. Collectively these sections provide clarity over why DT is a useful pedagogy for teaching EM.

5.3.1 Design thinking explained

The best way to teach entrepreneurship in general, and EM specifically, is far from settled (Lynch, Steinert, & Andersson, 2016a). However, there is a growing acceptance that design methods, and DT represents one possible method for supporting entrepreneurs to be more entrepreneurial (Neck & Greene, 2011; Nielsen & Stovang, 2015). However, we considered the student's perspective on this to be in important, and the extant literature on the subject was thin (Lynch, Kamovich, Longva, et al., 2019). We therefore set out to see how students experienced DT as a pedagogy, and whether this was supportive of their journey to be entrepreneurial. The results of which are covered in Lynch, Kamovich, Longva, et al. (2019). Before discussing these results though, it is worth outlining what DT is, and why it has a number of parallels to EM.

DT is a form of teaching that aims at generating new ideas and exploring possible solutions instead of just picking from existing solutions (Beckman & Barry, 2007). It inherently acknowledges that there are multiple answers instead of just one right answer. DT is not a unified and singular approach, but

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[2] By entrepreneurial approach, I refer to Saravassy's effectuation perspective.

has expanded to include multiple models over the years (Dorst, 2011). I personally subscribe to the method taught at the Hasso Platter Institute for Design at Stanford (Commonly called 'the d. School') and as discussed by Brown (2009) which involves a series of five steps. In discussion with other teachers of DT and in documents from the d.school (Bootcamp Bootleg, 2010), DT is often described as more of a mindset than a process (see Figure 21). While the five steps of DT are often portrayed linearly (Figure 18), they are more cyclical in nature, and often jump back and forth between the different steps. It also requires users of DT to know when to use which steps, and when to shift to different steps – in this way it resembles tacit knowledge.
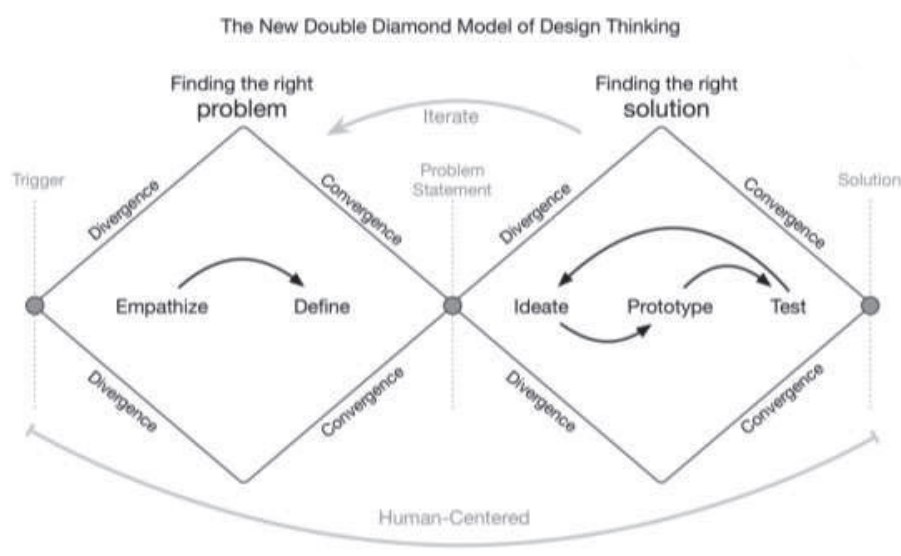
Figure 18 DT as a model (Liu, 2016)

 As the diagram shows, there is a double diamond which represents what is often labelled as a focus and flare, or sometimes exploration and exploitation after the innovation article by March (1991). "Exploration includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation. Exploitation includes such things as refinement, choice, production, efficiency, selection, implementation, execution" (March, 1991, P. 71).

DT therefore represents a good training ground for having people move between the two mindsets. For students who are new to the process, it might feel a little forced at times to move from one step to the next, however, over time it becomes more fluid to the transition between the differing steps and shifting mindsets back and forth between elaborative and implementive mindsets. Experienced design thinkers manage to dance back and forth between these two steps, in what has sometimes been called dancing with ambiguity (Leifer & Steinert, 2011).

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One of the key concepts of DT is this split between the problem space, and the solution space. In Figure 18, the two diamonds represent these two different spaces, with the problem space on the left, and the solution space on the right. The significance of these is that the two spaces are intertwined, where any successful solution needs to match to the problem space. This same concept has been represented in entrepreneurship literature, such as Value Proposition Design (Osterwalder, Pigneur, Bernarda, & Smith, 2015). The importance of this is that if we can be certain and clear about what the problem is and who has the problem, then it is just a matter of iterating on solutions until we find the one that matches our customer group, and having solved their "problem" we can then aim to build a business model around this transaction.

In giving equal room to the problem space as the solution space, DT implicitly acknowledges the fact that there needs to be as much time invested in understanding the problem as there is to creating a solution. This differs from typical perspectives on knowledge and teaching whereby students are simply asked to answer questions or develop solutions. In most teaching approaches, there is very little time spent on developing the right questions and or questioning whether the assumptions underlying the original question are correct. DT inherently acknowledges that we likely do not know the right question to begin with, so we begin on the left with a starting point, and then we begin to explore the problem space, which naturally leads to a broadening of our understanding, as we do so, we begin to see patterns and perspectives in a new light, we can then begin to narrow our exploration of the problem space as we zero in on what is the key driver of the problem/challenge/issue. It is at this point that we develop a point of view; which specifies our user, their need, and the reason for that need. Again, this ties in with existing entrepreneurial perspectives (for example value proposition design, crossing the chasm, and disciplined entrepreneurship), whereby, there is a focus on customer groups and their needs or defining the specific customers for whom entrepreneurs will serve.

DT also inherently acknowledges that it is impossible to truly understand a problem, and that understanding the problem and then creating a solution is not a linear process. Instead it requires a cyclical approach of multiple interactions. First you explore the problem space, develop a POV, and then prototype a solution based on the current understanding. Critically though it requires testing and feedback to ensure that this understanding of the problem and the proposed solution match. Rarely does this occur the first time around and requires multiple iterations.
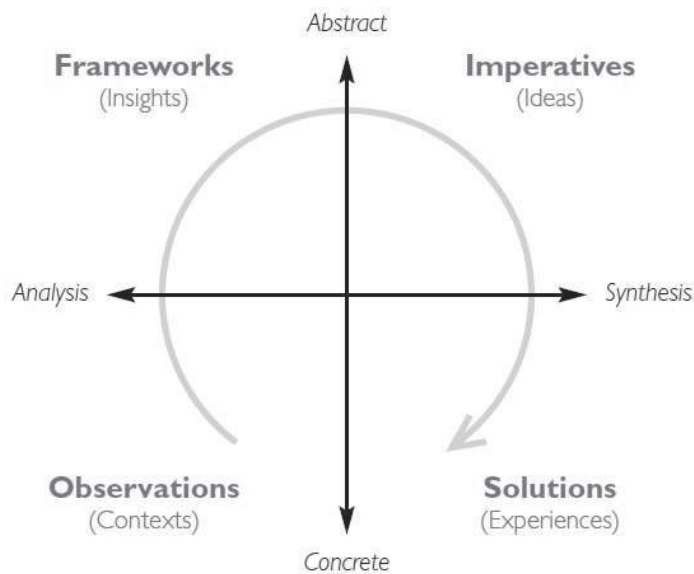
Figure 19 The innovation process (Beckman & Barry, 2007)

The iterative process can be visualised as moving between two axis's (Figure 19), the first is moving back and forth between the concrete physical world (for example prototypes, role playing etc.); versus abstract conceptualisation of ideas. This closely matches the way knowledge is generated (see Figure 5), in that we can generate knowledge through the realm of theory or through the realm of practice. DT makes use of both realms. At the same time, DT pushes users to use different types of thinking, both analysis and synthesis of information. The combination of this movement through the four different quadrants is meant to support abductive leaps in conceptual understanding (often called "aha" moments) (Dunne & Martin, 2006). Abductive logic described by Charles Sanders Peirce tells us that no amount of inductive and deductive thinking will reveal the unknown (Steinert & Leifer, 2012). DT therefore combines the generation of new ideas (abduction) and uses deduction to predict how these will be received. DT tests the most promising ideas, and then analysis the feedback and makes inductive generalisations about how they will be perceived by a wider user group (Figure 20).
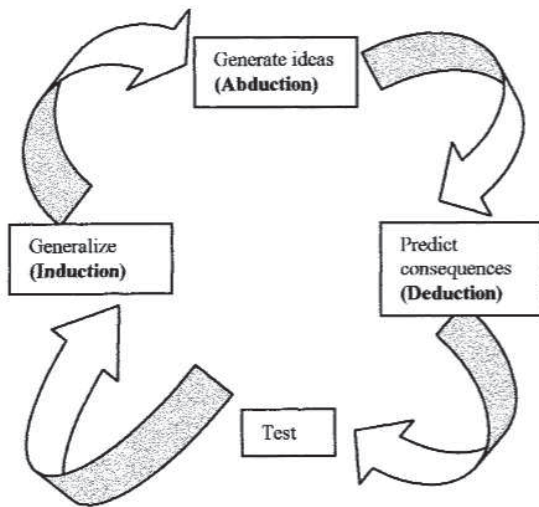
Figure 20 The different logics of DT (Dunne, 2006)

In moving between these ways of thinking and acting, it encourages diversity and flexibility of thought (Beckman & Barry, 2007). This directly relates to our conceptualisation of EM, in that our proposal is that mindset is not fixed, but constantly changing. As such, DT provides a training ground to support this flexibility of cognition, and to help entrepreneurs practice to pick the appropriate cognition for the challenge at hand. In doing so it shares the basic principles of Kolb's (1984) and Burgoyne's (1995) cycle of learning (Figure 16), in that experiences generate the chance to reflect and learn from these, which generates ideas and leads to further experimentation/learning.
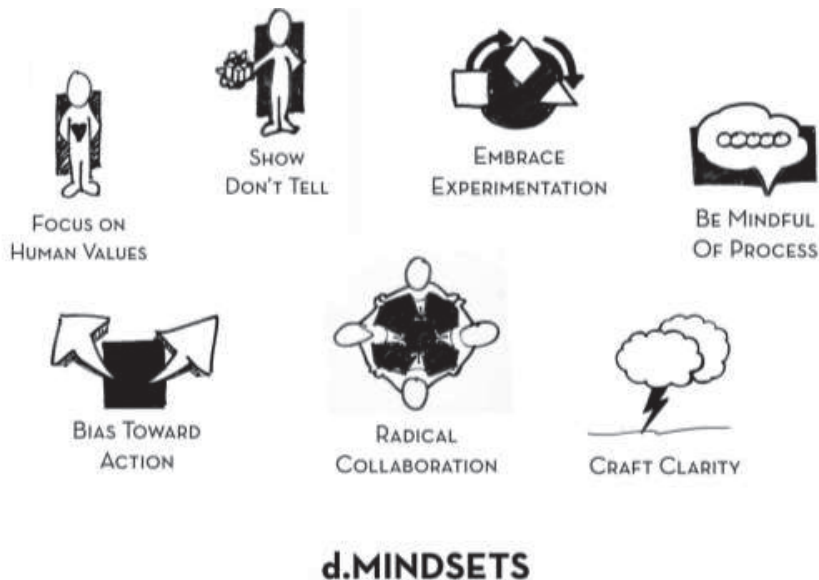
Figure 21 DT mindsets (Bootcamp Bootleg, 2010, Pg. 3).

DT also has some other direct correlations to entrepreneurship, in particular DT has a strong user focus on human values (Bootcamp Bootleg, 2010). In the entrepreneurship context this means a strong customer focus reflecting common entrepreneurship paradigms, such as those put forward in value proposition design (Osterwalder et al., 2015) and disciplined entrepreneurship (Aulet, 2013). The bias towards action and embracing experimentation closely align with lean start-ups (Ries, 2011). Radical collaboration also acknowledges that entrepreneurship does not happen in isolation (although this thesis sticks to analysis of the individual). DT also has a strong focus on testing and prototyping to ensure that assumptions match reality, again reflecting standard modern entrepreneurship methods. Lastly, it also has a bias towards action (Brown, 2009). As shown in Table 8 thinking alone correlates to low results in terms of start-up outcomes. Thinking needs to be combined with action in order to produce outcomes (Mathisen & Arnulf, 2013). The mindsets behind DT therefore seem to closely align with those that we are trying to teach in connection to the learning outcomes. While we have briefly touched on the connection between EM and DT in this section, I have still not specifically connected the DT pedagogy to the learning outcomes set out earlier. The next section therefore aims to address each of the learning outcomes in detail.

5.3.2 Learning outcomes addressed by DT

LO1: To develop an automated/non-conscious entrepreneurial approach to challenges. In order to have students develop an automated/non-conscious approach to acting entrepreneurially it requires them to engage in the practice of behaving entrepreneurially. Behaving entrepreneurially means acting on opportunities under uncertainty and carrying out the 5 common behaviours associated with effectuation (bird in hand; patchwork quilt; lemons into lemonade; pilot in the plane; and affordable loss, pg.54). DT is well suited to support this learning goal. Beginning with opportunities, DT uses exploration and empathy to have students begin to explore the problem space. During this time they build up an understanding of 'what is' and the 'now' situation. Through a process of synthesis (Kolko, 2010), students can then begin to generate insights that allows them to see the problem space in new ways. They can then narrow their focus to a singular type of potential customers through having a POV, or what might have traditionally been labelled a target customer. From here students begin to generate ideas about what 'could be' or potential opportunities that they could co-create with others. Having an idea they then prototype it based of the resources they have (bird in hand), and test this on their target customers, and at the same time seek out collaborators to see what they can co-create. DT sets out these steps as individual stages that students must pass through – and in that sense provides a framework for training them how to behave. To use an analogy, learning to dance might in the beginning have participants memorise individual steps, and proceed to use the steps in a memorised fashion. However, over time good

dancers begin to dance without consciously retrieving the dance steps, and in time find themselves improvising with the practiced steps. Likewise, DT initially provides memorised steps, that slowly become non-conscious and over time allows for improvisation. It is the practice of these steps that allow them to become automated and non-conscious.

LO2: To learn to apply appropriate cognitive processes for the task at hand. DT supports the development of multiple cognitive perspectives through pushing students to move through different ways of thinking. As visualised in Figure 18, Figure 19, and Figure 20 DT uses a number of different cognitive processes in different steps. The emphasises on focus & flair/exploration & exploration, means that students have direct practice at shifting back and forth between the two different mindsets that parallel with the elaborative and implementive mindsets.

Additionally, DT makes specific reference to several other cognitive processes, including analysis, synthesis, deduction, induction, abduction, abstract conceptualisation and concrete realisation. Each of these is a different cognitive process, and in having students use these differing ways of thinking, they begin to become familiar with their advantages and limitations. Initially, shifting between these cognitive processes might feel cumbersome and forced, however, in time they will become more familiar and comfortable applying them. To my knowledge, no other pedagogy makes such specific reference to such a wide range of cognitive perspectives.

Given the wide range of tasks entrepreneurs are required to solve, and the many challenges they face in doing so, practising these differing cognitive processes generates familiarity with the different ways of thinking. It also generates tacit knowledge about which way of thinking about a task might be best suited to helping them solve their challenge. In this way DT seems particularly appropriate as method for training flexibility in cognitive processes, and the appropriate selection of the cognitive process for the task at hand.

LO3: Develop a willingness to act under uncertainty. Acting under uncertainty naturally raises feelings of unease. A bias towards safety is a natural and understandable human bias. However, trying new things, acting on opportunities and creating ventures naturally requires some tolerance of uncertainty. DT plays a useful role here in providing a framework in which the uncertainty is not only acknowledged but leveraged in order to assist with the process of venture creation. DT does not require students to have good business ideas – instead it opts for having students go out and talk to others and gain empathy for these people's world views. This is done multiple times and can be with random individuals or individuals with some kind of common factor (for example football fans). DT then has students collect and collate the information they gather, makes sense of this through synthesis, develop hypothesises about what might work, have students prototype the ideas and test

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them. At no point in this process is the student required to 'know' what will work. At no point does the process requires students to have prior knowledge. Rather through a process of wayfinding (Steinert & Leifer, 2012), students explore the problem space and develop their understanding incrementally. This framework gives them confidence to act in the area of an unknown problem space because they have a framework to cling to.

One of the mindsets of DT is a bias towards action, whereby students are encouraged to get out of the building and talk to users, test their ideas and gather feedback. Connected to this bias for action is the concept of "good enough", whereby we encourage students to stop waiting for their concept to be perfectly formed, but instead they can aim for good enough to begin to iterate and improve. This emphasises on 'good enough' creates uncertainty and unease for many students, as they feel vulnerable that their work is not good enough as it is. DT says it's never too early to gather feedback and update your understanding.

In short, DT is set up to acknowledge uncertainty and to say that this uncertainty is what can be explored, tested, refined and learned about through taking action. Using DT as a guide to act under uncertainty has been labelled learning to dance with ambiguity (Leifer & Steinert, 2011). In this sense, DT is not about managing or handling uncertainty, but rather learning to thrive in it and enjoy it.

LO4: Willingness to experiment, make errors in the process, to reflect and learn from mistakes. A willingness to make errors, and experiment are solidly built into the DT process. Step 4 (prototyping) and step 5 (testing) are essentially about setting up experiments to see what works and what doesn't. The idea of prototyping quickly and rapidly means that you do not necessarily expect the prototype to work, but rather you wish to use it to gain further knowledge. The emphasis on iteration as part of the process also acknowledges that the experimenting is never finished, but rather there is always room for improvement. The willingness to experiment is even described as a key mindset of DT. This manifests itself in entrepreneurship education through things like multiple prototypes, MVP's, and through the way we teach. In discussions with students for example, they will often question whether the teacher thinks they have a good idea – to which I respond it is not up to me to decide, but rather their target customers get to decide and the only way to know whether the customer likes it is to gather feedback.

LO5: Capacity to apply previously learned insights into future actions. Prototypes as a concept are designed to test ideas, however, they serve a secondary purpose which is to limit the downside of experimentation. By rapidly and cheaply prototyping, we create the capacity to learn in a cost effective manner, both with regards to time and resources. The iterative aspect of DT is aimed

specifically at learning from experiments (or mistakes). In this sense iteration is not carried out because participants like repetition, but rather because with each iteration it is expected that something has been learned, knowledge has been updated, and there is now a conscious effort to test the new 'best guess'.

In testing and prototyping (with a low cost of failure), we acknowledge that we will not land on the perfect solution the first time. We therefore train students to expect to learn along the way, to expect to make mistakes and have failures, and that not only should these be expected, but in no way should they be considered fatal. Instead, they should expect to encounter setbacks and instantly continue to update their planning as to the best way to proceed. DT in its multiple steps always has a different step to move to when the current step does not seem to be working. If the prototype is not resonating with customers, then gain more empathy. If the empathy conversations seem to be repetitive then introduce a dark horse prototype (Steinert & Leifer, 2012) to catalyse new conversations. If the insights from the empathy seem contradictory, then carry out a process of synthesising to generate a new POV. These steps combined with the bias to action means that aspiring entrepreneurs develop the mindset that there is always something to do, and there is no point stopping or waiting. They also learn that failure, or undesired outcomes are part of the process of being entrepreneurial, and rather than getting stuck they need to find a way to move past these hinderances.

LO6: To practice venture creation. Venture creation is not something that can be practised in theory, or through cases. It is insufficient for an entrepreneur to merely have an idea, they must act on it (McMullen & Shepherd, 2006). In this sense DT is useful because it is a form of LFE and makes use of having student generate experiences.

DT thinking is particularly useful for having students practice prototyping ideas around their business, products and services. This means not just generating ideas but taking action to see if their conceptualisation of the world matches with reality. As the certainty grows, and the prototypes have greater fidelity, then the closer the students get to having a real venture. In the classes in which I teach entrepreneurship (with DT as an underlying pedagogy), the aim is always to create a real business with paying customers. In this way students practice going through the process of creating ventures. This experience of getting paid and having customers is a powerful experience, and usually an emotional process. These experiences with starting a real business are the ones that impact beliefs, self-identity and cognition (Krueger, 2007).

The connections between DT and each of the learning outcomes for training individuals to have an EM has meant that DT has been suggested as a fruitful way forward for teaching EM to students

(Daniel, 2016; Lynch, Kamovich, Longva, et al., 2019; Lynch et al., 2016a; Neck & Greene, 2011; Nielsen & Stovang, 2015). We do not argue that DT is the only or best way to teach EM, although we do argue that it is sufficiently effective toward generating a shift in EM to be used as teaching intervention (Lynch, Kamovich, Longva, et al., 2019; Lynch, Kamovich, & Steinert, 2019; Lynch et al., 2016a). This argument is based on the experience of using DT as a pedagogy and observing DT being taught over the last 5 years (see Table 2 for a non-exhaustive list of these experiences). However, simply saying that something is true is relatively weak research. Instead, we rely on student perceptions of DT as a pedagogy to argue for its usefulness as an intervention.

5.3.3   Student reflections on design based pedagogy

DT has gained popularity within entreprneruship education over the past years (Huq & Gilbert, 2017; Lahn & Erikson, 2016). Yet there has been limited insight into how students reflect upon this pedagogy (Lynch, Kamovich, Longva, et al., 2019), or what they get out of entreprneruship classes that use DT methods. This section heavily references work from Lynch, Kamovich, Longva, et al. (2019), as well as my own teaching experiences (see Table 2).

In 2015, in conjunction with co-authors (Uladzimir Kamovich, Kjersti Longva, Martin Steinert), we used students' reflections from a DT course on corporate entreprenruship to try to better understand how students perceived the pedagogy, and what they received out of the learning experiences. While every student has a different experinece, we coded their written reflections from the course and looked for themes that emerged. The reflections were surprisingly consistent and the emergent themes were grouped into 5 overarching categories. The categories we labelled as: being challenged; developing tangential skills; developing knowledge; real life application (see Figure 22).
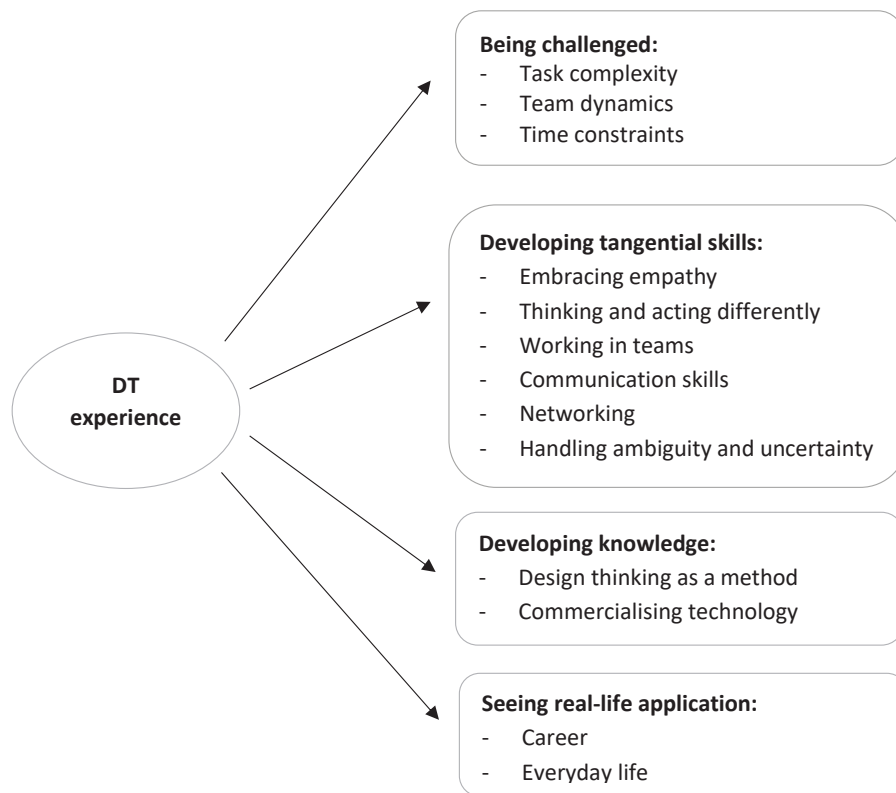
Figure 22 Student reflections on DT (Lynch, Kamovich, Longva, et al., 2019)

The purpose of the study (Lynch, Kamovich, Longva, et al., 2019) was not specifically to examine mindset, however, we can see evidence of the course teaching students about a new way of thinking and pushing them into mindsets that are constructive with regards to being more entrepreneurial. In order to elaborate on this, let us return to some initial points. Entrepreneurship is about acting on opportunities under conditions of uncertainty (McMullen & Shepherd, 2006). The purpose of the course was to give students real world experience with spotting, developing and creating opportunities. The students reflected on this by stating how this led to them thinking and acting differently compared to previous courses and how they normally would under such circumstances. They discussed how they had learned to commercialise technology and to see new opportunities. In addition, they discussed in detail how they had learned to handle ambiguity and tolerate uncertainty. In this sense, in their reflections we can see evidence that they have learned to act more entrepreneurially through the course, and that they see it as being applicable both to their everyday life and to their career/jobs that they have.

If we also consider the definition of EM as *An automated non-conscious perspective including the sum total of cognitive processes; that lead to an individual's willingness to take action under*

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uncertainty, make errors, learn from those failures and direct that learning to specific goals to best solve the entrepreneurial tasks within the process of venture creation (Lynch & Corbett, 2019). We see evidence of this having been developed in students. While the non-automated part only occurs once the mindset is learned, in the beginning we must lead students through these steps, which is what DT does so well. However, the focus on willingness to take action under uncertainty definitely comes through clearly in the reflections, with quotes like: "what I have learned will always be helpful in a real life setting, accepting that ambiguity and uncertainty is not bad, that feeling demotivated and stuck is sometimes what you need to open your mind to other possibilities". This quote perfectly demonstrates that the student was stuck with the implementive mindset, and that returning to the elaborative mindset allowed them to generate new ideas about how to proceed.

This shift back and forth between the steps of idea generation, and implementation that is so much emphasised in DT serves the purpose for students in training them in this mindset so that it automatically becomes automated over time. Again, a student summarises this well by saying: *"The DT methodology is not a linear process where you start in one end and keep on going straight forward until you hold the finished product in your hands. You will have to go back and forward between the different stages of DT, and make changes to the idea and prototype."* This reflects the non-linearity of entrepreneurship and preparing students to have the mindset that entrepreneurship requires more of an iterative (as opposed to linear) approach.

Generally, students had a positive experience with the course, although there were some who found the course too challenging, and some who had negative experiences with team work associated with the course.

5.3.4   Observed entrepreneurial behaviours

Entrepreneurship is ultimately about acting on opportunities, and our interest in training individuals to have an EM is not just about having them think differently, but also about having them act differently due to a changed mindset. Therefore, it was important to try to establish a connection between this shift in mindset due to having been taught DT, with a shift in entrepreneurial behaviour. The remainder of this section specifically discusses the work carried out in Lynch, Kamovich, and Steinert (2019) unless specifically stated.

In this study, students were taught DT, and innovation practices in general as it related to a corporate challenge they had been provided. The students were executives who had been identified by their company as having high leadership potential, and had therefore been sent to corporate training to learn skills connected to leadership, innovation, interpersonal skills and DT. While the topic of the course was not directly EM, the skills taught were synonymous with having an entrepreneurial

mindset. In observing students behaviours in the year following the training (based over two years, due to two iterations of the course), and having discussions with them we were able to note a number of instances in which behaviour had been different, and which the students themselves connected with being attributable to having gone through the training course. We highlight two of these now as examples of how behaviour can change due to having been trained in a new mindset. The data comes in the form of vignettes that are individual examples of behaviour change, but which are representative of a more typical behaviour change seen by participants.

The first is of a participant who found himself unhappy with the status quo with how the organisation was serving customers, and in talking about it with colleagues decided that they had been talking long enough and that it was now time for action. He said normally these conversations would have ended with only friendly banter and no action (elaboration without implementation) but having taken the course he was tempted to try something new and prototype the potential new idea. He suggested to his colleagues that they prototype the idea using cardboard and paper. The intention being to provide a tangible version of the concept. They showed their initial prototype to management the following day, who in exchange granted them a small amount of resources in the form of allotted time to work further on the concept. This example from the employee talks directly to how the training enabled him to move from thinking about an opportunity to acting on it through using the tools he had learned from DT.

Another example comes from a managing director for a business unit who had attended the training. He had a strong digital competency already but had traditionally worked on projects that took a long time to bring into fruition. In sharing his experiences after the course he stated that his team had moved from idea to (digital) product launch in the space of 3-4 weeks due to having gained experience in rapid prototyping through the course. He said the new product had been used by customers more than 1000 times (a few months after launch), with the feedback being overwhelmingly positive. He was also able to use his training to collaborate with those who had not been through the training and who were from an older generation. He said that the experience debunked the myth that "innovation is done by the young and restless" as the average age of the working group was over 50.

Drawing on an example observed during carrying out the research for the article Lynch, Kamovich, Longva, et al. (2019), we observed students attempting to find a new use for technology. The students were convinced that the technology was appropriate for the finance sector, but rather than simply concluding they had a good idea, they set up a meeting with a potential customer, flew to the other end of Norway and discussed the opportunity with a company. Given this was a normal

university course, the students were acting in a highly entrepreneurial way, consistent with the theory of effectuation in regards to trying to create new means and creating a patchwork of collaborators to support their idea.

I do not attempt to suggest that these vignettes are overwhelming proof of behaviour having changed due to using DT as a pedagogy to teach EM. However, the additional data provided by these vignettes serve as a way of triangulating our perspective through using multiple studies and multiple methods to examine the research question about why DT is useful as a pedagogy for training individuals to have an EM. Each method or piece of data lends credibility to the assertion that DT is an appropriate pedagogy, although individually each piece of data would be considered unconvincing.

5.3.5   Practical interventions for supporting growth in EM

As part of discussing research question 3, we have described what I conceive of as DT, I have provided data in the form of student reflections and changed behaviours. However, as part of explaining why DT is appropriate, I consider it important to describe some concrete elements of the teaching interventions that formed part of this research. If others are to carry out similar research, then it is important that perspectives on how to teach are shared so that comparisons can be made between pedagogies. I therefore set out some practical points for consideration when planning a teaching intervention. Based on my own practices of teaching in the past 4-5 years I have experimented with a number of methods for supporting growth in EM. These methods have come about through trial and error, as well as observing and learning from those who I admire as teachers. This section therefore aims to codify some of these insights into normative suggestions for how to teach EM interventions.

5.3.5.1   Basic ratio

The first suggestion is to base teaching on a certain ratio. That is to attempt to have students carrying out activities or engaged in it for around 80% of the time. This very much goes to the heart of experiential based learning as set out by Burgoyne (1995) and Kolb (1984). These experiences are what form the basis of later reflections, which is arguably where the learning occurs (Burgoyne, 1995; Kolb, 1984; Lackéus, 2014).

The other 20% is based on more traditional based teaching whereby the teacher is engaged in talking, showing slides and explaining concepts. This is split in two, whereby only 5% of the total time is spent on explaining theory. This is based on observing a teacher whom I greatly admire, and who has been the basis of several pieces of research (Kamovich & Longva, 2016; Lynch, Kamovich, Longva, et al., 2019; Lynch, Kamovich, & Steinert, 2019). While only 5% is focussed on theory, this might seem contentious. However, as discussed in Kamovich and Longva (2016), leaving theory hidden can

be an effective way to teach. It allows for greater time for students to focus on finding their own answers, and actively engaging in learning. This allows the students to take a greater responsibility for their own learning (Neck & Corbett, 2018).

The final 15% relates to storytelling by the teacher. Story telling might sound highly un-academic, however, we posit the opposite. Story telling has been shown to be an effective way to have humans remember details, and that story telling is more effective that simply sharing knowledge if you wish for it to be remembered (Zak, 2014). In addition, it is consistent with the work of Bandura (1997) who suggests the best way to improve self-efficacy is through experience (hence the 80% focus), then observation. However, failing this, hearing of others' stories and listening to them represents an effective way to improve self-efficacy.

These ratios are not rigid, and there is room for interpreting what falls into each category. For example, class discussions fall somewhere between active participation and passive listening depending on if the student is engaged in the discussion or just listening. In addition, some classes will necessarily involve more theory, while others might have none. In general, the ratio represents a benchmark to strive for in planning classes.

5.3.5.2 Language use

Based on the work already discussed in Lynch, Tuema, et al. (2017) and Lynch, Kamovich, et al. (2017), language can be used as a measure or benchmark for EM. However, the relationship between language and cognition is two way (d'Andrade, 1995; Liang et al., 2017). That is, the way we speak about things impacts the way we think about them. As such, we can use this to influence the way students think and reflect about the experiences they are having. During the classes I hold, I state to students that we wish to be conscious of our language and that it would be helpful to replace several common words with alternatives. A list of these are provided below:

Original	Replacement	Reason
Can't	Won't	It is rare we cannot do something. In most cases we are not willing to try or risk failing, or we are unwilling to put in the effort required. Saying "I won't" do something forces a sense of honesty about what is holding them back.
Should	Want	"Should" implies some unknown group of people who think something "should" happen, such as society or family. However, real motivation only comes from complying with things you actually want to do.
Good/Bad	Like/Dislike	There is no objective "good or bad" things, only things you prefer or dislike. It forces sense of acknowledgement on the subjectivity of the item being discussed.
Problem	Opportunity	"Problem" is inherently negative and causes the user to focus on the problem instead of searching for a solution. By shifting the word to

		"opportunity" it forces the user to become more cognitively aware of other opportunities or solutions.
Failure	Undesired outcome	Failure is a man-made construct. It represents having a desired or expected outcome and not achieving that. However, commonly associated with the word "failure" is a sense of shame that is not constructive. As such, failure is avoided as a word, and if something must be used, then "undesired outcome" is generally sufficient.

Table 13 Replacement words

The inspiration for the above words comes from J. O'Connor and Seymour (2011) whose work in turn comes from studying the interventions of psychologists. Their work is practical in nature and has served as basis for suggesting how to assist students who get stuck in the same patterns. One of his models was the basis for examining the ways in which to assist students to overcome internal resistance (Lynch et al., 2018).

In mentoring students, as part of classes, it has often been useful to use these language interventions to help them gain greater awareness of the ways in which their unsurfaced beliefs may be preventing them from moving forward with their business. A typical example would be a student who sat down and described the "problem" they were having in their business. I interjected and asked them to use the word "opportunity" instead of problem. They begrudgingly agreed and continued to describe the "opportunity" they were facing in great detail. In doing so, they began to focus more and more on potential solutions, and after 5 minutes they had come up with a strategy for how to move forward. I had barely spoken a word, and at the end of the session the student thanked me for helping them and for a great mentoring session. This is not the only time this has occurred and represents an easy step towards lifting the awareness in our beliefs and using this awareness to impact our EM.

5.3.5.3   Meditation

The positive benefits of mindfulness in general have been known for millennia through religious practices such as Buddhism, however, the research community is quickly catching on to meditation being a fruitful field of research. Including calls for it to be used more widely in business school curriculum (Zhu, Rooney, & Phillips, 2016). It has even been argued that it is not past entrepreneurial experience that positively affects opportunity identification, but rather the mediating factor is the mindfulness[3] with which entrepreneurs approach those past experiences (Rerup, 2005).

Meditation has not formed a large basis of my own teaching at the University level, however, I have seen it play a corner stone role in teaching in adult education and corporate training that I have co-taught (I have not led the meditation sessions). Informal feedback in the form of discussions with students, and emails from them afterwards, have suggested that many of them have found the

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[3] I use mindfulness as the outcome here and meditation as the practice.

process of starting classes with meditation to be a useful practice (Lynch, Kamovich, & Steinert, 2019).

Meditation may seem like an odd teaching tool with regards to EM. However, there is a number of positive feedback loops with regards to teaching students to be more entrepreneurial and in de facto to have a more EM. The first is that mindfulness assists students with being present in the current time and location, instead of being distracted or thinking of things outside the classroom. This alone supports learning regardless of the topic at hand.

The other main positive of mindfulness is that it lifts awareness internally of what one is experiencing. This is useful in having students become more aware of where their internal resistance may lie, and why they may be preventing themselves from moving forward with their own project (see Lynch et al. (2018) for a discussion on internal resistance). This self-awareness also supports meta-cognition, which has been linked to entrepreneurial learning through the ability to be aware of one's own thinking (Haynie et al., 2010; Haynie & Shepherd, 2009).

Lastly, entrepreneurship can be an emotional experience (Herold, 2008; Lackéus, 2014), and as such mindfulness practices can be useful in assisting students with emotional regulation (Thompson, 2014; Zhu et al., 2016). Mindfulness leads to greater equanimity in students, allowing them to better respond to the challenges they face (Shepherd & Patzelt, 2018). While the benefits seem obvious, there is a caveat in using meditative practices as part of a teaching programme. The main one is to judge students' receptiveness, and to make participation voluntary. There are still many students who associate meditation with religious practices despite this not being the case.

5.3.5.4 Institutional contexts

Training or education of individuals to have a more EM does not always take place in a typical educational setting. There are times when teaching professionals will be engaged to assist in staff training. I include a discussion of teaching EM in a corporate setting because these have been the contexts where I have observed the greatest shifts in individuals thinking (Lynch, Kamovich, & Steinert, 2019). These contexts are also not bound by the traditional university structures (such as assignments, grades, and power distance between the learner and the teacher) which grants greater space for designing teaching interventions in ways that are more impactful. In discussing these contexts, I hope that this might also spur a discussion in the future about whether we need to re-consider some of the traditional university structures.

When carrying out training in a corporate setting, the aim is to provide value to the company by making the company's employees more valuable. In the context of the training I have been involved in, this has been to train employees to think more entrepreneurially, act more entrepreneurially, and

ultimately to make the company more innovative in the process. This is based on the logic that for firms, opportunity identification and exploitation is key to continued growth and wealth maximisation (McMullen & Shepherd, 2006). A company's growth is based on its ability to identify opportunities, and then act on them (Hitt, 2000; Hitt et al., 2001; Shepherd et al., 2010). If they fail to act on perceived opportunities, then they will not realise potential wealth creation, and thus under reward stakeholders. The argument is therefore that companies that have the capacity to both perceive and act on opportunities, will have a competitive advantage – as wealth is only created when firms effectively combine opportunity-seeking and advantage-seeking behaviours (Ireland et al., 2003; Shepherd et al., 2010). Training is therefore aimed at empowering individuals to go through this process of identifying opportunities and acting on them. However, this takes place within a corporate context, and therefore there are additional structural issues to consider if the training is to be a success from the company's point of view.

People's abilities to be entrepreneurial will be based partly on the environments they are in (Lynch et al., 2018). In order for employees to behave more entrepreneurially, we must therefore create an environment that is supportive of entrepreneurial activities. The environment in a corporate context relates to both culture and the formalised incentives that exist. It is possible to design for innovation from the ground up (G. C. O'Connor, Corbett, & Peters, 2018). However, the typical training consultant who is trying to train staff to have a more EM will likely be unable to influence the corporate structure and incentives that exist, so effort can therefore be focussed on areas where the consultant can stack the odds in their favour.

In Lynch, Kamovich, and Steinert (2019) we discuss some structural issues that need to be considered using a case as an example. We were approached to carry out corporate training for future leaders in a large organisation. The training was targeted at having them become more innovative and being able to have them lead innovative projects in the future. I consider these goals to be synonymous with increasing EM in the participants.

While the training was targeted at 26 future leaders, we knew that in order for them to be effective in returning to their new roles, that there would need to be a strong signal from the top of the organisation, as well as support from those directly above them. In order to facilitate this, we invited the CEO to present his vision for the program on the first day of the training, so that support from the top was obvious and explicit. Secondly, we organised for top managers above those receiving the training to act as mentors for those receiving the program. This kept the c-level executives informed and involved. This ensured those receiving the training felt supported from above.

However, we needed the participants in the training to feel empowered to bring about change, and to speak the same language as those below them in the organisation. In order to facilitate this we had the participants run workshops for their colleagues as part of the final module of training. This locked in the learning for them and set them on the path of having them transfer their new way of working.
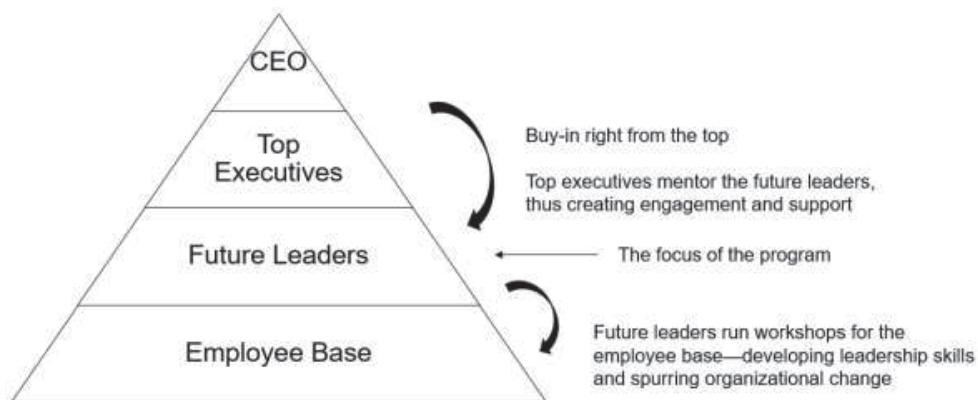
Figure 23 Structured approach to implementing EM training (Lynch, Kamovich, & Steinert, 2019)

The training was largely based around using DT and used all of the teaching interventions mentioned in this section (teaching ratio, meditation etc.). It was carried out over a 4-month period, made up of 4 modules (3 modules in later iterations of the course), with each module being 3-5 days (12-15 days total).

In observing the participants it was obvious that there had been a change in mindset during the training, but following up with the company a year later we found that little had changed in terms of workflow and innovative projects. In discussions with HR, it became clear that the company was aware that they needed to make some changes with regards to how they were utilising those who had been through the training. This supports the assertion that training is not enough, even when including other participants from the organisation. There needs to be a focus on the structural elements of an organisation in order to bring innovation into a firm (G. C. O'Connor et al., 2018).

Having set out a number of practical suggestions for teaching interventions connected to teaching EM, I now move the focus to considering the ethics of such interventions.

5.3.6 Ethics of psychological interventions

Our definition and understanding of EM is that it relates to deep cognitive structures, whereby these structures play a role in influencing the outcomes an entrepreneur generates. The intent of teaching EM to students is to have a positive influence on their EM, which also means impacting their deep

cognitive structures. However, there needs to be an adjoining conversation regarding the ethics of trying to influence students' cognitive structures.

The important issues that seem apparent to me are:

1. Do we have sufficient knowledge to safely intervene and create a more constructive mindset?
2. Who are we to say what is the "right" mindset?
3. Even though students choose entrepreneurship studies, are they fully aware of the impact we are attempting to have on their cognitive structures? With their level of awareness are they really consenting to such interventions?

Starting with the first issue, there has been a number of psychological experiments and interventions which have led to the participants receiving negative long-term consequences. One of the best known examples is surely the Harvard Prison experiment, and although teaching interventions are far less dramatic than having people role play being prisoners and guards, it does highlight the need to consider the potential unintended consequences of experimenting with students to try to alter their cognitive structures.

There appears to be an underlying assumption within the field of entrepreneurship that encouraging people to be entrepreneurs is a positive thing, and that we should strive to have more students become entrepreneurs. Yet the reality of being an entrepreneur can be quite brutal, with little job security, high pressure and often isolated work environments (Schumpeter, 2014). As creatively described in The Economist, "*It is fashionable to romanticise entrepreneurs. Business professors celebrate the geniuses who break the rules and change the world. Politicians praise them as wealth creators. Glossy magazines drool over Richard Branson's villa on Lake Como. But the reality can be as romantic as chewing glass: first-time founders have the job security of zero-hour contract workers, the money worries of chronic gamblers and the social life of hermits*" (Schumpeter, 2014). My own experiences with entrepreneurship have similarly been an emotional roller coaster of highs and lows. This rollercoaster has come at a personal cost and included high levels of stress, have come at the opportunity cost of lost wages and lost personal opportunities. These experiences are not necessarily something I would wish upon someone I like.

In training students to become more entrepreneurial and have an EM, it is important to first pause and ask the question about whether this is a good thing or something we should be aiming for. Ultimately, I believe we should be encouraging entrepreneurship as a path for people that represents a way to express an individual's sense of self. However, in order to teach entrepreneurship I think there needs to be an equally important focus on the downsides of such a career choice. In addition,

there is a need to supplement education with a focus on maintaining healthy states of mind and strategies for effectively riding the emotional roller coaster that is being an entrepreneur [For an excellent example, see Harnessing Entrepreneurial Manic-Depression, by Herold (2008)].

The final point with regards to the ethics of designing teaching interventions relates to whether students are fully aware of what they choose into, and whether they have sufficient knowledge to consent to such cognitive interventions. Most students would be unaware that in participating in entrepreneurship courses they would be signing up for an experience based program that is designed to create an intervention in their cognitive structures. While it might be possible to provide additional information in course descriptions, experience in teaching suggest many students do not fully read these before signing up for courses. In addition, this is even less relevant when the courses are part of a 'required' core programme.

There are no short simple answers to such questions regarding ethics. Nevertheless, it is worth being cognizant of the deeper implications of trying to teach EM to students. As a practical solution to the ethical issues raised, I would suggest that students are introduced to the intentions of courses very early in the process, and that an explanation be given that the purpose is to provide them with experiences that will enhance their EM. This gives students a chance to opt out or to seek further information before deciding to proceed. In teaching students, there needs to be a focus on having them generate reflections that are healthy with regards to the experiences they have been having. In this sense, encouraging them to see failure not as a reflection of their self-worth, but rather that failure is just undesired outcomes that represent an opportunity to learn. Such assistance in helping students reflect in a constructive way is necessarily hands on and requires small teaching ratios.

In addition to creating opportunities for practising entrepreneurship and learning, I believe it is important to discuss the less healthy aspects of entrepreneurship with students. Such that they are aware of its capacity to become all-consuming and the potential to have negative flow on effects to other things like relationships, mental and physical health (Freeman, Staudenmaier, Zisser, & Andresen, 2019). As part of this discussion, coping mechanisms for how best to deal with the stresses of entrepreneurship should be taught. These will include elements such as self-awareness so that students can recognise the moments they are not coping in a healthy manner. As well as elements such as what activities suit the mental state you're in, and what to avoid based on the current mental state you are experiencing. These are non-obvious elements to novice entrepreneurs but can save them from entering negative spirals.

Overall, the acknowledgement of the ethical implications of pedagogical interventions requires us to take a more holistic view of what we are trying to do, rather than the narrow academic perspective

of measuring changes in dependant variables based on changes in the independent variable. As such, it requires acknowledging the potential for good in teaching entrepreneurship while also acknowledging and accepting that some interventions may not go as planned and may result in negative experiences for those involved. My personal stance on such issues is that the risk is acceptable based on the potential for improvement in students, however, it also requires the informed consent of students who participate in such courses, as it is the students who bear the negative experiences of experiments in entrepreneurship pedagogy that have gone wrong.

5.4   Summary of chapter

This chapter has reviewed differing approaches to teaching entrepreneurship, and therefore EM. It began with a synopsis of existing literature that concluded that the best way to teach EM was through practice and LFE. In order to create such scenarios, design as a field has something to offer, in particular DT (Lynch et al., 2016a). DT has many forms, and we therefore explained the perspective I ascribe to. DT emphasises iteration, different styles of thinking and moving back and forward between convergent and divergent thinking. The purpose of this is to teach students to be more flexible in their thinking and approaches. This directly translates to our conception of EM which has a focus on learning, flexibility and iteration (Lynch & Corbett, 2019). So, while DT as a pedagogy is about problem solving (and not directly focussed on EM), I have found it an effective tool to indirectly train individuals to have a more EM. In order to answer the research question about why DT is an appropriate pedagogy for teaching EM, I broke down our definition of EM into six learning outcomes and explained the ways DT addressed each learning outcome. In order to provide some data to support the assertion that DT is appropriate, I shared students' reflections who had gone through this kind of teaching (Lynch, Kamovich, Longva, et al., 2019). As well as discussing the changes in entrepreneurial behaviour we had observed after students had taken a DT course (Lynch, Kamovich, & Steinert, 2019). In order to explain how interventions should be structured I then highlighted practical teaching interventions such as using a teaching ratio, focus on language, and meditation. Finally, we discussed the importance of context through referring to a corporate case using the same pedagogies. This case also highlights the ways in which using DT in corporate contexts can be used to support an increase in EM. Taking the different elements of this discussion together as a whole, I hope that it has become clear why DT is useful as a pedagogy for teaching EM, and in arguing for this I have answered the research question about why DT is an appropriate pedagogy for teaching EM.

6 The role of entrepreneurial mindset in taking action

6.1 Discussion of overarching research question

This section takes the answers from the three research questions, and collectively uses them to answer the original overarching research question, which is: **What is the role of EM (EM) in separating those who take entrepreneurial actions from those who have the intention to take entrepreneurial action but never do so.**

At the most basic level, entrepreneurship is about recognising opportunities and acting on them under the shroud of uncertainty (McMullen & Shepherd, 2006). Returning to our overall research question of what separates those who start a business from those who just talk about starting a business we might be able to reframe this question in a different way. With a nod in the direction of behaviourism in psychology, we might be able to reframe this question in the way that labels opportunities as a stimulus, which leads to a response in some individuals, but not in others. Behaviourism as a field has received criticism for treating cognition like a black box which they choose to avoid, however, speculating on the underlying cognition might be of value here. The study of mindset has sought to answer what is inside the black box by examining how the stimulus and the cognition work together to result in an individual successfully performing a task (French Ii, 2016).

The basic premise of behaviourism, commonly associated with Pavlov's dog experiments Pavlov (2010), is that stimulus leads to response. Applying this analogy to entrepreneurship, I argue that it is not that opportunities are the same for everyone, but rather that these opportunities are perceived differently by individuals, and these differences leads to different interpretations as to whether these opportunities are interesting enough to lead to an individual to take action on them. Using an analogy, we can describe the EM as being like a pair of polaroid sunglasses. The glasses block out some opportunities, while enhancing others, and leaving some unchanged. In an attempt to visualise this, we visualise mindset as being a lens that affects how opportunities are perceived.

| Objective opportunties | Mindset as a lens | Perceived opportunity | Cognitive choices/options | Action/ Response |
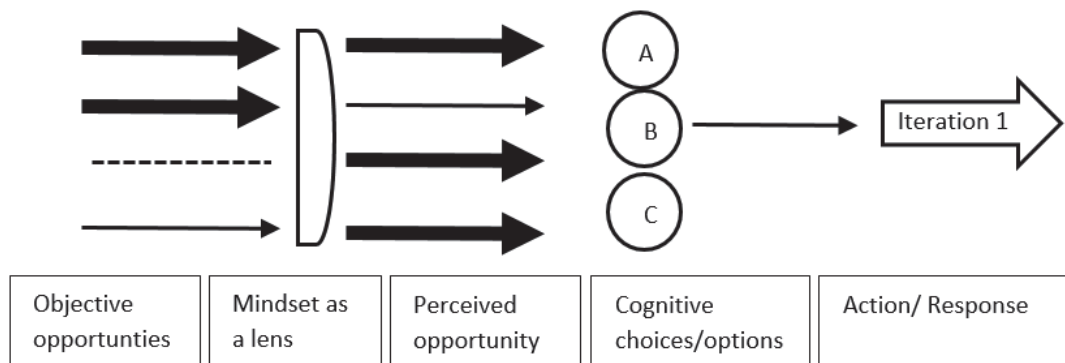
Figure 24 Mindset as a lens

This conception of EM as a lens is consistent with existing theoretical perspectives on how opportunities are perceived (McMullen & Shepherd, 2006). That is an entrepreneur compares an opportunity to their own internal criteria regarding desirability and perceived feasibility of achieving a desired outcome. We argue though that this screening process is done in a way that is often automated and consistent with definitions of mindset. In particular mindsets are often automated or at least not conscious processes (Humphrey, 1951). Prior descriptions of mindset have also utilised this analogy of a lens (Rhinesmith, 1992), for example, prior conceptions have described mindset as an orientation that allows you to see things that others do not see. Rhinesmith (1992) go on to describe it as a filter through which we see the world. The world is full of stimuli of different kinds, and being consciously aware of them would be overwhelming, and in this sense mindset filters out much of these inputs, allowing what we pay attention to to be a far more simplified version of the world (Rhinesmith, 1992).

Stimulus though is not something that is spontaneously created, but rather is something which is trained into us. In order for a stimulus to create action the stimulus needs to be what is called a conditioned stimulus, which is we associate the stimulus with something desirable. In Pavlov's experiments, the bell alone was an unconditioned stimulus, and only became a conditioned stimulus for the dogs once they associated it with food. I argue that the same is true for entrepreneurs too. An opportunity only leads to action in circumstances where the opportunity represents a conditioned stimulus, or in simplified language, where the opportunity represents something desirable for the entrepreneur. This is consistent with prior descriptions of intentions; which state that the intention to act is predicated on beliefs around desirability and feasibility (Ajzen, 2011; McMullen & Shepherd, 2006). While I have only briefly explored these motivations (Lynch, Slåttsveen, et al., 2017), where the conditioning comes from is outside the scope of this thesis, but common factors like family and environment play a strong role in shaping motivations (Lynch et al., 2018).

Continuing the perspective of stimulus and response, the entrepreneur having had external data filtered through the lens of their mindset then decides that an opportunity is perceived to be desirable and feasible. So, the conditioned stimulus should then lead to a response, or in other words, action. Yet action in the context of entrepreneurship is always under a cloak of uncertainty (McMullen & Shepherd, 2006). Acknowledging that action occurs under uncertainty helps illuminate the importance of the response by the entrepreneur to the conditioned stimulus. As mentioned earlier, early conceptions of mindset define it as the sum total of the cognitive processes activated to best solve the task (Peter M Gollwitzer & Bayer, 1999).

In light of the entrepreneurial context, we can reframe the task as acting on the perceived opportunity in order to generate a desired outcome (under a cloak of uncertainty). Yet, given the uncertainty, it is impossible to know which is the best cognitive process to solve the task. Therefore, it is important to select the best guess as to the right way to act based on the current set of knowns and the accepted set of unknowns (and unknown unknowns). Given this uncertainty, there are certain mental models which are more conducive to moving forward. The hunter gather model (Steinert & Leifer, 2012) for navigating new territory is one such model. The model suggests navigating based on what your best guess is based on the known information (or what you can see in front of you), then adjusting course and changing directions according as new information and discoveries become apparent. This requires movement or action towards a goal, monitoring the progress as compared to the desired outcome (which may also move), learning as new terrain is encountered, and thinking or reflecting over the possible future course of action (Lynch & Corbett, 2019). As such, this perspective for navigating uncertainty requires several different types of mindsets, and an ability to shift between them at appropriate times. Which again, is consistent with prior theoretical perspectives on entrepreneurship from elaborative and implementive mindsets (Mathisen & Arnulf, 2013); meta-cognition (learning mindset) (Haynie et al., 2010). As well as effectuation (Sarasthvathy, 2008), whereby an entrepreneur goes through iterations of creating new means (Figure 12)

Our definition of EM incorporates these perspectives by stating that an EM is the cognitive response that allows for the entrepreneur to achieve the desired outcome. As a reminder of our definition of EM, it is: *An automated non-conscious perspective including the sum total of cognitive processes; that leads to an individual's willingness to take action under uncertainty, make errors, learn from those failures and direct that learning to specific goals to best solve the entrepreneurial tasks within the process of venture creation (Lynch & Corbett, 2019).* This definition incorporates the point discussed in prior paragraphs, and is what allows an effective entrepreneur to act, while others get stuck not taking action. The ability to learn prevents habits from forming that are not conductive towards

achieving the desired outcomes. To elaborate on how crucial this flexibility and change of mindset is to the process of venture creation, we draw on theory from cognitive psychology.

6.1.1   Mindsets in relation to goal achievement

In examining how mindset plays a role in goal attainment (or venture creation in the context of entrepreneurship), we can draw of the work of Peter M Gollwitzer (1990). He created a model to explain the ways in which mindset vary throughout the process of attainment that he called the Rubicon Model. The model incorporates both goal setting and goal striving. It explains how an individual decides what goal to strive for, and subsequently how one strives to achieve that goal (building on the elaborative and implementive mindsets).

In examining the Rubicon model, it can be broken into two general parts, of which each part can be broken in half again – resulting in four parts. The two general parts can be labelled as before taking any action, and after taking action. The model derives its name from the split between these two parts. The river Rubicon was the river that Caesar crossed in his path to becoming a dictator. In crossing the river he disobeyed an order of the senate, meaning he was required to succeed in his quest for power or would have likely faced death as a punishment for treason. While most decisions to act are likely to be far less dramatic, Peter M Gollwitzer (1990) makes the point that once having taken action, most people become committed to achieving the desired goal.

Before crossing into action though, people go through two stages. The first (pre-decisional phase) in which the individual sets preferences for what their desired outcomes are. This is largely consistent with the theory of intentions that state an individual has beliefs about the desirability and feasibility about the proposed course of action. Most individuals will have competing sets of needs and wants, which means before they can proceed to the next stage they must choose or make a decision about what they wish to achieve. They then move into the second phase (pre-actional phase), where they plan when, where and how to act in order to achieve their desired goal. Where the goal is simple and easily achievable, this step will not necessarily be conscious, and will be passed through quickly.

Once the goal has been selected, and planning has occurred, then the individual crosses the Rubicon and enters into the actional phase, whereby efforts will be focussed on the achievement of the goal.

The final and fourth stage is the post-action phase, where the individual must decide whether their goal has been achieved or whether further striving is required.

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┌─────────────┐      ┌─────────────┐      ┌─────────────┐      ┌─────────────┐
│  Predecision │  ⇨   │   Preaction  │  ⇨   │    Action    │  ⇨   │  Post-action │
└─────────────┘      └─────────────┘      └─────────────┘      └─────────────┘
      Selection of goal         Commencement        Review of outcome
```
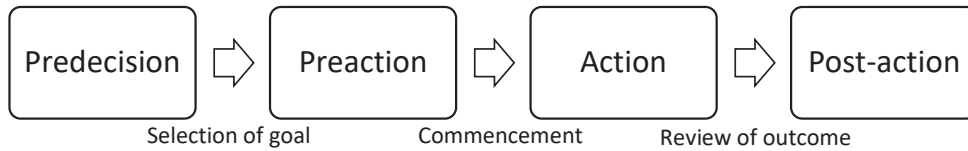
Figure 25 Rubicon model of goal enactment

The model initially appears linear as though an individual starts at one end and finishes at the other, however, Peter M Gollwitzer (1990) says that is rarely the case, with goals often being interrupted by other competing goals. The model also does not imply that action is always preceded by deliberate action, often there is simply a resumption of goals that had been selected earlier. The times when intense planning occur are normally when the feasibility of the goal is in doubt, other times the planning might not even occur consciously. The model also does not preclude overlap in the stages, or regression to prior stages as new information is encountered.

The model though is of particular interest to entrepreneurship, as it follows the same process as suggested by McMullen and Shepherd (2006) who set out the process through which entrepreneurs identify, select and subsequently act on the opportunity. In making a selection on what opportunity to act on, entrepreneurs use an internal selection criteria that relates to their perceptions around desirability and feasibility. While their 2006 article does not deal with the final stage in the Rubicon Model, separate work by the same authors in Haynie et al. (2010) deals with the concept of Meta-cognition, and how EM involves using knowledge learned to update their own mental models, which seems consistent with the final step of the Rubicon model.

6.1.2   Connection to existing theory in entrepreneurship[4]

While the Rubicon model described in the prior section relates to goal achievement, we are concerned with entrepreneurship and the way in which mindset plays a role on the actions entrepreneurs take. In order to examine this, we choose here to overlay the Rubicon model with existing theory in entrepreneurship to demonstrate theoretical coherence between the two previously unconnected perspectives.

There is more than one way through which entrepreneurial ventures come into existence, and the process can be viewed through multiple lenses (causation, effectuation, bricolage) (Fisher, 2012). In order to demonstrate how EM changes and updates during venture enactment, we use the new

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[4] This section is based on an earlier piece of writing carried out by Matthew Lynch and Andrew Corbett. Although the section has been updated and is therefore an original piece of writing, it would feel intellectually dishonest to not acknowledge the work Andrew carried out in helping shape this section.

venture creation process as proposed by Stevenson, Roberts, and Grousbeck (1985). The venture creation process is seen to consist of four stages, namely: searching; planning; marshalling; and implementing. McGee, Peterson, Mueller, and Sequeira (2009, p. 972) defines the stages as:

- The searching phase involves the development by the entrepreneur of a unique idea and/or identification of a special opportunity.
- The planning phase consists of activities by which the entrepreneur converts the idea into a feasible plan.
- The marshalling phase involves assembling resources to bring the venture into existence.
- The implementing phase is where the entrepreneur is responsible for growing the business and sustaining the business past its infancy.

Each stage has unique demands that call on specific cognitive skills or abilities (Kickul et al., 2009). Specifically, it is these sets of cognitions that match the primary definition of mindset as provided in the cognition literature.
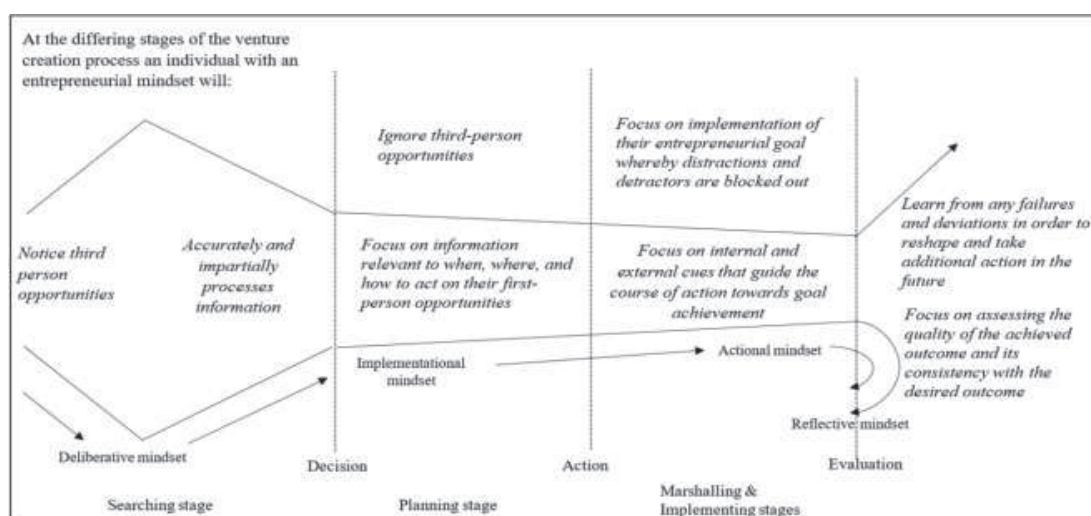
Figure 26 Overlaying the Venture creation process with the Rubicon Model

Figure 26 is a graphical representation of the conceptual model that we will explore throughout the remainder of the section, illustrating that the mindset changes at different stages of the venture creation process. We provide a brief description here first, before elaborating on the connection between the model and existing theory.

In the initial stages, an entrepreneur is cognitively tuned to notice all opportunities, at this point their mindset is open as represented in the model. The mindset then begins to narrow as the

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entrepreneur focusses upon whether certain opportunities meet their internal set of criteria (McMullen & Shepherd, 2006). In this sense, the entrepreneur is starting to hone in on a particular idea and pay more attention to those ideas that meet their internal criteria. At this point, the entrepreneur's mindset is focussed on making a realistic assessment of the idea in relation to its desirability and feasibility. The focus is not yet singular until a decision is made. Having made a decision to proceed with an idea, the entrepreneur's mindset is then closed to other opportunities represented by a further narrowing of their focus. Having crossed the decision threshold, the entrepreneur's mindset shifts to focussing on when, where and how to implement their idea. The entrepreneur then continues to act, and in doing so ignores detractors whose opinions might be negative, and other distractions that may stand in the way of implementing their goal. At the same time, the entrepreneur has a mindset that is cognitively tuned to both internal and external cues about how best to implement their goal. The cognitive tuning is only towards information that assists with implementation and closes out other information. Having carried out steps to achieve the goal, the entrepreneur's mindset becomes more reflective. At this point, they will begin to assess whether they have met their original goal and consider whether they should continue taking steps or say quit trying to achieve the desired goal. This is both backward looking and future orientated at the same time, where the entrepreneur is considering their original motives and goals, while also considering what to do in the future. In addition, they will reflect on their learnings from the venture creation process and these learnings will inform future entrepreneurial actions. This is represented by a broadening of the mindset as they look both forward and backwards and might be likened to lifting their head to examine their surroundings after having had the blinkers of intense focus on. We now discuss each stage in detail and its grounding within extant literature in entrepreneurship.

6.1.2.1.1 Deliberative mindset

The deliberative mindset as descried by Peter M Gollwitzer (1990) is a person's position prior to making a decision. This is labelled as the pre-decisional stage in the Rubicon model and is typified by wishing and deliberating. During this stage people are likely to be weighing the pros and cons of any such decision (Peter M. Gollwitzer et al., 1990). Before an intention to take a course of action, an individual will consider both the feasibility and desirability of any course of action or goal, which then directly impacts that individual's intentions (Peter M Gollwitzer, 1990). This mimics cognition research in entrepreneurship, which has examined the link between desirability and feasibility in forming intentions to start a new venture (Krueger & Brazeal, 1994; Mathisen & Arnulf, 2013; Shapero & Sokol, 1982; Veciana, Aponte, & Urbano, 2005).

Drawing on the mindset work by Peter M Gollwitzer (1990) in relation to the Rubicon model, the predominant mindset of an individual before making a decision to enter into entrepreneurship will

be to have an open mindset. In our model this is depicted as a broadening of the model to show the openness of an entrepreneur at this stage. In this way mindset impacts attitude to what is perceived, and allows entrepreneurial opportunities to become more noticeable (Peter M Gollwitzer, 2012; Rhinesmith, 1992). At this stage, the EM will be tuned to being open and aware of opportunities, this might be observed for example through the number of opportunities an entrepreneur recognizes in a day. This process is synonymous with the attention stage of becoming aware of all opportunities which McMullen and Shepherd (2006) label as third person opportunities (that may later become a 1st person opportunities) or entrepreneurial alertness (Ireland et al., 2003).

Having noticed an opportunity, an entrepreneur will be cognitively tuned to be aware of information that is relevant to the feasibility and desirability of acting on this opportunity (Peter M Gollwitzer, 1990; Mathisen & Arnulf, 2013; Shapero & Sokol, 1982). In an entrepreneurial context this means that an internal set of belief criteria exist or have been fostered, that makes a nascent entrepreneur want to notice entrepreneurial opportunities and then assess these based on the consistency between the opportunity and their own set of internal criteria (McMullen & Shepherd, 2006). To best decide whether an opportunity suits an entrepreneur, they must decide whether the opportunity is in fact a first person opportunity (McMullen & Shepherd, 2006). First person opportunities are those that match an entrepreneur's internal belief criteria as to whether the idea is both feasible and desirable. In order to facilitate this evaluation process, it requires making a realistic assessment of both the opportunity and the entrepreneur's ability to capitalise on it, as well as a realistic evaluation of whether the opportunity matches their personal criteria of feasibility and desirability.

We would expect to observe those with an EM to notice both the negative and positive elements of opportunities and give each their due weighting. Then, being aware of an opportunity, and having impartially and accurately assessed the opportunity, an individual makes a decision, either to proceed or to continue the search for a better opportunity. This process does not need to be a conscious process by which people lament over a decision to be made, and especially for experienced entrepreneurs it is one that can take place sub-consciously (Humphrey, 1951).

6.1.2.1.2   Implementational mindset

Having made a decision to proceed, the entrepreneur then shifts focus from whether the opportunity is suited to them, to instead focussing on how to best act on the opportunity. Prior literature suggests that entrepreneurs may make conscious choices to ignore certain new venture opportunities (McMullen & Shepherd, 2006). This is consistent with the Rubicon model that states once a goal has been decided upon, then the actor will ignore other potential goals and maintain focus on achievement of this goal (Peter M Gollwitzer, 1990). This marks a change in mindset from

being tuned towards all possible opportunities, and instead represents a shift towards a more focused mindset. Our model mimics this narrowed focus through narrowing the lines of the model.

We would expect entrepreneurs at this stage to notice fewer opportunities than those at the pre-implemental stage as they are now more focused upon shaping, reshaping and reworking the opportunity they have chosen to pursue (Peter M Gollwitzer, 1990). This mimics work by Mathisen and Arnulf (2013) who found that if entrepreneurs continued to question the wisdom to pursue their entrepreneurial goal, it led to negative impacts on entrepreneurial actions. They suggested that once a decision to pursue a goal has been made, that entrepreneurs needed to then focus on execution of that goal.

As the name suggests, implemental mindset is based on planning when, where and how to implement an opportunity. This is consistent with the planning described by (Stevenson et al., 1985), whereby an aspiring entrepreneur mentally converts an idea into actionable steps that can be taken. Peter M Gollwitzer (1990) points out that this might not necessarily be in the form of conscious, intensive planning, especially when the path to goal achievement is perceived as relatively clear.

In terms of the Rubicon Model, the implementation mindset is prior to any action being taken; however, it marks the transition from thinking about an opportunity to acting on it.

6.1.2.1.3   Actional mindset

At the most basic level entrepreneurship requires one not just to make a decision with regards to an opportunity, but to actually act on that opportunity and be willing to bear the uncertainty concomitant to it (McMullen & Shepherd, 2006). The Rubicon model suggest this point of no return signals a shift in cognition from goal setting to goal striving (Corno, 1993). In entrepreneurship, the action stages cover both the marshalling and implementation stage in the entrepreneurial process described by Stevenson et al. (1985).

Each business opportunity is different, so we do not delve into the operational details of the mindsets required for each individual step within the actional mindset, and we therefore require some generalisations. Keeping in mind that the overarching definition of mindset is the cognitive processes best suited to solve the task at hand, as these tasks vary widely under implementation, so too will the mindsets required to best solve them. What is common at this stage is a sense of flow whereby individuals block out other distractions and stay singularly focussed (Peter M Gollwitzer, 1990). The individual involved will no longer question the qualities of the goal to be achieved, as in whether it is worth it, or whether they should re-evaluate the goal (Mathisen & Arnulf, 2013). Prior literature supports this assertion, with entrepreneurs being described as thick skinned and disinterested in hearing dissenting opinions on their business (Nicholson, 1998). More specifically,

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we know from practice and research that entrepreneurs tend to be highly overconfident and often full of hubris (Hayward, Shepherd, & Griffin, 2006). As Humphrey (1951) points out, mindset can be an effective filter for blocking out information. Once a mind is set on achieving an outcome, it can block out contradictory information (Cohen-Kdoshay & Meiran, 2007).

At this point an entrepreneur is singularly focussed on implementing their one opportunity and is ignoring other opportunities and negative detractors. However, in order to facilitate implementation there is a need to be cognisant of information that supports implementation. Mindset allows certain information to be highlighted when relevant to solving the challenge at hand (Rhinesmith, 1992). Exactly what this information is depends on the entrepreneurial venture, and the challenge at hand. The concept of cognitive adaptability (Haynie & Shepherd, 2009) mimics this, in that entrepreneurs are regarded as "motivated tacticians" who choose the appropriate tactics for the situation. Mindset supports this by focussing on information that supports the decision of which tactics to apply.

Blocking out distractions and detractors, while simultaneously being open to internal and external cues that guide action, might sound contradictory, in that the first is about closing out negative distractions and detractors, while the second is about being open to input about how best to achieve the goal. We do not see a conflict here, as both relate to intense task orientation and focussing only inputs that will help them achieve the desired goal. This is consistent with the work of Rhinesmith (1992), who describes mindset as a filter, whereby some information is emphasised, while other information is blocked.

6.1.2.1.4 Reflective mindset

Having taken action, an individual then moves through to the final stage, which is defined as evaluative, to decide on whether the goal has been achieved. This topic receives scant attention within entrepreneurship literature. Although, there is reference to monitoring activities in discussions around Meta-Cognition (Haynie et al., 2010; Haynie & Shepherd, 2009). When do entrepreneurs decide that they have achieved their goal? Or that they should quit, as continuing to act will not satisfy their original desires that provided the motivation for the goal in the first place?

This separates one of the ways in which mindset differs from habits. If entrepreneurship was a habit, then people would continue relentlessly, while mindset says an individual will check to see whether their goals have been achieved (Mathisen & Arnulf, 2013). In evaluating whether their goal has been achieved, individuals compare their status quo to their original motivation for setting out in the goal striving process (Peter M Gollwitzer, 1990).

Prior work has looked at the way entrepreneurs incorporate feedback into their decision making process (Shepherd et al., 2010). We know that learning is an important component for the

development of an opportunity within the venture creation process (Cope 2005; Corbett 2005; 2007). It is apparent that entrepreneurs participate in escalating feedback loops where additional feedback from the entrepreneurial environment is incorporated into decision-making regarding the opportunity. At this point entrepreneurs must also come to grips with failures, both small and large. An EM requires an individual to take action and these early entrepreneurial attempts tend to include some failure (Yamakawa & Cardon, 2015). Yet crucial to EM is learning from these failures. However, trials and failure must only be through affordable losses (Sarasthvathy, 2008), as learning should take place through making small bets as the entrepreneur seeks out confirmation that their idea/opportunity is feasible, and as they seek to create new means.

Overall, our model follows the path of Gollwitzer (1990) who explains that path completion may not always include deliberation, as actions may be the resumption of a task that may not include intense planning. As such, the steps in our EM model are not necessarily a conscious process, but rather ones that can occur without conscious deliberation, especially where the environment or tasks may be familiar. Nor are they a linear process from start to finish, but allow for backtracking, interruption and resumption in the pursuit of achieving goals.

6.2   Connecting the insights from the discussion of all research questions

Bringing the different parts of this thesis together, we suggest the entrepreneurial lens impacts the way they see the world, and therefore impacts the opportunities they see, and their reaction to these opportunities. When applied to entrepreneurial goals, this exhibits itself in the form of shifting back and forth between elaborative and implementive mindsets, whereby when the entrepreneur encounters problems, they shift to an elaborative mindset to search for potential solutions, before shifting back to an implementive perspective to trial whether the selected cognitive solution generates the desired outcome. In applying this perspective to an entrepreneurial goal, the Rubicon model demonstrates the steps that are moved through, from pre-decision, to re-action, to action and finally post action. These steps are not always linear and may be observed as mini-processes within larger goals. They can also be cyclical, allowing for trial and error, and learning from failure (Lynch & Corbett, 2019).

When we search for evidence of how this plays out with real world successful entrepreneurs, then we can rely on the operationalised mindset perspective of effectuation (Sarasthvathy, 2008). These exhibit themselves through language use as well, whereby the way entrepreneurs talk about their world. These are summarised as action orientation; future orientation; collective thinking; customer orientation and growth (Lynch, Kamovich, et al., 2017). The action orientation, collective thinking, customer orientation and growth outlook are all consistent with Saravasthy's work, and the future orientation is not inconsistent with her work either – and might form a parallel to her perspective of

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entrepreneurs focussing only on what they can control. Collectively, these suggest that there is a connection between language, cognition, and taking action in a way that creates successful entrepreneurial outcomes.

We also see that this mindset can be trained for using DT as pedagogy (Lynch, Kamovich, Longva, et al., 2019; Lynch, Kamovich, & Steinert, 2019), and that when students go through this form of training they begin to behave in a way that is more entrepreneurial. We see that using DT causes students to begin to see new opportunities that they were previously oblivious to, not only do they see these opportunities, but they also begin to take action on them, moving to prototype the concepts to gain feedback, and learn along the way (Lynch, Kamovich, Longva, et al., 2019; Lynch, Kamovich, & Steinert, 2019). When stuck, they have the DT process to fall back upon, which has elaborative and implementive perspectives built into it.

Taking these perspectives together we can see this connection between action and cognition. In the process of venture creation it is natural to encounter challenges. However, the difference between those who stop/never get started/quit/or get stuck and those who manage to move forward in the process is the ability to apply the fluidity of EM. That is, they can switch between differing cognitions, and apply the one that is most likely to generate the desired outcome (Lynch & Corbett, 2019). EM is different from habits and heuristics, as it is the ability to learn and adapt as the circumstances change. While this becomes non-conscious with practice, in early stages this may require considerable cognitive effort (Peter M Gollwitzer, 1990). This may partly explain why so many people find entrepreneurship a challenge, the cognitive effort of facing challenges and finding solutions is unlikely to be viewed as pleasurable by most people.

To summarise, EM influences our world view, and with it comes a perspective on what is desirable, and feasible, which ultimately forms our intentions to act (Lynch, Steinert, & Andersson, 2016b). When actions do not generate the desired outcomes, it as an EM that allows individuals to learn and try new approaches until they arrive at the desired outcome (Lynch & Corbett, 2019).

6.3 Limitations

All research has limitations and boundaries, and this thesis is no different. It has focussed largely on the individual, and their EM. However, we know that humans are not solitary creatures, impervious to those around them. People's mindsets are influenced by those around them, both at a near level through those they interact with, and at a more distant societal level. Outside of the work carried out in Lynch et al. (2018), there has been little acknowledgement of the importance of these environmental factors in this thesis. I do not mean to suggest that they are somehow unimportant. I

acknowledge the body of work that exists demonstrating this link between the two. However, my research has not delved deeply into this connection.

We note a somewhat contradiction established between our conceptualisation of mindset and our suggested methodology for measuring mindset. In our conceptualisation we explain that mindset is fluid, changing and updating as the individual's mindset learns through trial and error. Yet, our measurement, and indeed no measurement can truly capture this fluidity. It reminds us of the proverb that you never step in the same river twice. Indeed, what an individual's mindset is when measured at a single moment will be different only moments later, and as the entrepreneur continues to grow and learn so too will this mindset and cognition update. Perhaps therefore measurement of EM is actually a futile endeavour given how fleeting and impermanent it is.

In our discussions of learning and teaching EM we have again focussed on individuals. Yet Burgoyne (1995) points out in relation to learning, there is often a meeting of the minds whereby learning is a socially constructed activity, where individuals are influenced by the other learners around them. The same is likely true of EM, and research into this would be a fruitful path to explore (albeit it is challenging).

The research contained within has some limitations due to not having had many of the findings tested in an experimental sense. The time allowed for the project has meant that not all the desired research has managed to be carried out. It would, for example, have been interesting to examine whether language could be used to influence peoples EM.

I also have some concerns about the robustness of the results from the grounded approach to measuring cognition via language. While the methodology is sound, I would have liked to have a more robust way to separate the control and test groups. I think additional analysis of the meanings and subjects discussed by interviewees could also reveal interesting insights.

The insights from teaching EM using design as a pedagogy also raise additional questions, for example how they compare to other experience based pedagogy, and whether there are advantages and disadvantages to using DT. The use of a case method for Lynch, Kamovich, Longva, et al. (2019) and Lynch, Kamovich, and Steinert (2019) means that we cannot generalise the results and it requires additional research in other contexts before we can say with greater certainty that the results are true in other contexts. Also, any research on a class taught by a single teacher brings into question the impact that this teacher has on students. The teacher in the two cases above has been described as "inspirational" by many students who have attended his class. To what extent this skews the results is hard to know, and further necessitates that similar pedagogies taught by different teachers be compared in future research.

6.4   Further research

While this thesis delves into EM, the concept is far from fully explored and holes in the literature are far from filled, suggesting there are many fruitful avenues of research awaiting those interested in the topic. Building on many of the limitations discussed above, I suggest future research into EM could explore the following themes.

The first crucial task to be tackled in my opinion is to delve further into the question regarding at what level EM should be measured. The current conception hints at the way EM changes and that it maybe individual thoughts that are impacting the way an entrepreneur decides to act. I therefore think resolving the level of measurement at which we should be trying to measure EM would inform on the other research avenues discussed below.

Closely connected to this, is the interaction between individual elements of cognition, such as the way beliefs impact perceptions, and how these influence the way an entrepreneur perceives challenges. In addition, the interaction between heuristics and trialling of new methods, when old ones seem to fail. These individual elements seem to have been well explained by existing literature, but virtually no literature I am aware of discusses the interaction between the differing elements of cognition. Mapping the interaction of these might provide a more "systems" like perspective on cognition and might be helpful in identifying ways to bring about changes in EM. By systems perspective, I mean that we can map the interconnectedness of the individual elements of mindset and begin to see how influencing one part leads to changes in other individual parts of the mindset.

A further avenue of research would be into the negative elements of having an EM, especially given the correlation between entrepreneurship and psychiatric conditions (Freeman et al., 2019), or the close correlation between psychopathic tendencies and entrepreneurial habits (Walker, 2015). In what ways might EM hinder other outcomes or play a negative role in an entrepreneur's life. We do not mean to suggest that having an EM is the best way of thinking, instead we acknowledge that learning an EM might come at some unforeseen cost (as well as the negative sides of being an entrepreneur). Starting a venture is an emotional process, so there is room to research further into how to help entrepreneurs have healthy emotional responses as part of their EM training.

The language analysis carried out to date has focussed on individual words. Yet meaning is not conveyed through individual words, but through the construction of sentences and discussions. Therefore, exploring patterns of language use, and not just the individual words, would provide potential insights into EM. In addition, the existing methodology could be applied to different data sets to search for consistency and transferability of results between test groups. This would allow us to place greater trust in the method as an appropriate benchmark for measuring EM.

As mentioned already, this thesis has focussed analysis at the level of the individual. Examining the way collective mindsets were formed, and shaped, would represent a fascinating way forward for measuring mindset. However, such a path is fraught with challenges, such that attempting such a project would feel overly audacious.

The research carried out in this thesis has been primarily focussed on "what is" or examining EM as it is today. Taking the insights from this thesis and transferring them into actionable experiments would be an interesting approach to test the validity of the findings. Setting up experiments to nudge people into having a more EM would represent an interesting path forward. A simple example might be to nudge students into using different language and see whether this impacts some form of entrepreneurial behaviour, such as opportunity identification. Although, as discussed in Nudge (Thaler & Sunstein, 2009), subtlety influencing people's choices instantly raises a number of ethical questions about what direction is appropriate to nudge them in. Given some of the negative sides associated with entrepreneurship, any research that influences behaviour needs to seriously consider the ethics of such interventions.

Lastly, the research carried out here with regards to DT as a pedagogy suggests that it is a useful tool for training students to have a more EM. However, this has not been compared to other pedagogies, in particular pedagogies that use learning from experience (LFE). Further research might wish to run a controlled comparison of teaching pedagogies to compare DT, versus a more generalised LFE pedagogy, and finally have a more traditional approach to teaching EM as a control group. Having a true comparison is challenging but has been done before in other pieces of research.

Collectively, these paths represent a broad opportunity to deepen our understanding of EM and enrich our understanding of the construct and its associated constructs. With additional insights we can explore how to better support students of entrepreneurship in their mission to achieve transformation in society through generating more entrepreneurial outcomes.

6.5 Conclusions

This thesis contributes to an overall understanding of EM and expands on the concept in a way that contributes to the field's overall understanding of the role of EM in the process of venture creation. This topic is important because the internal factors inside an entrepreneur's head, their cognition or EM play a large role in deciding whether an entrepreneur is successful in acting on their entrepreneurial desires and achieving successful outcomes (Lynch & Corbett, 2019; Lynch et al., 2016b).

We know this based on the research carried out over the last four years that builds on an existing body of knowledge from both inside the field of entrepreneurship and outside the field. Collectively I

have used these pieces of research to expand on the key research questions. The first research question focussed on how do we define and conceptualise what is meant by an EM? We landed on the definition of EM as: *An automated non-conscious perspective including the sum total of cognitive processes; that leads to an individual's willingness to take action under uncertainty, make errors, learn from those failures and direct that learning to specific goals to best solve the entrepreneurial tasks within the process of venture creation (Lynch & Corbett, 2019).* This definition is based on synthesising perspectives from prior research on mindset from outside the field of entrepreneurship. Crucial to this conception is the perspective that EM is not one thing, but something that is fluid and changing. Drawing on prior work from Mathisen and Arnulf (2013), we showed that being effective as an entrepreneur required having multiple mindsets, or in particular an elaborative and implementive mindset (Lynch & Corbett, 2019). Those who had both mindsets, and could switch between them, were able to generate more entrepreneurial outcomes (Mathisen & Arnulf, 2013). However, it is not enough to define only what EM is, we therefore elaborated on the role this definition played in the process of venture creation.

Collectively these perspectives show that EM is not one fixed thing, but a collection of cognitions that is used to best serve the entrepreneur in their attempts to achieve their desired outcomes (Humphrey, 1951; Lynch & Corbett, 2019; Mathisen & Arnulf, 2013). Which raises issues for the second research question on how to measure mindset, especially given that it is something fluid that changes over time. The second research question was: How can we measure EM? In answering this question, we relied on the perspective that what we talk about and how we talk about it reflects what we think about and how we think about it (Lynch, Kamovich, et al., 2017; Lynch, Tuema, et al., 2017). This connection between language and cognition allows us to measure language as a proxy for thought.

We carried out two studies whereby we examined language use by successful entrepreneurs in an attempt to measure the ways in which their mindset differed from those of less successful entrepreneurs (Lynch, Kamovich, et al., 2017; Lynch, Tuema, et al., 2017). These studies revealed results consistent with those of Sarasthvathy (2008), where our own results highlighted action orientation; future orientation; collective thinking; customer orientation and growth. The methods used in these studies are far from perfect, but they do suggest that there is potential as a future path for research to better explore whether we can use language as a proxy for cognition.

Which brings us to the third research question focussed around how to train individuals to have an EM. We suggested that DT is a pedagogy that can be useful for training individuals to have an EM (Lynch et al., 2016a). This leads to the research question: Why is DT a useful pedagogy for teaching

EM? In order to answer this, I delved into what we mean by DT and how as a method it makes use of several different logics, such as inductive, deductive and abductive. It also uses differing orientations, moving between synthesis and analysis, and between abstraction and the concrete world. These shifting perspectives is useful as the cognitions associated with each are different, therefore as a pedagogy, DT trains individuals to be flexible in their cognition. As such DT represents a useful training tool for having students practice having an EM (Lynch, Kamovich, Longva, et al., 2019; Lynch, Kamovich, & Steinert, 2019). Our conception of EM also focusses on learning from experiences and willingness to make errors. This is also something focussed upon in DT, whereby the process encourages reflection, learning from feedback, and prototyping with a willingness to test ideas before they are fully finished concepts (Lynch, Kamovich, Longva, et al., 2019; Lynch, Kamovich, & Steinert, 2019; Lynch et al., 2016a).

While the theory of DT aligns with EM, and conceptually makes sense to the author, I also chose to use data to support the investigation of the research question. This comes in the form of two studies about where DT had been used as pedagogy. The feedback from these studies were used to outline what students received from DT pedagogy. These were summarised as four themes: being challenged; developing tangential skills, developing knowledge and seeing real life applications (Lynch, Kamovich, Longva, et al., 2019). When we connect these to entrepreneurial behaviours, we see that the students practised spotting opportunities, and acting on them, while developing their willingness to take action under uncertainty. In following students' behaviour after a DT course, we were able to observe students taking entrepreneurial action under uncertainty in an attempt to create value for their organisations (Lynch, Kamovich, & Steinert, 2019). Collectively these insights point to the usefulness of DT as a pedagogy for training individuals to have a more EM.

Having argued for DT as an appropriate method, I then provided pedagogical suggestions that are crucial to consider when using DT in teaching entrepreneurship. These perspectives were based on my own teaching experience, and the experience of watching others teach similar subjects.

Collectively the insights described attempt to answer the three research questions and the final overarching research question, which is: what is the role of EM in separating those who take entrepreneurial actions from those who have the intention to take entrepreneurial action but never do so.

We answered this in two parts. The first part focuses on EM as kind of filter or lens that simplifies an entrepreneur's world view. This lens filters out, enhances or leaves unchanged entrepreneurial opportunities. What passes through this lens impacts what the entrepreneur experience as a stimulus. The stimulus leads to an entrepreneurial response, exactly what this response is depends

on the entrepreneur's cognitive choices about how to respond. If the initial response does not generate the desired outcome, then the entrepreneur learns and updates their perspective.

The second was to show how mindsets played a role in venture creation, I again borrowed from cognitive psychology and the work of Gollwitzer who developed the Rubicon model. This model shows the way mindset changes and shifts at different stages towards trying to achieve goals, which for entrepreneurs means venture creation. The model sets out four differing stages an individual goes through, and we aligned these with the venture creation process to conceptualise how EM played a role. In the initial stages EM is open and searching for information on opportunities and their feasibility; the next stage sees entrepreneurs narrow their focus to how to execute on the idea, which leaves them ignoring information on other opportunities. In the following stages an entrepreneur become intently focused on implementing, whereby the mindset blocks out detractors, and pays attention to cues on how to achieve the desired outcome and is likened to an intense focus. In the final stage, the entrepreneur becomes more reflective, learning from their attempts and decisions, while also reflecting on whether they have achieved their desired goal and deciding on future actions. This process can be iterative and does not necessarily represent a linear flow and allows for interruptions and pauses along the way.

Overall the answer to the question of what is the role that EM plays in venture creation is that it assists in generating cognitive choices that an aspiring entrepreneur can utilise in order to move past challenges and hurdles they encounter in the path towards venture creation. It is something that changes and updates as the entrepreneur learns from experience. Finally, it is a cognition that provides entrepreneurs with the willingness to take action under uncertainty by leveraging their cognitive resources.

6.6 Implications

Given the conceptualisation we have created focusses on the flexibility and adaptability of mindsets, we need to begin to train aspiring entrepreneurs to be more flexible in their cognition. Traditional teaching has focussed on having students come up with the "right" answer, yet in the world of mindset, it is about training them to see that there are multiple options, and that some of these are of course better than other choices. However, training them to recognise that they have cognitive choices and to make appropriate choices is the purpose of training students in EM. This requires them to practise moving between mindsets, practising learning from experiences, and giving them the support to do so.

DT appears to be a pedagogy that is adept at achieving the desired outcomes for having students practise this mental adaptability and flexibility. We should therefore consider implementing more DT

into entrepreneurship curriculum. Although, we note that DT is already becoming popular within the entrepreneurship community, we do suggest that its implementation is done with caution. Firstly, like any pedagogy it can be used poorly resulting in sub-optimal outcomes. The other concern is that the research community should invest more time in comparing DT to other experience based learning methods to see whether DT is the most appropriate pedagogy.

There is the implication that language plays a role in how we view the world. For those of us who are aspiring entrepreneurs, we should therefore be highly cognizant of our language usage and choose wisely the way we speak. These words will impact how we view the world and influence the way we see and implement solutions.

If we accept that EM has a significant role to play in influencing entrepreneurial outcomes, then there is still more work to be done in order to better operationalise this perspective into a way of being, so that aspiring entrepreneurs can learn from it. There is also a wealth of research that needs to be done to examine connected aspects of EM (as mentioned in the further research section). As such, the implications for research in the area for EM is that the work is still in its infancy, and that there is a need for a lot more research before we can fully comprehend the phenomena. That research in the field of cognitive psychology began in the 1950s suggests that we should not expect a quick answer in the field of cognition and entrepreneurship, but rather that we could benefit from a richer field of research in this area.

The implication of our conceptualisation of EM suggests that we need to reconsider the way we measure mindset. While I have not found a clear answer as to what is the best way to measure EM, the research conducted in this thesis suggests that current measures are measuring something else other than EM. This also suggest we need to focus our research efforts on finding an appropriate methodology to measure EM.

Lastly, those who do not feel very entrepreneurial should feel heartened by this research. As the research on pedagogy suggests that an EM is something that can be learned through experience and practise and not something you are necessarily born with.

6.7 References

Ahl, H. J. (2003). 1 THE SCIENTIFIC REPRODUCTION OF GENDER INEQUALITY A Discourse Analysis of Research Articles on Women's Entrepreneurship.

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes, 50*(2), 179-211.

Ajzen, I. (2011). Theory of planned behavior. *Handb Theor Soc Psychol Vol One, 1*(2011), 438.

Ajzen, I., & Fishbein, M. (1980). Understanding attitudes and predicting social behaviour.

Aksoy, L., van Riel, A. C. R., Calabretta, G., Driessen, P. H., Hillebrand, B., Humphreys, A., . . . Beckers, S. F. M. (2013). Consumer perceptions of service constellations: implications for service

innovation. *Journal of Service Management, 24*(3), 314-329. doi:10.1108/09564231311327012

Allen, B. A., & Armour-Thomas, E. (1993). Construct validation of metacognition. *The Journal of Psychology, 127*(2), 203-211.

Ashourizadeh, S., Chavoushi, Z. H., & Schøtt, T. (2014). People's confidence in innovation: a component of the entrepreneurial mindset, embedded in gender and culture, affecting entrepreneurial intention. *International Journal of Entrepreneurship and Small Business, 23*(1-2), 235-251.

Aulet, B. (2013). *Disciplined entrepreneurship: 24 steps to a successful startup*: John Wiley & Sons.

Bagozzi, R. P., Baumgartner, J., & Yi, Y. (1989). An investigation into the role of intentions as mediators of the attitude-behavior relationship. *Journal of Economic Psychology, 10*(1), 35-62.

Bandura, A. (1994). *Self-efficacy*: Wiley Online Library.

Bandura, A. (1997). Self-efficacy: The exercise of self-control. In: New York: Freeman.

Baron, R. A. (1998). Cognitive mechanisms in entrepreneurship: Why and when enterpreneurs think differently than other people. *Journal of Business venturing, 13*(4), 275-294.

Baron, R. A., & Ensley, M. D. (2006). Opportunity recognition as the detection of meaningful patterns: Evidence from comparisons of novice and experienced entrepreneurs. *Management science, 52*(9), 1331-1344.

Baron, R. A., & Henry, R. A. (2010). How entrepreneurs acquire the capacity to excel: Insights from research on expert performance. *Strategic Entrepreneurship Journal, 4*(1), 49-65.

Beckman, S. L., & Barry, M. (2007). Innovation as a learning process: Embedding Design Thinking. *California management review, 50*(1).

Bedi, G., Carrillo, F., Cecchi, G. A., Slezak, D. F., Sigman, M., Mota, N. B., . . . Corcoran, C. M. (2015). Automated analysis of free speech predicts psychosis onset in high-risk youths. *npj Schizophrenia, 1*, 15030.

Berger, P. L., & Luckmann, T. (1991). *The social construction of reality: A treatise in the sociology of knowledge*: Penguin UK.

Biesta, G. (2007). Why "what works" won't work: Evidence-based practice and the democratic deficit in educational research. *Educational theory, 57*(1), 1-22.

Bilán, S. G., Kisenwether, E. C., Rzasa, S. E., & Wise, J. C. (2005). Developing and assessing students' entrepreneurial skills and mind-set. *Journal of Engineering Education, 94*(2), 233-243.

Bootcamp Bootleg. (2010). d. school Bootcamp Bootleg. In. Hasso Plattner, Institute of Design: Stanford: Institute of Design at Stanford.

Brandstätter, H. (2011). Personality aspects of entrepreneurship: A look at five meta-analyses. *Personality and Individual Differences, 51*(3), 222-230. doi:http://dx.doi.org/10.1016/j.paid.2010.07.007

Brigham, K. H., De Castro, J. O., & Shepherd, D. A. (2007). A person–organization fit model of owner–managers' cognitive style and organizational demands. *Entrepreneurship Theory and Practice, 31*(1), 29-51.

Brown, T. (2009). Change by design.

Bruner, J. (1991). The narrative construction of reality. *Critical inquiry, 18*(1), 1-21.

Burgoyne, J. G. (1995). Learning from experience: from individual discovery to meta-dialogue via the evolution of transitional myths. *Personnel Review, 24*(6), 61-72.

Burke, P. J. (1991). Identity processes and social stress. *American sociological review*, 836-849.

Burke, P. J. (2004). Identities, events, and moods. In *Theory and research on human emotions* (pp. 25-49): Emerald Group Publishing Limited.

Busenitz, L. W., & Barney, J. B. (1997). Differences between entrepreneurs and managers in large organizations: Biases and heuristics in strategic decision-making. *Journal of Business venturing, 12*(1), 9-30.

Caird, S. (1991). The enterprising tendency of occupational groups. *International Small Business Journal, 9*(4), 75-81.

Cohen-Kdoshay, O., & Meiran, N. (2007). The representation of instructions in working memory leads to autonomous response activation: Evidence from the first trials in the flanker paradigm. *The Quarterly Journal of Experimental Psychology, 60*(8), 1140-1154.

Colvin, G. Talent is overrated: what really separates world-class performers from everybody else.(2008). *New York: Portfolio*.

Cope, J. (2005). Researching entrepreneurship through phenomenological inquiry: philosophical and methodological issues. *International Small Business Journal, 23*(2), 163-189.

Corbett, A. C., & Hmieleski, K. M. (2007). The conflicting cognitions of corporate entrepreneurs. *Entrepreneurship Theory and Practice, 31*(1), 103-121.

Corno, L. (1993). The best-laid plans: Modern conceptions of volition and educational research. *Educational researcher, 22*(2), 14-22.

d'Andrade, R. G. (1995). *The development of cognitive anthropology*: Cambridge University Press.

Dabbagh, N., & Menascé, D. A. (2006). Student perceptions of engineering entrepreneurship: An exploratory study. *Journal of Engineering Education, 95*(2), 153-164.

Daniel, A. D. (2016). Fostering an entrepreneurial mindset by using a design thinking approach in entrepreneurship education. *Industry and Higher Education, 30*(3), 215-223.

Davis, M. H., Hall, J. A., & Mayer, P. S. (2016). Developing a new measure of entrepreneurial mindset: Reliability, validity, and implications for practitioners. *Consulting Psychology Journal: Practice and Research, 68*(1), 21.

Dorst, K. (2011). The core of 'design thinking'and its application. *Design studies, 32*(6), 521-532.

Dunne, D., & Martin, R. (2006). Design thinking and how it will change management education: An interview and discussion. *Academy of Management Learning & Education, 5*(4), 512-523.

Duval-Couetil, N., Reed-Rhoads, T., & Haghighi, S. (2012). Engineering students and entrepreneurship education: Involvement, attitudes and outcomes. *International Journal of Engineering Education, 28*(2), 425.

Dweck, C. (2006). *Mindset: The new psychology of success*: Random House.

Ericsson, K. A. (2006). The influence of experience and deliberate practice on the development of superior expert performance. *The Cambridge handbook of expertise and expert performance, 38*, 685-705.

Ericsson, K. A., & Charness, N. (1994). Expert performance: Its structure and acquisition. *American psychologist, 49*(8), 725.

Ericsson, K. A., Charness, N., & Hoffman, R. (2006). *The Cambridge Handbook of Expertise and Expert Performance*. New York: Cambridge University Press.

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological review, 100*(3), 363.

Erikson, E. H. (1980). Identity and the life cycle.

European Commission. (2006, 2006). *The Oslo Agenda for Entrepreneurship Education in Europe*.

European Society for Engineering Education. (2012). *Annual Report (2011)*. Retrieved from Brussels, Belgium: http://www.sefi.be/wp-content/uploads/SEFI%20Report%202011-final.pdf

Fayolle, A. (2013). Personal views on the future of entrepreneurship education. *Entrepreneurship & Regional Development, 25*(7-8), 692-701.

Fayolle, A. (2018). A Research Agenda for Entrepreneurship Education. In: Cheltenham (UK): Edward Elgar Publishing.

Fisher, G. (2012). Effectuation, Causation, and Bricolage: A Behavioral Comparison of Emerging Theories in Entrepreneurship Research. *Entrepreneurship Theory and Practice, 36*(5), 1019-1051. doi:10.1111/j.1540-6520.2012.00537.x

Fiske, S. T., & Taylor, S. E. (2013). *Social cognition: From brains to culture*: Sage.

Freeman, M. A., Staudenmaier, P. J., Zisser, M. R., & Andresen, L. A. (2019). The prevalence and co-occurrence of psychiatric conditions among entrepreneurs and their families. *Small Business Economics, 53*(2), 323-342.

French Ii, R. P. (2016). The fuzziness of mindsets: Divergent conceptualizations and characterizations of mindset theory and praxis. *International Journal of Organizational Analysis, 24*(4), 673-691.

Gaglio, C. M., & Katz, J. A. (2001). The psychological basis of opportunity identification: Entrepreneurial alertness. *Small Business Economics, 16*(2), 95-111.

Gartner, W. B. (1985). A conceptual framework for describing the phenomenon of new venture creation. *Academy of management review, 10*(4), 696-706.

Gartner, W. B. (1993). Words lead to deeds: Towards an organizational emergence vocabulary. *Journal of Business venturing, 8*(3), 231-239.

Gartner, W. B. (2001). Is there an elephant in entrepreneurship? Blind assumptions in theory development. *Entrepreneurship Theory and Practice, 25*(4), 27-39.

Geertz, C. (1973). *The interpretation of cultures* (Vol. 5043): Basic books.

Gergen, K. J. (1991). *The saturated self: Dilemmas of identity in contemporary life*: Basic books.

Gibb, A. (2008). Entrepreneurship and enterprise education in schools and colleges: Insights from UK practice. *International Journal of Entrepreneurship Education, 6*(2), 48.

Gollwitzer, P. M. (1990). Action phases and mind-sets. *Handbook of motivation and cognition: Foundations of social behavior, 2*, 53-92.

Gollwitzer, P. M. (2012). *Mindset theory of action phases*.

Gollwitzer, P. M., & Bayer, U. (1999). Deliberative versus implemental mindsets in the control of action. *Dual-process theories in social psychology*, 403-422.

Gollwitzer, P. M., Heckhausen, H., & Ratajczak, H. (1990). From weighing to willing: Approaching a change decision through pre-or postdecisional mentation. *Organizational behavior and human decision processes, 45*(1), 41-65.

Grégoire, D. A., Corbett, A. C., & McMullen, J. S. (2011). The cognitive perspective in entrepreneurship: An agenda for future research. *Journal of Management studies, 48*(6), 1443-1477.

Gupta, A. K., & Govindarajan, V. (2002). Cultivating a global mindset. *Academy of Management Perspectives, 16*(1), 116-126.

Hanington, B. (2003). Methods in the making: A perspective on the state of human research in design. *Design issues, 19*(4), 9-18.

Haynie, M., Shepherd, D., Mosakowski, E., & Earley, P. C. (2010). A situated metacognitive model of the entrepreneurial mindset. *Journal of Business venturing, 25*(2), 217-229.

Haynie, M., & Shepherd, D. A. (2007). Exploring the entrepreneurial mindset: Feedback and adaptive decision-making.

Haynie, M., & Shepherd, D. A. (2009). A measure of adaptive cognition for entrepreneurship research. *Entrepreneurship Theory and Practice, 33*(3), 695-714.

Hayward, M. L. A., Shepherd, D. A., & Griffin, D. (2006). A hubris theory of entrepreneurship. *Management science, 52*(2), 160-172.

Herold, C. (2008). Harnessing Entrepreneurial Manic-Depression: Making the Rollercoaster Work for You. Retrieved from https://tim.blog/2008/10/03/harnessing-entrepreneurial-manic-depression-making-the-rollercoaster-work-for-you/

Hitt, M. A. (2000). The new frontier: Transformation of management for the new millennium. *Organizational Dynamics, 28*(3), 7-17.

Hitt, M. A., Ireland, R. D., Camp, S. M., & Sexton, D. L. (2001). Strategic entrepreneurship: Entrepreneurial strategies for wealth creation. *Strategic management journal, 22*(6-7), 479-491.

Hoholm, T., & Araujo, L. (2011). Studying innovation processes in real-time: The promises and challenges of ethnography. *Industrial Marketing Management, 40*(6), 933-939. doi:10.1016/j.indmarman.2011.06.036

Humphrey, G. (1951). Thinking: An introduction to its experimental psychology.

Huq, A., & Gilbert, D. (2017). All the world'sa stage: transforming entrepreneurship education through design thinking. *Education+ Training, 59*(2), 155-170.

Ireland, R. D., Hitt, M. A., & Sirmon, D. G. (2003). A model of strategic entrepreneurship: The construct and its dimensions. *Journal of management, 29*(6), 963-989.

Jonassen, D., Strobel, J., & Lee, C. B. (2006). Everyday problem solving in engineering: Lessons for engineering educators. *Journal of Engineering Education, 95*(2), 139-151.

Kamovich, U., & Longva, K. K. (2016). 10 When theory is invisible and hidden in practice: a qualitative study of one entrepreneurship course. In *Offentleg sektor i endring* (pp. 157-173).

Kickul, J., Gundry, L. K., Barbosa, S. D., & Whitcanack, L. (2009). Intuition versus analysis? Testing differential models of cognitive style on entrepreneurial self-efficacy and the new venture creation process. *Entrepreneurship Theory and Practice, 33*(2), 439-453.

King, C. J. (2012). Restructuring engineering education: Why, how and when? *Journal of Engineering Education, 101*(1), 1-5.

Knight, F. H. (2012). *Risk, uncertainty and profit*: Courier Corporation.

Kolb, D. A. (1984). Experiential learning: experience as the source of learning and development.

Kolko, J. (2010). Sensemaking and framing: A theoretical reflection on perspective in design synthesis. *Design Research Society*.

Krueger, N. F. (2007). What lies beneath? The experiential essence of entrepreneurial thinking. *Entrepreneurship Theory and Practice, 31*(1), 123-138.

Krueger, N. F., & Brazeal, D. V. (1994). Entrepreneurial potential and potential entrepreneurs. *Entrepreneurship Theory and Practice, 18*, 91-91.

Krueger, N. F., & Carsrud, A. L. (1993). Entrepreneurial intentions: applying the theory of planned behaviour. *Entrepreneurship & Regional Development, 5*(4), 315-330.

Krueger, N. F., Kickul, J., Gundry, L. K., Verma, R., & Wilson, F. (2009). Discrete choices, trade-offs, and advantages: Modeling social venture opportunities and intentions.

Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business venturing, 15*(5), 411-432.

Kuratko, D. F., & Morris, M. H. (2018). Examining the future trajectory of entrepreneurship. *Journal of Small Business Management, 56*(1), 11-23.

Lackéus, M. (2014). An emotion based approach to assessing entrepreneurial education. *The International Journal of Management Education, 12*(3), 374-396.

Lahn, L. C., & Erikson, T. (2016). Entrepreneurship education by design. *Education+ Training, 58*(7/8), 684-699.

Leifer, L. J., & Steinert, M. (2011). Dancing with ambiguity: Causality behavior, design thinking, and triple-loop-learning. *Information Knowledge Systems Management, 10*(1-4), 151-173.

Liang, H., Marquis, C., Renneboog, L., & Li Sun, S. (2017). Future-Time Framing: The Effect of Language on Corporate Future Orientation. *SSRN Working Paper*.

Litzinger, T., Lattuca, L. R., Hadgraft, R., & Newstetter, W. (2011). Engineering education and the development of expertise. *Journal of Engineering Education, 100*(1), 123-150.

Liu, J. (2016). Visualizing the 4 Essentials of Design Thinking. Retrieved from https://medium.com/good-design/visualizing-the-4-essentials-of-design-thinking-17fe5c191c22

Lord, R. G., & Maher, K. J. (1990). Alternative information-processing models and their implications for theory, research, and practice. *Academy of management review, 15*(1), 9-28.

Lynch, M., & Corbett, A. C. (2019). Entrepreneurial Mindset and Cycles of Learnng. *Manuscript submitted for publication*.

Lynch, M., Kamovich, U., Andersson, G., & Steinert, M. (2017). *The Language of Successful Entrepreneurs: An Empirical Starting Point for the Entrepreneurial Mindset.* Paper presented at the 12th European Conference on Innovation and Entrepreneurship, Paris, France.

Lynch, M., Kamovich, U., Longva, K. K., & Steinert, M. (2019). Combining technology and entrepreneurial education through design thinking: Students' reflections on the learning process. *Technological Forecasting and Social Change*, 119689. doi:https://doi.org/10.1016/j.techfore.2019.06.015

Lynch, M., Kamovich, U., & Steinert, M. (2019). Promoting strategic entrepreneurship at the firm level. *Manuscript submitted for publication*.

Lynch, M., Slåttsveen, K., Lozano, F., Steinert, M., & Andersson, G. (2017, 2017). *Examining entrepreneurial motivations in an education context*.

Lynch, M., Steinert, M., & Andersson, G. (2016a). Educating entrepreneurs in practical methods with design practices as a guide. *DS 85-2: Proceedings of NordDesign 2016, Volume 2, Trondheim, Norway, 10th-12th August 2016*.

Lynch, M., Steinert, M., & Andersson, G. (2016b, 2016). *Entrepreneurship: What Separates Those Who Do from Those Who Don't.* Paper presented at the The Fourth International Conference on Design Creativity, Atlanta, GA, USA.

Lynch, M., Steinert, M., & Andersson, G. (2018). Levels of Internal Resistance in Entrepreneurship: a psychology based model for guiding coaching. *GSTF Journal of Business Review, 5*(3).

Lynch, M., Tuema, L., Andersson, G., & Steinert, M. (2017, 2017). *Entrepreneurial Mindset: an Empirical Starting Point*.

MacMillan, I. C., & Katz, J. A. (1992). Idiosyncratic milieus of entrepreneurial research: The need for comprehensive theories. *Journal of Business venturing, 7*(1), 1-8.

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science, 2*(1), 71-87.

Mathisen, J.-E., & Arnulf, J. K. (2013). Competing mindsets in entrepreneurship: The cost of doubt. *The International Journal of Management Education, 11*(3), 132-141.

McAdams, D. P., & Pals, J. L. (2006). A new Big Five: fundamental principles for an integrative science of personality. *American psychologist, 61*(3), 204.

McCall, G. J., & Simmons, J. L. (1966). Identities and interactions.

McCrae, R. R., & Costa Jr, P. T. (1999). A five-factor theory of personality. *Handbook of personality: Theory and research, 2*, 139-153.

McGee, J. E., Peterson, M., Mueller, S. L., & Sequeira, J. M. (2009). Entrepreneurial self-efficacy: refining the measure. *Entrepreneurship Theory and Practice, 33*(4), 965-988.

McGrath, R. G., & MacMillan, I. C. (2000). *The entrepreneurial mindset: Strategies for continuously creating opportunity in an age of uncertainty* (Vol. 284): Harvard Business Press.

McMullen, J. S., & Kier, A. S. (2016). Trapped by the entrepreneurial mindset: Opportunity seeking and escalation of commitment in the Mount Everest disaster. *Journal of Business venturing, 31*(6), 663-686.

McMullen, J. S., & Shepherd, D. A. (2006). Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *Academy of management review, 31*(1), 132-152.

Mitchell, G. R. (2007). Instill the entrepreneurial mindset. *Research-Technology Management, 50*(6), 11-13.

Mitchell, R. K. (2005). Tuning up the global value creation engine: The road to excellence in international entrepreneurship education. In *International entrepreneurship* (pp. 185-248): Emerald Group Publishing Limited.

Mitchell, R. K., Busenitz, L., Lant, T., McDougall, P. P., Morse, E. A., & Smith, J. B. (2002). Toward a theory of entrepreneurial cognition: Rethinking the people side of entrepreneurship research. *Entrepreneurship Theory and Practice, 27*(2), 93-104.

Mitchell, R. K., Smith, B., Seawright, K. W., & Morse, E. A. (2000). Cross-cultural cognitions and the venture creation decision. *Academy of management Journal, 43*(5), 974-993.

Morris, M. H., Kuratko, D. F., & Cornwall, J. R. (2013). *Entrepreneurship programs and the modern university*: Edward Elgar Publishing.

Mudraya, O., Rayson, P., Cave, F., & Whitehouse, O. (2005). Development of a Corpus of Entrepreneurship/Small Business. *Corpus Linguistics 2005*.

Murnieks, C., & Mosakowski, E. (2007). Who am i? looking inside the 'entrepreneurial identity'.

Naumann, C. (2017). Entrepreneurial Mindset: A Synthetic Literature Review. *Entrepreneurial Business and Economics Review, 5*(3), 149-172.

Neck, H. M., & Corbett, A. C. (2018). The scholarship of teaching and learning entrepreneurship. *Entrepreneurship Education and Pedagogy, 1*(1), 8-41.

Neck, H. M., & Greene, P. G. (2011). Entrepreneurship education: known worlds and new frontiers. *Journal of Small Business Management, 49*(1), 55-70.

Neck, H. M., Greene, P. G., & Brush, C. G. (2014). *Teaching entrepreneurship: A practice-based approach*: Edward Elgar Publishing.

Neneh, N. B. (2012). An exploratory study on entrepreneurial mindset in the small and medium enterprise (SME) sector: A South African perspective on fostering small and medium enterprise (SME) success. *African Journal of Business Management, 6*(9), 3364-3372.

Nenkov, G. Y. (2012). It's all in the mindset: Effects of varying psychological distance in persuasive messages. *Marketing Letters, 23*(3), 615-628.

Ness, I. J. (2017). Polyphonic orchestration–facilitating creative knowledge processes for innovation. *European Journal of Innovation Management, 20*(4), 557-577.

Nicholson, N. (1998). Personality and entrepreneurial leadership:: A study of the heads of the UK's most successful independent companies. *European Management Journal, 16*(5), 529-539.

Nielsen, S. L., & Stovang, P. (2015). DesUni: university entrepreneurship education through design thinking. *Education+ Training, 57*(8/9), 977-991.

O'Connor, G. C., Corbett, A. C., & Peters, L. S. (2018). *Beyond the champion: institutionalizing innovation through people*: Stanford University Press.

O'Connor, J., & Seymour, J. (2011). *Introducing NLP: Psychological skills for understanding and influencing people*: Conari Press.

Obschonka, M., Silbereisen, R. K., & Schmitt-Rodermund, E. (2011). Successful entrepreneurship as developmental outcome. *European Psychologist*.

Obschonka, M., & Stuetzer, M. (2017). Integrating psychological approaches to entrepreneurship: the Entrepreneurial Personality System (EPS). *Small Business Economics, 49*(1), 203-231.

Olson, D. R. (2004). The triumph of hope over experience in the search for "what works": A response to Slavin. *Educational researcher, 33*(1), 24-26.

Osterwalder, A., Pigneur, Y., Bernarda, G., & Smith, A. (2015). *Value Proposition Design: How to Create Products and Services Customers Want*: John Wiley & Sons.

Owen, C. L. (1998). Design research: Building the knowledge base. *Design studies, 19*(1), 9-20.

Oyserman, D., Sorensen, N., Reber, R., & Chen, S. X. (2009). Connecting and separating mind-sets: Culture as situated cognition. *Journal of personality and social psychology, 97*(2), 217.

Palich, L. E., & Bagby, D. R. (1995). Using cognitive theory to explain entrepreneurial risk-taking: Challenging conventional wisdom. *Journal of Business venturing, 10*(6), 425-438.

Passow, H. J., & Passow, C. H. (2017). What competencies should undergraduate engineering programs emphasize? A systematic review. *Journal of Engineering Education, 106*(3), 475-526.

Patton, M. Q. (1990). *Qualitative evaluation and research methods*: SAGE Publications, inc.

Pavlov, P. I. (2010). Conditioned reflexes: an investigation of the physiological activity of the cerebral cortex. *Annals of neurosciences, 17*(3), 136.

Pittaway, L., & Cope, J. (2007). Entrepreneurship education: A systematic review of the evidence. *International Small Business Journal, 25*(5), 479-510.

Pittaway, L., & Edwards, C. (2012). Assessment: examining practice in entrepreneurship education. *Education+ Training, 54*(8/9), 778-800.

Polanyi, M. (1968). Life's Irreducible Structure: Live mechanisms and information in DNA are boundary conditions with a sequence of boundaries above them. *Science, 160*(3834), 1308-1312.

Polanyi, M. (2012). *Personal knowledge*: Routledge.

Popper, K. (2005). *The logic of scientific discovery*: Routledge.

Rae, D. (2003). Opportunity centred learning: an innovation in enterprise education? *Education+ Training, 45*(8/9), 542-549.

Rauch, A., & Frese, M. (2000). Psychological approaches to entrepreneurial success: A general model and an overview of findings. *International review of industrial and organizational psychology, 15*, 101-142.

Rerup, C. (2005). Learning from past experience: Footnotes on mindfulness and habitual entrepreneurship. *Scandinavian Journal of Management, 21*(4), 451-472.

Rhinesmith, S. H. (1992). Global mindsets for global managers. *Training & Development, 46*(10), 63-69.

Ries, E. (2011). *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*: Crown Books.

Rover, D. T. (2005). New economy, new engineer. *Journal of Engineering Education, 94*(4), 427-428.

Saldaña, J. (2015). *The coding manual for qualitative researchers*: Sage.

Sarasthvathy, S. (2008). Effectuation: Elements of entrepreneurial expectation. In: Edward Elgar: Cheltenham.

Sarasvathy, S. D. (2001). Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of management review, 26*(2), 243-263.

Sarasvathy, S. D., & Dew, N. (2005). New market creation through transformation. *Journal of evolutionary economics, 15*(5), 533-565.

Sarasvathy, S. D., & Venkataraman, S. (2011). Entrepreneurship as method: Open questions for an entrepreneurial future. *Entrepreneurship Theory and Practice, 35*(1), 113-135.

Schumpeter. (2014). Entrepreneurs anonymous. *The Economist*.

Shadish, W. R., Cook, T. D., Cook, T. D., & Campbell, D. T. (2002). Experimental and quasi-experimental designs for generalized causal inference.

Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of management review, 25*(1), 217-226.

Shapero, A., & Sokol, L. (1982). The social dimensions of entrepreneurship. *Encyclopedia of entrepreneurship*, 72-90.

Shaver, K. G., & Scott, L. R. (1991). Person, process, choice: The psychology of new venture creation. *Entrepreneurship Theory and Practice, 16*(2), 23-45.

Shepherd, D. A. (2015). Party On! A call for entrepreneurship research that is more interactive, activity based, cognitively hot, compassionate, and prosocial. *Journal of Business venturing, 30*(4), 489-507.

Shepherd, D. A., & Patzelt, H. (2018). *Entrepreneurial cognition: Exploring the mindset of entrepreneurs*: Cham: Palgrave Macmillan.

Shepherd, D. A., Patzelt, H., & Haynie, J. M. (2010). Entrepreneurial Spirals: Deviation–Amplifying Loops of an Entrepreneurial Mindset and Organizational Culture. *Entrepreneurship Theory and Practice, 34*(1), 59-82.

Simon, H. A. (1996). *The sciences of the artificial*: MIT press.

Simon, M., Houghton, S. M., & Aquino, K. (2000). Cognitive biases, risk perception, and venture formation: How individuals decide to start companies. *Journal of Business venturing, 15*(2), 113-134.

Stake, R. E. (1995). *The art of case study research*: Sage.

Steinert, M., & Leifer, L. J. (2012). 'Finding One's Way': Re-Discovering a Hunter-Gatherer Model based on Wayfaring. *International Journal of Engineering Education, 28*(2), 251.

Stevenson, H., H., Roberts, M. J., & Grousbeck, H. I. (1985). *New business ventures and the entrepreneur*: Irwin.

Stryker, S., & Burke, P. J. (2000). The past, present, and future of an identity theory. *Social psychology quarterly*, 284-297.

Swann Jr, W. B., Pelham, B. W., & Krull, D. S. (1989). Agreeable fancy or disagreeable truth? Reconciling self-enhancement and self-verification. *Journal of personality and social psychology, 57*(5), 782.

Täks, M., Tynjälä, P., Toding, M., Kukemelk, H., & Venesaar, U. (2014). Engineering Students' Experiences in Studying Entrepreneurship. *Journal of Engineering Education, 103*(4), 573-598.

Taleb, N. N. (2007). *The black swan: The impact of the highly improbable* (Vol. 2): Random house.

Taleb, N. N. (2018). *Skin in the game: Hidden asymmetries in daily life*: Random House.

Thaler, R. H., & Sunstein, C. R. (2009). *Nudge: Improving decisions about health, wealth, and happiness*: Penguin.

Thompson, E. (2014). *Waking, dreaming, being: Self and consciousness in neuroscience, meditation, and philosophy*: Columbia University Press.

Torelli, C. J., & Kaikati, A. M. (2009). Values as predictors of judgments and behaviors: The role of abstract and concrete mindsets. *Journal of personality and social psychology, 96*(1), 231.

Van Maanen, J. (2011). Ethnography as work: Some rules of engagement. *Journal of Management studies, 48*(1), 218-234.

Veciana, J. M., Aponte, M., & Urbano, D. (2005). University students' attitudes towards entrepreneurship: A two countries comparison. *The International Entrepreneurship and Management Journal, 1*(2), 165-182.

Vest, C. M. (2005). Educating engineers for 2020 and beyond. *National Academy of Engineering*.

Walker, B. (2015). *Personality and Cognitions underlying Entrepreneurial Intentions.* (Doctor of Philosophy), UNSW Australia,

Wang, Y., Mahmud, J., & Liu, T. (2016, 2016). *Understanding Cognitive Styles from User-Generated Social Media Content*.

Watson, T. J. (2011). Ethnography, reality, and truth: the vital need for studies of 'how things work'in organizations and management. *Journal of Management studies, 48*(1), 202-217.

White, R. E., Thornhill, S., & Hampson, E. (2006). Entrepreneurs and evolutionary biology: The relationship between testosterone and new venture creation. *Organizational behavior and human decision processes, 100*(1), 21-34.

White, R. E., Thornhill, S., & Hampson, E. (2007). A biosocial model of entrepreneurship: The combined effects of nurture and nature. *Journal of Organizational Behavior, 28*(4), 451-466.

Whorf, B. L., & Chase, S. (1956). *Language, Thought and Reality, Selected Writings of Benjamin Lee Whorf. Edited... by John B. Carroll. Foreword by Stuart Chase*: Mass.

Wiklund, J., Davidsson, P., Audretsch, D. B., & Karlsson, C. (2011). The future of entrepreneurship research. *Entrepreneurship Theory and Practice, 35*(1), 1-9.

Xu, A. J., & Wyer Jr, R. S. (2011). The role of bolstering and counterarguing mind-sets in persuasion. *Journal of Consumer Research, 38*(5), 920-932.

Yamakawa, Y., & Cardon, M. S. (2015). Causal ascriptions and perceived learning from entrepreneurial failure. *Small Business Economics, 44*(4), 797-820.

Yin, R. K. (2009). Case study research: Design and methods (applied social research methods). *London and Singapore: Sage*.

Yin, R. K. (2011). *Applications of case study research* (3 ed.): Thousand oaks: Sage.

Zak, P. J. (2014). Why your brain loves good storytelling. *Harvard Business Review, 28*.

Zhu, Y., Rooney, D., & Phillips, N. (2016). Practice-based wisdom theory for integrating institutional logics: A new model for social entrepreneurship learning and education. *Academy of Management Learning & Education, 15*(3), 607-625.

7 Appendix

7.1 Article 1: Entrepreneurship: What separates those who do from those who don't

ENTREPRENEURSHIP: WHAT SEPARATES THOSE WHO DO FROM THOSE WHO DON'T

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Abstract: Gather a group of nascent entrepreneurs together and observe them for 6 months. The group would be able to be classified into those that have managed to start a business and those that have not. This paper discusses varying levels of analysis for the reasons why there might be differences between nascent entrepreneurs who start, and those who do not. Starting with intention as a construct of desirability and feasibility. Both of which are largely influenced by personality traits. While personality traits are appealing, they can not be considered detailed enough to explain human behaviour. We instead suggest that entrepreneurship should focus at the level of beliefs, perceptions of reality, and heuristic ways of thinking. We suggest that these types of analysis hold greater promise for answering a lingering question in entrepreneurship as to what separates those who do, from those who don't.

Keywords: entrepreneurship, mindset, cognition

1. Introduction

A central question to entrepreneurship has been, what makes entrepreneurs different from others. This question has spawned hundreds, potentially thousands of papers look at the issue from various angles, using various empirical methods and resulting in a trove of information. The results have not always been consistent or clear, and has often lead to conflicting points of view. The debate feels far from settled when reviewing the literature on the subject of entrepreneurship.

The aim of this paper is to look at a specific instance of where entrepreneurs are different. That is what separates those nascent entrepreneurs who have a clear intention to start, from those nascent entrepreneurs who have a clear intention to start and manage to bring their business into existence? To phrase it more colloquially, what separates those who talk about starting a business from those who get on with the hard work of starting? This question appears not to have been well examined within literature, with most of the focus being on what makes a successful entrepreneur; or instead what separates entrepreneurs from the general population.

The inspiration for fine slicing the difference between entrepreneurs who manage to get started, and those who don't comes from observing the rise of piece of slang in entrepreneurial culture. The word is a "wantrepreneur", and is referred to as someone who never starts up, or someone who just talks about wanting to start their business idea or is always searching for the "right" idea. Understanding this phenomen is of importance, especially from the perspective of training future entrepreneurs. In better understanding what might be holding a nascent entrepreneur back from getting started, the better training courses can be designed to help them overcome this barrier. A comprehensive answer to the question of what makes some people so much more effective at starting businesses will obviously involve the joint effects of a large number of variables relating to entrepreneurs (e.g., their skills, motives, values, actions, etc.), a host of environmental and market conditions, and complex interactions between these variables (Baron & Henry, 2010).

2. Intention as the starting point

To better understand the issue that will be examined, it is worth carrying out a mental experiment. Assume a group of 100 nascent entrepreneurs were gathered, all of whom had been pre-selected based on their intention to start a business in the coming months. If this group was surveyed 6 months later, the group could be split into several sub groups. Those who still had the intention to start (but had not); those who had given up and no longer had the intention to start; those who had started their business; and finally those who had taken action to start/had started, but had subsequently given up. Figure 1. sets out a visual representation of the change in the group.
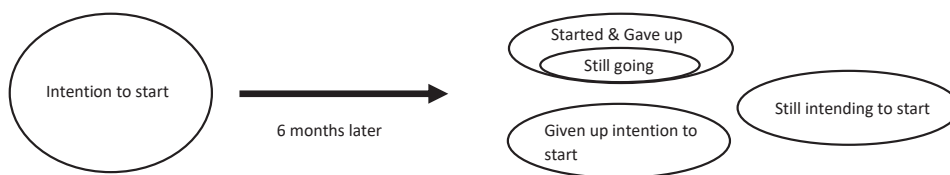
Figure 1. Example of how a group of nascent entrepreneurs could be classified after 6 months

Assuming that those gathered were all based in the same geographical region, this would eliminate any major differences in terms environment, or access to opportunities. This places the level of analysis at that of the individual, and presumes that there is some difference between each of the final 4 subgroups that explains the outcomes, and presumes that the resulting difference is not due to luck or chance.

Examing the difference between intentions and outcomes is important because within the last three decades, research has indicated that intentions are a reliable— and for many the most effective— predictor of actual behavior (Ajzen, 2011; Ajzen & Fishbein, 1980; N. F. Krueger & Carsrud, 1993; Shaver & Scott, 1991). In psychological literature, intentions have proven the best predictor of planned behaviour (Bagozzi, Baumgartner, & Yi, 1989), particularly when that behavior is rare, hard to observe, or involves unpredictable time lags (MacMillan & Katz, 1992). Intention to start a business can be described as the combination of perceived desirability of ownership and perceived feasibility (Brandstätter, 2011). Perceived feasibility can be seen as entrepreneurial self-efficacy. Self-efficacy is concerned not with the skills one has, but with one's judgments of what one can do with whatever skills one possesses (Kickul, Gundry, Barbosa, & Whitcanack, 2009). In many cases, perceptions of self-efficacy are even more important than actual skills as a determinant of behavior (N. Krueger & Dickson, 1994).

As for desirability of starting a business, this is likely based on perceptions of how it is to be an entrepreneur. People have a surprisingly detailed mental picture of who fits a role and how they fill it, even if it is based on very limited or even inaccurate information. Students will have a mental prototype of "entrepreneur" that may be depressingly dysfunctional or at least limiting (N. F. Krueger, 2008). Desirability is likely to be partly shaped by the extent to which a nascent entrepreneur has been surrounded by family and friends who are successful entrepreneurs (Corbett & Hmieleski, 2007). The subjective impact of a role model is a stronger predictor of intention to start, than is the mere presence of a role model (N. Krueger & Dickson, 1994). In addition, past behavior (e.g., previous success starting a new venture) may influence future intentions toward starting a new business, and may also affect personal factors (e.g., entrepreneurial self-efficacy). These factors are continuously interacting to shape one another (Corbett & Hmieleski, 2007).

It is worth noting though that the desirability and feasibility are not equally important with regards to affecting intentions. Fitzsimmons and Douglas (2011) carried out an empirical study of 400 MBA students who were soon graduating and were considering entrepreneurial careers. The results of the study produced some interesting findings in that intentions stayed relatively the same except for when the students self-reported both low desirability for an entrepreneurial career as well as low perceived feasibility, or put differently, even low perceived feasibility could be countered by high desirability in maintaining a strong intention to enter an entrepreneurial career. Thus suggesting that where the desire to be an entrepreneur is high the student will find a way even if it does not feel achievable at the time (Fitzsimmons & Douglas, 2011).

At the simplest level, the difference between those who start and those who only have the intention is that those who start take actions based on their intentions. They are able to overcome the initial inertia and get started. In design literature this is referred to as having a bias towards action (Brown, 2009). However in providing clues as to what separates those who do from those who don't, having a bias to action is an effect of a mental process, not a cause. Thus bringing us no closer to an answer, as a bias to action is an observable outcome. This further steers us in the direction of examining the mental processes of entrepreneurs.

Difference in intention, desirability, and self efficacy clearly brings us into the realm of psychology and cognition. Ultimately these differences may even be labelled as entrepreneurial mindset. Little is known about the ways in which cognitive styles facilitate or inhibit an individual's ability when confronting the challenges of the venture creation (Kickul et al., 2009). Prior knowledge, assumptions, and beliefs may prove problematic, even dysfunctional, if not confronted in a constructive manner. For individuals, there comes a moment when their deep cognitive structures and the deep beliefs that anchor them must change, often dramatically if they are to succeed (N. F. Krueger, 2007).

3. Personality as a predictor of intention

Personailty characteristics as a predictor of entrepreneurs has a dubious history, with there being no real consensus within academia as to their importance in the field of entrepreneurship studies. Depending on

your choice of author, personality traits can either be the cause of entrepreneurship (Brandstätter, 2011) or they can be incredibly poor predictors of behavior (N. F. Krueger, Reilly, & Carsrud, 2000) or any one of a number of other standpoints. Given the persistence of the personality trait school of thought, they are worth discussing in relation to the difference between those who start and those who only have the intention to start. Even the concept of what constitutes a personality trait is not entirely clear. The concepts of personality and personality traits both in psychological research and in common sense understanding are rather fuzzy (Brandstätter, 2011). In a broad sense, personality traits include abilities (e.g., general intelligence as well as numerical, verbal, spatial, or emotional intelligence), motives (e.g., need for achievement, power, or affiliation), attitudes (including values), and characteristics of temperament as overarching style of a person's experiences and actions (Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) (Brandstätter, 2011).

The five-factor model (Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) has been the dominant psychological traits reference system since the 1980's (Costa & MacCrae, 1992; Digman, 1990; Goldberg, 1990). To better understand what is meant by each of these personality traits we have relied on the definitions by John, Naumann, and Soto (2008, p. 138). Openness to experience ''. . . describes the breadth, depth, originality, and complexity of an individual's mental and experiential life''. Conscientiousness ''. . . describes socially prescribed impulse control that facilitates task- and goal-directed behaviour, such as thinking before acting, delaying gratification, following norms and rules, and planning, organizing, and prioritizing tasks''. Extraversion ''. . . implies an energetic approach toward the social and material world and includes traits such as sociability, activity, assertiveness, and positive emotionality''. Agreeableness ''. . . contrasts a prosocial and communal orientation toward others with antagonism and includes traits such as altruism, tendermindedness, trust, and modesty''. Neuroticism ''. . . contrasts Emotional Stability and even-temperedness with negative emotionality, such as feeling anxious, nervous, sad, and tense''.

That these five traits can adequately explain the intention to start, and are therefore the best predictor of activity feels like a stretch despite the solid arguments made by Brandstätter (2011). However, intuition that there is a greater complexity to the situation is insufficient evidence to fault Personality Traits school of thought. Especially as there is significant evidence to support the standpoint of Brandstätter (2011). Entrepreneurs have substantially higher scores on Openness and Conscientiousness, somewhat more Extraverted, and lower scores on Agreeableness and Neuroticism when compared to managers Zhao and Seibert (2006). When measuring each of the five traits against the intention to start a business, and business success they found a strong correlation between Openness and Consciousness, weak but significant correlations with Extraversion, no significant correlation for Agreeableness, and a negative correlation for Neuroticism (Zhao, Seibert, & Lumpkin, 2010). Which suggests that personality traits play a significant role in predicting both the intention to start, but also the likelihood of success for entrepreneurs.

Traits can be viewed as causes of mental and behavioral processes (John et al., 2008). The measures of the traits are usually based on descriptions of how people think, feel, and act in a variety of situations, but these reports are conceived of as indicators of real internal causes (interacting with the external causes) of a person's experiences and actions. For example the intention of establishing a private business is not part of the definition of the trait Openness, but an effect of this trait (Brandstätter, 2011).

That the likelihood of starting a business and succeeding in it is dependent on our personality feels somewhat dissatisfying, especially given that by the time we reach adulthood our personalities become rather fixed (Bandura, 1994). In addition, it paints a rather monotone picture of what entrepreneurship is, a group of people with highly similar personalities. Anecdotal observations would not support this either given the diversity of entrepreneurs who are easily observed. Relying on five measures by which all of human diversity can be measured and graded feels deceptively simple when trying to separate the

difference between those who start a business and those who merely have the intention. We should not throw out the baby with the bathwater though in the sense that the field of psychology has insights which might guide further investigation. The issue lies is that the personality traits field uses a too lower resolution to provide a clear picture.

4. Cognition

Instead of examing the broad categories of personality traits, there might be a greater value in examining entrepreneurs at the level of cognition. Little is known about the ways in which cognitive styles facilitate or inhibit an individual's ability or entrepreneurial self-efficacy when confronting the challenges associated with the different stages of the venture creation process (Kickul et al., 2009). Research in the entrepreneurial cognition domain has demonstrated that entrepreneurs tend to draw from similar sets of *event* schemas when considering to start a new venture (Corbett & Hmieleski, 2007). The emerging view of entrepreneurial cognition suggests that an understanding of the mental processes of entrepreneurs will enable researchers to build a well-grounded foundation toward systematically explaining the individual's role within the process of entrepreneurship (Mitchell et al., 2002). Previous research tells us that entrepreneurs think differently from others, but how exactly is still to be clarified (Baron, 1998; Busenitz & Barney, 1997). In addition, empirical research examining the connection between entrepreneurial cognitions and venture creation has demonstrated that entrepreneurs across many different national cultures do, in fact, use similar cognitive scripts (Mitchell et al., 2002; Mitchell, Smith, Seawright, & Morse, 2000).

Even if it were possible to avoid relying on entrepreneurs to self-report their thoughts, one of the difficulties in researching cognition would be the sheer quantity of thoughts that an average person would think. Even if it were possible to record all of these thoughts, sifting through them to establish the significant thoughts would be near impossible. No all thoughts are created equal, the thoughts that are often acted upon are those thoughts backed by emotion. In addition, this would assume that people always acted on their thoughts. Instead, we often see that people act based on "gut instinct" or what "feels" right. Exploring this represents a methodological minefield and is likely the reason that cognition has been largely ignored within the academic field of entrepreneurship.

5. Reality and beliefs

Depending on the readers personal philosophical standpoint you might be willing to accept that the reality an individual lives in is largely one that is mentally constructed. That while there are physical elements that are concrete and solid, how we perceive them and the meaning we attach to them are mostly personal. In accepting this epistemological standpoint, we can then conceive that entrepreneurs who pursue their business ideas might reside in a perceived reality that is somewhat different from those who do not get started. They may perceive starting as easier, more achievable, less of a risk – many of which are equally explained by measures of personality traits. If we accept this constructivistic point of view, it becomes critical to try understand the deep knowledge structures of entrepreneurs (N. F. Krueger, 2007). Deeply held beliefs are learned and relearned over time, but are typically anchored on some initial belief that makes them difficult to change (Krueger Jr, Kickul, Gundry, Verma, & Wilson, 2009). Prior knowledge, assumptions, and beliefs may profoundly impact behaviour. Therefore, the first task is metacognitive, to surface these beliefs. Being fully aware of certain of deep beliefs makes it much easier to question and modify them (N. F. Krueger, 2007).

6. Speculating on the differences

Viewing entrepreneurship at the resolution of individual thoughts risks is likely too detailed to be of use, and that is before examining the practicality of collecting and recording such information. While viewing the individual at the level of a set of five personality traits is probably too lower of a resolution. Examing from the perspective of belief systems, entrepreneurs perceived reality, and potentially heuristic ways of thinking might represent a middle ground. Collectively these would allow us to

examine how an entrepreneur experiences the world, and search for differences in their perceived reality from those who intend to start businesses but be waylaid along the way. We suggest such an examination of these beliefs could be carried out using qualitative, methods, based around in depth interviews with entrepreneurs.

We would expect entrepreneurs to express their experience of the world in way that differed from those who have not managed to start. Examples of this might include the entrepreneurial stories that they tell themselves, and are representative of their experiences. Those who do not manage to start might be focused on all the reasons they have not been able to start, essentially listing excuses that have prevented them from starting. While those who have managed to start, we would expect them to express their start up story as being one where they have simply made do with the resources they have had at hand, supporting the theory of bricolage set out in Baker and Nelson (2005) and resulting in similar stories. While those who have not managed to have gotten started will be more likely to tell stories that are filled with excuses or explanations as to how the problem was external to them. We would expect entrepreneurs to demonstrate a higher level of accountability for their actions. The problems or excuses that non-starters identify likely exist for those who have managed to start, the main difference being that those who have started have managed to overcome these initial obstacles. This suggests that there is an element of determination or resilience, or what sometimes is labelled as grit. Which is a determination to see through a project in the face of adversity. The difference between these two types of people can be readily observed, and is likely familiar to those who have coached nascent entrepreneurs. Those who do not manage to start have an endless list of problems, while those who manage to overcome these normally focus on the steps ahead, solutions, elements that exist within their field of control. They appear to have better coping mechanisms for tackling the challenges of life.

To examine such differing perspective should form future research to establish whether such differences are supported by data. We suggest this might open a rich field of insights that will have meaning for training future entrepreneurs, and for helping those who have become stuck long the way to overcome the issues they have encountered. This is based on the assumption that such mindsets can in fact be changed, and are mallable over the course of a lifetime.

7. Conclusion

A clear understanding of what separates those with an intention to start a new business from those who have an intention but never manage to start is something that still eludes researchers. Examining this question from several different perspectives leads to the view that personality traits while important cannot explain fully the differences between these two groups. A more detailed understanding of how entrepreneurs thinks leads us into the realm of cognition. There is a danger of examining the way entrepreneurs think in too much detail. The authors propose that what separates those who do from those who don't is largely a combination of personal beliefs, perceived reality, as well as heuristics that entrepreneurs use to operate. This translates to a worldview where entrepreneurs overcome the challenges they face by using coping strategies, such as bricolage, in order to get started based on the opportunities they have and the resources they can acquire. Those who don't manage to start are trapped by their own realities, and are likely to be far more focussed on excuses or problems that they perceive as insurmountable. The differences that separate these groups can be sumamrised as an entrepreneurial mindset. The authors believe that further research into what this mindset is would benefit the academic community and should be the focus of future research.

8. Bibliography

Ajzen, I. (2011). Theory of planned behavior. *Handb Theor Soc Psychol Vol One, 1*(2011), 438.

Ajzen, I., & Fishbein, M. (1980). Understanding attitudes and predicting social behaviour.

Bagozzi, R. P., Baumgartner, J., & Yi, Y. (1989). An investigation into the role of intentions as mediators of the attitude-behavior relationship. *Journal of Economic Psychology, 10*(1), 35-62.

Baker, T., & Nelson, R. E. (2005). Creating something from nothing: Resource construction through entrepreneurial bricolage. *Administrative science quarterly, 50*(3), 329-366.

Bandura, A. (1994). *Self‐efficacy*: Wiley Online Library.

Baron, R. A. (1998). Cognitive mechanisms in entrepreneurship: Why and when enterpreneurs think differently than other people. *Journal of Business Venturing, 13*(4), 275-294.

Baron, R. A., & Henry, R. A. (2010). How entrepreneurs acquire the capacity to excel: Insights from research on expert performance. *Strategic Entrepreneurship Journal, 4*(1), 49-65.

Brandstätter, H. (2011). Personality aspects of entrepreneurship: A look at five meta-analyses. *Personality and Individual Differences, 51*(3), 222-230. doi:http://dx.doi.org/10.1016/j.paid.2010.07.007

Brown, T. (2009). Change by design.

Busenitz, L. W., & Barney, J. B. (1997). Differences between entrepreneurs and managers in large organizations: Biases and heuristics in strategic decision-making. *Journal of Business Venturing, 12*(1), 9-30.

Corbett, A. C., & Hmieleski, K. M. (2007). The conflicting cognitions of corporate entrepreneurs. *Entrepreneurship Theory and Practice, 31*(1), 103-121.

Costa, P. T., & MacCrae, R. R. (1992). *Revised NEO personality inventory (NEO PI-R) and NEO five-factor inventory (NEO FFI): Professional manual*: Psychological Assessment Resources.

Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual review of psychology, 41*(1), 417-440.

Fitzsimmons, J. R., & Douglas, E. J. (2011). Interaction between feasibility and desirability in the formation of entrepreneurial intentions. *Journal of Business Venturing, 26*(4), 431-440.

Goldberg, L. R. (1990). An alternative" description of personality": the big-five factor structure. *Journal of personality and social psychology, 59*(6), 1216.

John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative big five trait taxonomy. *Handbook of personality: Theory and research, 3*, 114-158.

Kickul, J., Gundry, L. K., Barbosa, S. D., & Whitcanack, L. (2009). Intuition versus analysis? Testing differential models of cognitive style on entrepreneurial self‐efficacy and the new venture creation process. *Entrepreneurship Theory and Practice, 33*(2), 439-453.

Krueger Jr, N., Kickul, J., Gundry, L. K., Verma, R., & Wilson, F. (2009). Discrete choices, trade‐offs, and advantages: Modeling social venture opportunities and intentions.

Krueger, N., & Dickson, P. R. (1994). How believing in ourselves increases risk taking: Perceived self‐efficacy and opportunity recognition. *Decision Sciences, 25*(3), 385-400.

Krueger, N. F. (2007). What lies beneath? The experiential essence of entrepreneurial thinking. *Entrepreneurship Theory and Practice, 31*(1), 123-138.

Krueger, N. F. (2008). A Case of Mistaken (Role) Identity?: Envisioning Entrepreneurial Role Demands. *Envisioning Entrepreneurial Role Demands (July 3, 2008)*.

Krueger, N. F., & Carsrud, A. L. (1993). Entrepreneurial intentions: applying the theory of planned behaviour. *Entrepreneurship & Regional Development, 5*(4), 315-330.

Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing, 15*(5), 411-432.

MacMillan, I. C., & Katz, J. A. (1992). Idiosyncratic milieus of entrepreneurial research: The need for comprehensive theories. *Journal of Business Venturing, 7*(1), 1-8.

Mitchell, R. K., Busenitz, L., Lant, T., McDougall, P. P., Morse, E. A., & Smith, J. B. (2002). Toward a theory of entrepreneurial cognition: Rethinking the people side of entrepreneurship research. *Entrepreneurship Theory and Practice, 27*(2), 93-104.

Mitchell, R. K., Smith, B., Seawright, K. W., & Morse, E. A. (2000). Cross-cultural cognitions and the venture creation decision. *Academy of Management Journal, 43*(5), 974-993.

Shaver, K. G., & Scott, L. R. (1991). Person, process, choice: The psychology of new venture creation. *Entrepreneurship Theory and Practice, 16*(2), 23-45.

Zhao, H., & Seibert, S. E. (2006). The big five personality dimensions and entrepreneurial status: a meta-analytical review. *Journal of applied psychology, 91*(2), 259.

Zhao, H., Seibert, S. E., & Lumpkin, G. T. (2010). The relationship of personality to entrepreneurial intentions and performance: A meta-analytic review. *Journal of Management, 36*(2), 381-404.

Levels of Internal Resistance in Entrepreneurship: a psychology based model for guiding coaching

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Abstract—In coaching entrepreneurs we often encounter those who have an intention to start a business but seem to be stuck, and not progressing further in developing their idea. In searching for a framework to assist entrepreneurs to continue their momentum and overcome instances of internal resistance we turn to psychological literature for inspiration. The interest in psychological factors in explaining the phenomenon of entrepreneurship has grown in popularity. With it, a diverse field of theory has emerged. This article seeks to link some of these theories using a model called neurological levels. The model links the perception of the environment, entrepreneurial behaviors, capabilities, beliefs, identity, and purpose together to explain how these levels interact with one another. The model discusses how higher levels such as beliefs, identity, and purpose can overcome limiting factors with regards to the environment, entrepreneurial behaviors and capabilities. Each level of the model has an impact on the other levels, with changes at higher levels cascading down to lower levels, while changes at lower levels take a longer time to affect the higher levels. The model has implications for policy, entrepreneurs and teaching entrepreneurship.

Keywords-component; entrepreneurship; psychology; beliefs; identity; coaching; motivation.

Introduction

Growing economies and wealth creation are accepted as being one of entrepreneurship's defining objectives (Ireland, Kuratko, & Covin, 2003). There are various ways in which entrepreneurship may affect economic growth. Entrepreneurs may introduce important innovations by entering markets with new products or production processes (Acs & Audretsch, 2003) and entrepreneurs often play vital roles in the early evolution of industries (Van Stel, Carree, & Thurik, 2005). Some even suggest that entrepreneurship can be sufficient to support the growth of an entire economy (Ireland, Hitt, et al., 2003).

In recognition of entrepreneurships' importance to national economies there has been a growth in the number of entrepreneurship education programmes (Duval-Couetil, 2013). However, the success of many of these training programs for entrepreneurs remains questionable (Pittaway & Edwards, 2012). There remains room for improvement in the process of training and supporting entrepreneurs from idea to successful execution (Pittaway & Edwards, 2012). In our own work of teaching and mentoring entrepreneurs, we have noticed a great many entrepreneurs who have the intention to start, but never manage to do so. The difference between intention to start versus outcomes is important because within the last three decades, research has indicated that intentions are a reliable— and for many the most effective—predictor of actual behavior (Ajzen, 1991; Ajzen & Fishbein, 1980; Krueger & Carsrud, 1993; Shaver & Scott, 1991). In psychological literature, intentions have proven the best predictor of planned behavior (Bagozzi et al., 1989), particularly when that behavior is rare, hard to observe, or involves unpredictable time lags (MacMillan & Katz, 1992). Yet the intention to start a business is in no way a certain predictor that the aspiring entrepreneur will manage to do so.

This raises the important question why do so many aspiring entrepreneurs with the intention of getting started never manage to do so. In searching for inspiration from psychological literature we refer to a model presented by J. O'Connor and Seymour (2011) that identifies varying psychological "levels" at which individuals might be encoutering resistance towards achieving their stated goals. The "levels" are: environment, behavior, capabilities, beliefs, identity, and purpose. The model was originally proposed as a way of helping psychologists identify at what level a patient might be encountering internal resistance to change, so as to assist with where therapy might be best directed (J. O'Connor & Seymour, 2011). In applying the model to the phenomenon of entrepreneurship, the intention is to provide a model that might assist mentors or coaches of aspiring entrepreneurs to identify at what level their mentee's are encountering issues that are interfering with their intention to start a business. In discussing this model, borowed from the psychological literature, we refer to existing theoretical lenses within entrepreneurship to demonstrate the significance of each level of the model.

The article begins with an examination of the model and linking this to existing literature that is relevant to each level in the model. How the varying parts interact are then discussed in conjunction with the model itself. The article ends with a discussion on the impact this has for the field and proposes an agenda for further research.

A theoretical model

The model called neurological levels, as set out by J. O'Connor and Seymour (2011), explains the different ways in which an entrepreneur might think about starting a business. At the Environmental level, they

might think "This is a good place to start a business." In terms of behaviors they might think, I will just get started. While in terms of capacity they might think: "I can start a business." While beliefs relate to entrepreneurs thinking they are good at identifying opportunities and acting on them. Identity might relate to thoughts around: I am an entrepreneur. Finally, purpose for an entrepreneur might be a need to have an impact on society through their business.
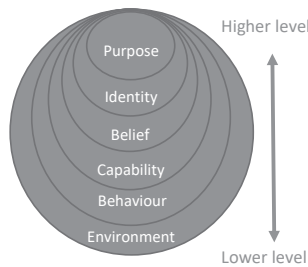
Figure 1. Model of neurological levels adjusted from J. O'Connor and Seymour (2011)

Importantly, a change at one level has cascading impacts on lower levels. This is to say that an individual who wakes up with a purpose to change the world and decides to do this through entrepreneurship will be effectively motivated to overcome issues around not having an entrepreneurial identity, not having entrepreneurial beliefs, lacking entrepreneurial capabilities and having never having engaged in entrepreneurial behaviors. They will find a way to overcome these obstacles and to achieve their purpose if they consider that a higher calling. Changes at the highest level (Purpose) always cascade downwards towards the lower levels (J. O'Connor & Seymour, 2011).

Changes in the lower levels can influence the upper levels, although J. O'Connor and Seymour (2011) suggest this is a slower path to change and learning. An example might be a person who finds themselves in an entrepreneurial environment, where it is normal to be behaving entrepreneurially. They then begin to take entrepreneurial actions and build their capabilities. Over time this affects their sense of self until they begin to view themselves as an entrepreneur. We suggest that such a process might be more tentative, and subject to interruption from negative experiences associated with entrepreneurship. Whereby encountering difficulties might be more likely to cause the person in our example to quit, whereas a person with a sense of purpose would continue to pursue their objective even in the face of obstacles.
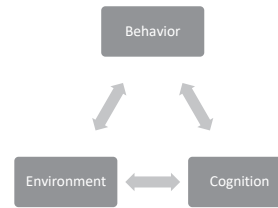
Figure 2. Socio learning theory (Bandura, 2002)

The neurological model is consistent with social learning theory as set out by Bandura (2002). Social learning theory recognises the reciprocal causation bewteen cognition, behavior and environment. Social learning theories explain human behavior in terms of triadic reciprocal causation bewteen behavior; cognition and other personal factors; and environmental events (Chen, Greene, & Crick, 1998). The model presented in this article goes a step further by identifying additional elements within the triad of cognition, behavior and environment. Specifically it splits cognition into beliefs and identity; it adds capabilities as an additional factor to behaviors. Finally it includes purpose as a factor that is not considered within social learning theory. In addition, the social learning theory model places all elements on an equal footing, while the neurological model suggests that higher level factors have a greater influence on entrepreneurial outcomes.

We now proceed to examine the model from existing theoretical perspectives in entrepreneurship. The purpose here is to demonstrate that each level of the model is grounded in existing theory, of which research has demonstrated its importance to aspiring entrepreneurs. At each level we link the theoretical perspective to how this might be relevant to supporting aspirng entrepreneurs.

Environment

The importance of the environment is widely recognized in entrepreneurship literature across several theoretical frameworks from networks (Nijkamp, 2003), to opportunity identification (Dimov, 2011), to organizational norms (Bercovitz & Feldman, 2008) and family environment (Obschonka et al., 2011). Each framework seeks to explain (or partly explain) the entrepreneurial phenomenon through the connection between the environment and the observed entrepreneurial outcomes.

The network perspective, for example, argues that entrepreneurs in cities have a greater chance to access

useful networks that will help them achieve their entrepreneurial outcomes (Nijkamp, 2003). Urban areas offer more favorable incubator conditions than rural areas due to networks being denser than rural areas and therefore providing greater access to opportunities. Although this is not to say that rural contexts are devoid of opportunities, but rather entrepreneurs interact with rural environments differently to create opportunities (Korsgaard, Ferguson, & Gaddefors, 2015). In some literature, entrepreneurial opportunities are considered external to the entrepreneurs and can be described as a discovery/recognition process (Dimov, 2011). In this sense, the environment plays a key role (Korsgaard et al., 2015), whereby opportunities are something to be found by an entrepreneur who has sufficient entrepreneurial awareness (Ardichvili, Cardozo, & Ray, 2003). These perspectives are at the macro level of the environment, whereas the process of venture creation can also be viewed as a social process (Korsgaard & Anderson, 2011).

Environmental factors can also be viewed from an organizational or family perspective. Bercovitz and Feldman (2008) for example found that the organizational culture in which academics were exposed to early in their career affected their entrepreneurial disposition. Academics who were exposed to entrepreneurial departments whereby entrepreneurial activities were encouraged were more likely to carry out entrepreneurial activities for the remainder of their career. This effect carried over even when those academics moved over to less entrepreneurial departments, although their activity did diminish somewhat (Bercovitz & Feldman, 2008). Tracing the entrepreneurial environment back even earlier in entrepreneurs development, it is argued that the family environment plays a key role in predicting whether people go on to become entrepreneurs (Obschonka et al., 2011). Longitudinal studies show career outcomes are rooted in adolescence and childhood (Clausen, 1991; Schoon, 2001). Collins and Moore (1964) were the first authors to verify through empirical research that new venture ideas are influenced as early as childhood by family circumstances of the entrepreneur (Veciana et al., 2005). Although whether aspiring entrepreneurs are fully aware of its influence on them is debatable given the mixed results found by Veciana et al. (2005) in examining the influence family had on university students' intentions to start a business as well as perceived desirability and feasibility.

The literature discussed so far signifies that environment level influences entrepreneurs, their perceptions of entrepreneurship and their likelihood to get started. Even the most ardent supporter of these environmental perspectives would be hard pressed to argue that environment explains the entire entrepreneurial phenomenon. The neurological levels model from J. O'Connor and Seymour (2011) suggest that the environment is the lowest level factor in influencing a person. Which is to say that if an entrepreneur is operating at a higher level (which are discussed in the coming sections), then they do not need a supportive environment. The aspiring entrepreneur with an entrepreneurial identity or a sense of purpose will be able to see past the environmental factors and take entrepreneurial behaviors. Put differently, a positive entrepreneurial environment might be considered supportive, but not a necessary factor. In this way, we acknowledge the importance of the environment especially for those who might have marginal motivation towards starting a new venture.

In examining a real world example, entrepreneur Jason Cohen, the founder of Wordpress states the importance of environment by saying "You find that happening to you all the time. That if you're surrounded by entrepreneurs, you become more entrepreneurial… just being in the right environment has so much more influence over you, than sitting down with a checklist and insisting that you get it all down exactly every time"(Cohen, 2011).

The implication for coaching or mentoring an entreprneur is that encouraging them to find an entrepreneurial envirnoment might also be a relatively easy step for them to take that can begin the process of socialising them into being an entrepreneur. This has never been easier with the explosion of co-working spaces and entrepreneurships hubs appearing in most developed cities across the world. Given the variation in obserrved culture within these spaces, it might be worth making a considered decision as to which space is best for an aspiring entrepreneur. If we still notice a mentee's motivation waning while being in an entrepreneurial environment, then we should consider examining higher levels of the model.

Entrepreneurial behaviors

If the environment is not sufficient to bring about new firm creation or entrepreneurship, then this leaves the question what other factors are at work? Most would agree that identifying an opportunity and being in an entrepreneurial environment is not sufficient; there needs to be entrepreneurial behavior or actions in addition. There is no strong consensus on exactly what entrepreneurial behaviors are (Baron & Henry, 2010;

Gruber & MacMillan, 2017). In an excellent discussion on training future entrepreneurs, Baron and Henry (2010), suggest that we should help aspiring entrepreneurs to practice these entrepreneurial behaviors while simultaneously acknowledging that they are not certain what behaviors entrepreneurs should be practicing. Entrepreneurial behaviors are often described in a linear manner. An example of this is the description of the venture creation process as: (1) the searching stage, (2) the planning stage, (3) the marshaling stage, and (4) the implementing stage (Kickul et al., 2009). This builds on the theoretical perspective of opportunity identification and/or creation; then taking action based on these opportunities. Ardichvili et al. (2003) describe these as the core entrepreneurial processes that involve the perception, discovery or creation of opportunities, then evaluation and subsequent development or abortion of the opportunities.

An alternative theoretical perspective on entrepreneurial behavior can be found in Bricolage. Bricolage suggests that entrepreneurs often manage to create new ventures regardless of the environment they are in (Baker & Nelson, 2005). Bricolage is described as the entrepreneurial behavior whereby entrepreneurs make do with what they have (Baker & Nelson, 2005). It is almost described as an alchemy whereby they create something from the resources they find in their environment, even when others consider the resources to be limited or restrictive (Baker & Nelson, 2005). Bricolage is focussed on the behavior and less on the mindset behind the actions. Although, it hints at an underlying world view or psychological perspective that seesopportunities where others see problems.

In discussing the venture creation process, Gartner (1985) describes the "process" as locating opportunities, accumulating resources, marketing products and services and production, and organization building. Gartner's (1985) model recognizes the importance of environment in affecting this process and considers the two interdependent. That these parts are interdependent again recognizes the importance of the environment in affecting the individual entrepreneur, as well as the process and organization choice having an impact. This recognizes that no individual part is independent of the other.

The neurological levels model from J. O'Connor and Seymour (2011) suggest that behaviors are sufficient to overcome a negative environment, that for example simply starting can be enough to lead to success. However, it does not suggest that these behaviors are unaffected by the entrepreneur's perception of the environment. Like Gartner, the models suggest the two are interdependent. However, behaviors are considered a higher level process, where changes in behavior can overcome limitations in the environment. This feeds into entrepreneurial folklore, where the sole entrepreneur manages to get started by taking actions against all odds, despite not being in the right environment. The practical insight though for coaching or mentoring entrepreneurs is that we often observe entreprenurs who become trapped thinking about their ideas. If this is the case, it might be best to push these entreprenurs to lift the number of activities they are carrying out, and have them learn by doing. The concept of simply taking action and testing ideas has been gaining greater acceptance through movements like Value Proposition Design, that focus on testing ideas in the real world, rather than excessive planning (Osterwalder et al., 2015). However, we commonly encounter aspiring entrepreneurs who feel they cannot take those initial steps to starting their business, in these cases we suggest moving up to the next level of the model.

Entrepreneurial Capabilities

Entrepreneurial capabilities relates to an entrepreneur feeling they have the skillsets needed to execute on their idea. Caspi, Elder, and Bem (1988) describe a concept called cumulative continuity whereby people accumulate characteristic adaptations (e.g., early behaviors or competencies) that "are sustained by the progressive accumulation of their own consequences" (p. 308). Simply put, we self-select into environments whereby our skills and competencies are nourished, thereby supporting further growth of those skills and competencies, resulting in characteristic adaptions. Likewise, we avoid environments where we feel less capable, resulting in these capabilities not improving or increasing. If people do not feel capable of achieivng their entrepreneurial ideas, the result is that they will likely avoid trying them out.

Obschonka et al. (2011) suggests there is a link between early entrepreneurial competence and entrepreneurial work competence in adulthood even while controlling for the effect of the entrepreneurial Big Five profile (measured in adulthood). We consider entrepreneurial competence to be synonymous with entrepreneurial capabilities. Obschonka et al. (2011) suggest that competence growth processes are relatively independent of personality traits. It is also consistent with life span research showing adolescent competence to play a central role in the shaping of the life course

(Clausen, 1991). Obschonka et al. (2011) also found that parenting style and early role models (environment) had an effect on early entrepreneurial competence, although the effect of parenting style was rather small. These findings suggests that entrepreneurial competence can be trained for and developed, especially in adolescence. This is encouraging for entrepreneurship programmes, however, it also sends a clear message that we should be training entreprenurs as early as possible.

The connection between entrepreneurial environment and entrepreneurial behaviors becomes evident at this point. Whereby aspects of personality nudge entrepreneurs towards environments that they find supportive of their personality and capabilities, along the way they carry out entrepreneurial actions, which builds their skills and competencies, thus bringing about characteristic adaptions that become a positive feedback loop.

Although attitudes towards entrepreneurship tend to form in early adolescence, they can still be adopted at a later stage. An example of this is Melanie Duncan, founder of Custom Greek Threads who discovered entrepreneurship late in life, saying "I never thought I was interested in business. I was a psychology major in school and it wasn't until meeting my husband who has a very entrepreneurial background that I realized this was going to be the way for me, moving forward for the rest of my future. But my background was just very typical you know nine to five parents" (Duncan, 2014). Duncan's story demonstrates that entrepreneurial capabilities can be developed late in life, even when you have not previously been exposed to an entrepreneurial environment.

Skills based education has the greatest chance to play a positive role here for aspiring entreprenurs. By equipping them with skils based education we can bolster their sense of capacity or capability to carry out their ideas. Unfortunately the most typical format for assessment of entrepreneurship courses is still exams, business plans and reports, oral presentations and mandatory class attendance, mirroring an unfortunate focus on the less effective passive pedagogical approaches in entrepreneurial education (Lackéus, 2014; Pittaway & Edwards, 2012). As entrepreneurial coaches and mentors are roles are even more important here in ensuring that we set atsks for mentees that builds their sense of confidence in their capacbilities. What also begins to creep into the model at this point is that it might not necessarily be the objective perception (if such a thing exists) of an environment or capabilities that

matter, but rather the entrepreneurs' beliefs about these matters.

Beliefs

Too often, scholars take beliefs for granted or consider them to be too far removed from human action to be sufficiently relevant (Krueger, 2007). The theory of planned behavior postulates that behavior is a function of beliefs relevant to the behavior (Veciana et al., 2005). Beliefs are considered to be the prevailing determinants of a person's attitudes, intentions and behaviors (Ajzen, 1991). Behavioral beliefs are assumed to influence attitudes toward the behavior. Each belief links the behavior to a certain outcome, which is already valued positively or negatively (Ajzen, 1991). Therefore, people automatically acquire an attitude toward the behavior. In this way, people form favorable attitudes toward behaviors believed to have desirable consequences and negative attitudes toward behaviors associated with undesirable consequences (Ajzen, 1991).

Most people avoid careers and environments they believe to exceed their capabilities regardless of the benefits these may hold, yet they seek out vocations they judge themselves capable of handling (Krueger & Dickson, 1994). Accordingly, decisions about career choice reflect a process in which beliefs, attitudes, and intentions evolve as we cognitively process our knowledge, beliefs, and experiences (Lent, Brown, & Hackett, 1994). Prior research suggests this is also true for entrepreneurial career choices (Katz, 1994).

Much of the literature on beliefs in entrepreneurship is focussed on self-efficacy (Boyd & Vozikis, 1994; Krueger, 2005; McGee et al., 2009). Self-efficacy was coined by Bandura (1994) and is described as an individuals belief in his or her ability to master and implement necessary resources, skills, and competencies to obtain a certain level of achievement on a given task. The higher the self-efficacy, the more challenging the activities they pursue. Individuals high in self-efficacy not only prefer challenging activities but also they display higher staying power in those pursuits (Bandura, 1997). Self-efficacy is known for its spiraling effect that, once well established, leads individuals to make choices and attempt tasks that reinforce and further increase the sense of confidence in one's capabilities (Lucas & Cooper, 2004).

Whether we refer to the theory of planned behavior which says beliefs are the antecedent to action, or self-efficacy that states that peoples' belief in their ability prevents or supports their ability to achieve the desired

outcome, both theories arrive at the same conclusion which relates to the importance of beliefs. A person's willingness to act is influenced by their self-belief in their perceived abilities and skills with respect to that area of activity (Lucas & Cooper, 2004). It, therefore, stands that entrepreneur's willingness to take entrepreneurial actions is influenced by beliefs. The environments they seek out are likewise impacted by their beliefs about what environments are favorable in regards to boosting their sense of self (Veciana et al., 2005). So the link between environment, entrepreneurial behaviors, capabilities, and beliefs begin to emerge when examining how the differing perspectives on entrepreneurship correlate to one another. The analogy that perceived clouds can block out real sunshine is used in discussing the neurological levels (J. O'Connor & Seymour, 2011). In the sense that negative beliefs about these lower levels (environment, capabilities etc.) might be sufficient to stop an individual pursuing their entrepreneurial dream. Likewise, unrealistic beliefs about their own capabilities might be equally dangerous to an aspiring entrepreneur who might then overextend themselves. As mentors of entrepreneurs, we often ask mentees to question their beliefs. We attempt to have them examine where these beliefs come from, and whether they are based on fact. This process of lifitng beleifs from being subconcious to concious often allows entrepreneurs to realise they have been holding themselves back. When this does not work though we often find that it is not individual beliefs that are holding entrepreneurs back, but rather their sense of self-identity dicussed in the next level.

Entrepreneurial Identity

Relatively new in the field of entrepreneurship literature is the concept of entrepreneurial identity. First put forward by Murnieks and Mosakowski (2007) the concept of entrepreneurial identity borrowed structural identity theory (Stryker, 1968; Stryker & Burke, 2000). The theory proposes that individuals are motivated to engage in entrepreneurial activities because they seek to verify important self-conceptions (Murnieks & Mosakowski, 2007). Structural identity theory posits that individuals choose to act in ways that are consistent with roles they value (Stryker & Burke, 2000). Identity theorists are very careful to distinguish between the concepts of "role" and "identity" (Murnieks & Mosakowski, 2007).

Role refers to expected behaviors that are associated with societal statuses or positions (Cast, 2004). Positions in this sense refer to socially recognized categories such as mother, father, or teacher (Stryker & Statham, 1985).

While an identity is made up of the combined sense of what these roles mean into an individual's perception their self (Stryker & Burke, 2000). Quoting directly from Cast (2004) "an identity is a set of meanings that represent the self in a social role, defining who one is in that status" (p. 57). Identities are what people think when they ask themselves "Who am I?" They are the "meanings a person attributes to the self" (Burke, 1980, p. 18). A role represents a set of socially-held behavioral expectations attached to positions external to an individual, while an identity represents the internalization and incorporation of these expectations into one's own sense of a self-concept (Gecas, 1982) Applying an example from Cast (2004) to the entrepreneurial context; the status of entrepreneur has an attached set of role expectations, such as identifying an opportunity, assembling a team, starting a business, and these expectations are internalized in an identity so that each entrepreneur has an identity that reflects these expectations of themselves in the status of entrepreneur. Entrepreneurs internalize specific behavioral expectations, perhaps those of identifying, evaluating and exploiting opportunities (S. Shane & Venkataraman, 2000), into an entrepreneurial identity (Murnieks & Mosakowski, 2007).

Identities motivate behavior (Burke, 1991; Burke & Reitzes, 1981). McCall and Simmons (1966) go a step further and state that identities are perhaps the primary sources of motivation for human behavior. This is based on Identity control theory (Burke, 1991) that says identities are powerful motivators because they fulfill the human need for self-verification (Swann Jr et al., 1989), which then contributes in turn to a sense of efficacy (Earley, 1993). Related to the need for self-consistency, self-verification represents the desire for individuals to preserve self-conceptions (Burke, 2004) or put differently people have a strong desire to keep their sense of self intact, and will take actions to maintain this sense of self. Congruency with the sense of self promotes feelings of stability and control (Swann Jr et al., 1989). Consistency in one's conception of self over time provides an individual with a sense of coherence and continuity, which increases an individual's perceived ability to deal effectively with his or her environment (Earley, 1993). In addition, self-verification leads to increased positive affect (Burke, 2004) and self-esteem (Earley, 1993).

On the other hand, a lack of self-verification may lead to feelings of confusion, inefficacy, and distress (Burke, 2004). Self-verification is achieved when an individual successfully aligns self-relevant feedback concerning his

or her actions with the standards of conduct embodied within an identity (Burke, 2004). In this sense, Burke (2004) likens identity processes to control systems. He argues that individuals continually regulate their behavior by monitoring feedback from others generated as a result of that behavior. A cyclical process occurs where an individual takes some action, views the results of that action, evaluates the results in comparison with the standards embodied within an identity, and then incorporates this new information to modify his or her behavior to improve the expected results. Behavior is continually altered until feedback matches the identity standard (Burke, 1991). If this is true, then those with an entrepreneurial identity will constantly seek out environments and take entrepreneurial actions consistent with their sense of identity.

In an attempt to determine whether entrepreneurs possess an identity linked to this entrepreneurial role, Murnieks and Mosakowski (2007) asked 59 entrepreneurs to indicate whether or not they each maintained an entrepreneurial identity, in addition to a number of other identities. All 59 entrepreneurs indicated that they possessed an entrepreneurial identity which was a distinct entity separate from their other identities (Murnieks & Mosakowski, 2007). Equally interestingly is that the entrepreneurial identity was ranked as one of the three most important identities by 80% (47 out of 59)(Murnieks & Mosakowski, 2007).

The implication of the theory of self-identity is that individuals will take actions to maintain a perception of congruency with their perceived self. This means that if aspiring entrepreneurs do not have an entrepreneurial self identity, then they are likely to self-sabotage their own attempts to become entrepreneurs. In mentoring entrepreneurs, if we observe them indulging in self-sabotaging behaviors towards their own business venture, then we might want to help those entrepreneurs examine their sense of self identity.

The theory suggest that sense of self identity is one of the most powerful motivators, so ensuring that this motivation is directed towards assisting the entrepreneur achieve their goals is an important factor to consider (McCall & Simmons, 1966). It is also worth considering that large part of a role or identity is socially constructed (Stryker & Statham, 1985), and as such the myths around who is an entrepreneur and how they behave can have an impact on aspiring entrepreneurs sense of identity. As S. A. Shane (2008) points out "Our collective belief that the typical entrepreneur is a hero with special powers that leads him to build a great company, which innovates, creates jobs, makes markets more competitive and, and enhances economic growth, is a myth" (p. 161). Such a colletive belief places the bar far too high for the avergae aspiring entrepreneur, and may instead represent a deterrent to ever getting started. The responsibility for those assisting entrepreneurs to get started is therefore to paint a more realistic picture of what is involved, and to help update mentee's mental model of who is an entrepreneur.

As McAdams and Pals (2006) argue that an individual's personality is composed of three intertwined levels: dispositional traits, characteristic adaptations, and integrative life narratives. These narratives have an impact on the way an individual perceives themselves in relation to the events of their life. Internal narratives are an important aspect of identity and examing internal narratives might potentially be one source of helping entrepreneurs identify and update their sense of identity. Obschonka et al. (2011) suggest that future entrepreneurship studies could examine whether life narratives might be a method for assisting entrepreneurs.

A review of the model as so far explained, suggests that the sets of beliefs an individual holds about themselves in relation to entrepreneurship, and their perception of themselves as being an entrepreneur will strongly influence their behavior. Even if they hold certain negative beliefs, for example about the the inappropriateness of the environment to start a business, if they hold a higher level perspective of having an entrepreneurial identity, then this might be sufficient to overcome the lower levels of resistance. In addition, carrying out entrepreneurial behaviors, will feed back positively into an individuals perception of their entrepreneurial identity.

Prior studies that have examined role identity theory have discounted the importance of basic social motivations that shape the behaviors and actions of individuals when they are engaging with others (Brewer & Gardner, 1996). In particular they have ignored how an individual might define themselves in terms of relationships to others. Thus suggesting that some people find meaning through less ego-centric perspectives. This leads on to purpose as a factor in determing an entrepreneurs motivations.

Purpose

The final level in the model is purpose and builds on the sense of identity. This might be described almost like a higher calling. Whereby entrepreneurs feel it is their

duty or purpose in life to bring about the existence of their company. In attempting to define identity, Fauchart and Gruber (2011) set out to better understand what it was that motivated people to become entrepreneurs. Fauchart and Gruber (2011) generalises entrepreneurs into being three types of individuals, for whom being a founder means (1) that they can make money and build their financial wealth; for other founders it means (2) that they can advance the community with their innovative equipment and benefit from the support of the community in return, or (3) that they can pursue their political vision and advance a particular cause (such as a social or an environmental mission). This reflects that for some individuals being an entrepreneur is almost a higher calling, a life purpose for which entrepreneurship is just the vehicle to achieve their outcomes.

A similar theme is echoed by Porras, Emery, and Thompson (2007) who interviewed more than 200 individuals, many of them entreprenurs. They found a common theme, which is, doing that which matters most them often defined many individuals worklifes/careers. When their work was filled with a sense of passion, recruiting others, overcoming obstacles and doing what needed to be done becomes part of achieivng their purpose. Porras et al. (2007) are not the only others to make the connection between purpose and passion. Cardon, Gregoire, Stevens, and Patel (2013) suggest that passion is that which can give individuals a sense of meaning. We do not wish to imply that passion, purpose and meaning are interchangeable, however, there is a element of motivation that is exhibited in each.

The concept of purpose is not well explored within literature. This perhaps a result of the origin of entrepreneurship studies that have traditionally come out of business and economics schools. Where higher purpose and monetary goals make for uneasy bedfellows. Economics has traditionally viewed individuals as rational beings who set out to maximize their wellbeing. The finding that entrepreneurs are motivated by more than money is long-standing and quite robust across studies (Neck & Greene, 2011). There have been some calls within the education sector to expand beyond the singularly monetary focussed view of entrepreneurship (Giacalone, 2004).

In understanding how purpose impacts on the entrepreneurial process, we suggest that it overrules the lower neurological levels already described. If an entrepreneur has this sense of purpose then they will not let anything stand in their way of achieving their dream, they will find a way regardless of the circumstances. While not every entrepreneur has such a drive, there are some well-known examples of people who do have this kind of singular purpose in following their dreams. An example might be Elon Musks, whose early investments in Tesla, Space X, and Solar City at the same time seemed like a terrible investment. His purpose for each investment was about bringing about a radically needed change in society (Vance, 2015). Which has likely contributed to him being able to lead these organisations to overcome many challenges. People with purpose are not likely to need an entrepreneurial identity or a positive environment, or previous capabilities in entrepreneurship to realize their ideas, their purpose alone provides sufficient motivation to begin.

Discussion

The model presented here has been borrowed from psychological literature yet sits comfortably within existing theoretical frameworks as discussed in each section. In reviewing the literature it becomes apparent that each level should not be viewed as a distinct independent category, but rather as more of a blended spectrum. Taking for example the environment, it is equally your beliefs about the environment and how your sense of identity fits within this environment that impacts how you behave in relation to producing entreprenurial outcomes.

It might also be argued that the level of capabilities couldbe removed from the model without any loss of meaning, as beleiefs about capabilites seem to sufficiently cover this level.

Human beings are complex, and any attempt to simplify what drives them and leads to outcomes willl obviously fall short. There will always be a difference between the map and the territory. To think that a model could explain all of human beahviour would be niave at best. Yet, there is value in attempting to understand the factors that might be standing in the way of entrepreneurs achieving their entrepreneurial ambitions.

One element that the model is explicitly missing is motivation. Although motivation might fall under several categories, for example beliefs, with regards to desirability of a perceived outcome affecting motivation. Alternatively motivation might be expressed under a sense of purpose, or through being motivated to beahve in a way consistent with the sense of self. While

motivation is generally considered to be important by researchers of entrepreneurship, research on entrepreneurial motives is still scare (Murnieks & Mosakowski, 2007). Although we acknowledge the importance of motivation, we consider the term too broad to direct attention on helping entrepreneurs overcome their internal resistance.

Future research

The model is built upon existing literature and does not have an empirical basis. Therefore, future research could focus on establishing whether the model holds with observations of entrepreneurs and their experiences.

In addition, it would be interesting to carry out a study on whether coaching aimed at differing levels in the model produces different outcomes in terms of entrepreneurial behavior.

Conclusion

The model has implications for entrepreneurs, policy makers, and educators. The implications for entrepreneurs is that they might want to consider their internal motivations for wanting to engage in entrepreneurial activities. If it is their life purpose, then they will be able to overcome obstacles as they arise. However, if they hold negative beliefs surrounding money, or perhaps around how difficult entrepreneurship should be, then they might find themselves acting in self-limiting ways. This suggests that entrepreneurs should consider raising their level of personal awareness to allow them to better understand at what levels they might need to carry out personal growth. It might also imply that entrepreneurs should set out to engage in the easiest entrepreneurial behavior first, so as to build their own sense of self efficacy.

The implications for policy makers is that creating entrepreneurial environments are useful, but insufficient to really bring about change in behaviors or higher level changes within individuals. It suggests that coaching entrepreneurs is also an important part of the mix in ensuring a more entrepreneurial society. In addition we as a society might wish to examine social roles and how entrepreneurs are perceived, and in particular what steps can be taken to allow people to participate in more self-actuating behavior. This applies especially to minorities and women, who traditionally have been underrepresented in Western entrepreneurship (Chen et al., 1998). In addition, roles and a sense of self identity are formed at an early age (Obschonka et al., 2011), suggesting that entrepreneurship should be taught from

an earlier age, when childrens sense of intetity is forming.

The implications for educators is that we need to ensure a greater focus on the higher level aspects when teaching entrepreneurship. It is not sufficient to have students participate in entrepreneurial activities; we should instead be helping students to surface their beliefs (Krueger, 2007) and encourage their sense of self-efficacy (Baron & Henry, 2010). Training entrepreneurs in technical skills associated with entrepreneurial acitivities is the minimum standard for entrepreneurial education (Chen et al., 1998).

In examining entrepreneurship from varying levels, it is apparent that there are many factors which might affect an entrepreneurs decision to start a business. The growing focus on entrepreneurial thinking and mindset can benefit from a more unified perspective offered here in regards to how the different psychological elements might be connected. We do not claim that the model explains everything about entrepreneurship but hope that it adds to the discussion about how the different elements might be interacting with each other.

References

1. Ireland, R.D., D.F. Kuratko, and J.G. Covin, *Antecedents, elements, and consequences of corporate entrepreneurship strategy.* Proceedings of the Sixty-third Annual Meeting of the Academy of Management (CD), 2003.

2. Acs, Z.J. and D.B. Audretsch, *Innovation and technological change*, in *Handbook of entrepreneurship research*. 2003, Springer. p. 55-79.

3. Van Stel, A., M. Carree, and R. Thurik, *The effect of entrepreneurial activity on national economic growth.* Small business economics, 2005. **24**(3): p. 311-321.

4. Ireland, R.D., M.A. Hitt, and D.G. Sirmon, *A model of strategic entrepreneurship: The construct and its dimensions.* Journal of management, 2003. **29**(6): p. 963-989.

5. Duval‐Couetil, N., *Assessing the impact of entrepreneurship education programs: Challenges and approaches.* Journal of Small Business Management, 2013. **51**(3): p. 394-409.

6. Pittaway, L. and C. Edwards, *Assessment: examining practice in entrepreneurship education.* Education+ Training, 2012. **54**(8/9): p. 778-800.

7. Ajzen, I., *The theory of planned behavior.* Organizational behavior and human decision processes, 1991. **50**(2): p. 179-211.

8. Ajzen, I. and M. Fishbein, *Understanding attitudes and predicting social behaviour.* 1980.

9. Krueger, N.F. and A.L. Carsrud, *Entrepreneurial intentions: applying the theory of planned behaviour.* Entrepreneurship & Regional Development, 1993. **5**(4): p. 315-330.

10. Shaver, K.G. and L.R. Scott, *Person, process, choice: The psychology of new venture creation.* Entrepreneurship theory and practice, 1991. **16**(2): p. 23-45.

11. Bagozzi, R.P., J. Baumgartner, and Y. Yi, *An investigation into the role of intentions as mediators of the attitude-behavior relationship.* Journal of Economic Psychology, 1989. **10**(1): p. 35-62.

12. MacMillan, I.C. and J.A. Katz, *Idiosyncratic milieus of entrepreneurial research: The need for comprehensive theories.* Journal of Business Venturing, 1992. **7**(1): p. 1-8.

13. O'Connor, J. and J. Seymour, *Introducing NLP: Psychological skills for understanding and influencing people*. 2011: Conari Press.

14. Bandura, A., *Social foundations of thought and action.* The health psychology reader, 2002: p. 94-106.

15. Chen, C.C., P.G. Greene, and A. Crick, *Does entrepreneurial self-efficacy distinguish entrepreneurs from managers?* Journal of business venturing, 1998. **13**(4): p. 295-316.

16. Nijkamp, P., *Entrepreneurship in a modern network economy.* Regional Studies, 2003. **37**(4): p. 395-405.

17. Dimov, D., *Grappling with the unbearable elusiveness of entrepreneurial opportunities.* Entrepreneurship Theory and Practice, 2011. **35**(1): p. 57-81.

18. Bercovitz, J. and M. Feldman, *Academic entrepreneurs: Organizational change at the individual level.* Organization Science, 2008. **19**(1): p. 69-89.

19. Obschonka, M., R.K. Silbereisen, and E. Schmitt-Rodermund, *Successful entrepreneurship as developmental outcome.* European Psychologist, 2011.

20. Korsgaard, S., R. Ferguson, and J. Gaddefors, *The best of both worlds: how rural entrepreneurs use placial embeddedness and strategic networks to create opportunities.* Entrepreneurship & Regional Development, 2015. **27**(9-10): p. 574-598.

21. Ardichvili, A., R. Cardozo, and S. Ray, *A theory of entrepreneurial opportunity identification and development.* Journal of Business venturing, 2003. **18**(1): p. 105-123.

22. Korsgaard, S. and A.R. Anderson, *Enacting entrepreneurship as social value creation.* International Small Business Journal, 2011. **29**(2): p. 135-151.

23. Schoon, I., *Teenage job aspirations and career attainment in adulthood: A 17-year follow-up study of teenagers who aspired to become scientists, health professionals, or engineers.* International Journal of Behavioral Development, 2001. **25**(2): p. 124-132.

24. Clausen, J.S., *Adolescent competence and the shaping of the life course.* American journal of sociology, 1991. **96**(4): p. 805-842.

25. Collins, O.F. and D.G. Moore, *The enterprising man*. Vol. 1. 1964: Michigan State Univ Pr.

26. Veciana, J.M., M. Aponte, and D. Urbano, *University students' attitudes towards entrepreneurship: A two countries comparison.* The International Entrepreneurship and Management Journal, 2005. **1**(2): p. 165-182.

27. Cohen, J., *Turning The Tables On Me*, A. Warner, Editor. 2011: https://mixergy.com/interviews/jason-cohen-wpengine-interview/.

28.   Baron, R.A. and R.A. Henry, *How entrepreneurs acquire the capacity to excel: Insights from research on expert performance.* Strategic Entrepreneurship Journal, 2010. **4**(1): p. 49-65.

29.   Gruber, M. and I.C. MacMillan, *Entrepreneurial behavior: A reconceptualization and extension based on identity theory.* Strategic Entrepreneurship Journal, 2017. **11**(3): p. 271-286.

30.   Kickul, J., et al., *Intuition versus analysis? Testing differential models of cognitive style on entrepreneurial self‐efficacy and the new venture creation process.* Entrepreneurship Theory and Practice, 2009. **33**(2): p. 439-453.

31.   Baker, T. and R.E. Nelson, *Creating something from nothing: Resource construction through entrepreneurial bricolage.* Administrative science quarterly, 2005. **50**(3): p. 329-366.

32.   Gartner, W.B., *A conceptual framework for describing the phenomenon of new venture creation.* Academy of management review, 1985. **10**(4): p. 696-706.

33.   Osterwalder, A., et al., *Value Proposition Design: How to Create Products and Services Customers Want*. 2015: John Wiley & Sons.

34.   Caspi, A., G.H. Elder, and D.J. Bem, *Moving away from the world: Life-course patterns of shy children.* Developmental psychology, 1988. **24**(6): p. 824.

35.   Duncan, M., *This lifestyle entrepreneur removed herself from her clothing company by year three*, A. Warner, Editor. 2014: https://mixergy.com/interviews/melanie-duncan-custom-geek-threads-interview/.

36.   Lackéus, M., *An emotion based approach to assessing entrepreneurial education.* The International Journal of Management Education, 2014. **12**(3): p. 374-396.

37.   Krueger, N.F., *What lies beneath? The experiential essence of entrepreneurial thinking.* Entrepreneurship Theory and Practice, 2007. **31**(1): p. 123-138.

38.   Krueger, N.F. and P.R. Dickson, *How believing in ourselves increases risk taking: Perceived self‐efficacy and opportunity recognition.* Decision Sciences, 1994. **25**(3): p. 385-400.

39.   Lent, R.W., S.D. Brown, and G. Hackett, *Toward a unifying social cognitive theory of career and academic interest, choice, and performance.* Journal of vocational behavior, 1994. **45**(1): p. 79-122.

40.   Katz, J.A., *Modelling entrepreneurial career progressions: concepts and considerations.* Entrepreneurship: Theory and Practice, 1994. **19**(2): p. 23-40.

41.   Boyd, N.G. and G.S. Vozikis, *The influence of self-efficacy on the development of entrepreneurial intentions and actions.* Entrepreneurship theory and practice, 1994. **18**: p. 63-63.

42.   McGee, J.E., et al., *Entrepreneurial self‐efficacy: refining the measure.* Entrepreneurship theory and Practice, 2009. **33**(4): p. 965-988.

43.   Krueger, N.F., *The cognitive psychology of entrepreneurship.* Handbook of entrepreneurship research, 2005: p. 105-140.

44.   Bandura, A., *Self‐efficacy*. 1994: Wiley Online Library.

45.   Bandura, A., *Self-efficacy: The exercise of self-control*. 1997, New York: Freeman.

46.   Lucas, W.A. and S.Y. Cooper, *Enhancing self-efficacy to enable entrepreneurship: the case of CMI's connections.* 2004.

47.   Murnieks, C. and E. Mosakowski, *Who am i? looking inside the'entrepreneurial identity'.* 2007.

48.   Stryker, S. and P.J. Burke, *The past, present, and future of an identity theory.* Social psychology quarterly, 2000: p. 284-297.

49.   Stryker, S., *Identity salience and role performance: The relevance of symbolic interaction theory for family research.* Journal of Marriage and the Family, 1968: p. 558-564.

50. Cast, A.D., *Well-being and the transition to parenthood: An identity theory approach.* Sociological Perspectives, 2004. **47**(1): p. 55-78.

51. Stryker, S. and A. Statham, *Symbolic interaction and role theory.* 1985.

52. Burke, P.J., *The self: Measurement requirements from an interactionist perspective.* Social psychology quarterly, 1980: p. 18-29.

53. Gecas, V., *The self-concept.* Annual review of sociology, 1982. **8**(1): p. 1-33.

54. Shane, S. and S. Venkataraman, *The promise of entrepreneurship as a field of research.* Academy of management review, 2000. **25**(1): p. 217-226.

55. Burke, P.J., *Identity processes and social stress.* American sociological review, 1991: p. 836-849.

56. Burke, P.J. and D.C. Reitzes, *The link between identity and role performance.* Social psychology quarterly, 1981: p. 83-92.

57. McCall, G.J. and J.L. Simmons, *Identities and interactions.* 1966.

58. Swann Jr, W.B., B.W. Pelham, and D.S. Krull, *Agreeable fancy or disagreeable truth? Reconciling self-enhancement and self-verification.* Journal of personality and social psychology, 1989. **57**(5): p. 782.

59. Earley, P.C., *Culture, self-identity, and work*. 1993: Oxford University Press on Demand.

60. Burke, P.J., *Identities, events, and moods*, in *Theory and research on human emotions*. 2004, Emerald Group Publishing Limited. p. 25-49.

61. Shane, S.A., *The illusions of entrepreneurship: The costly myths that entrepreneurs, investors, and policy makers live by*. 2008: Yale University Press.

62. McAdams, D.P. and J.L. Pals, *A new Big Five: fundamental principles for an integrative science of personality.* American psychologist, 2006. **61**(3): p. 204.

63. Brewer, M.B. and W. Gardner, *Who is this" We"? Levels of collective identity and self representations.* Journal of personality and social psychology, 1996. **71**(1): p. 83.

64. Fauchart, E. and M. Gruber, *Darwinians, communitarians, and missionaries: The role of founder identity in entrepreneurship.* Academy of management journal, 2011. **54**(5): p. 935-957.

65. Porras, J., S. Emery, and M. Thompson, *Success built to last*. 2007: Pearson Education India.

66. Cardon, M.S., et al., *Measuring entrepreneurial passion: Conceptual foundations and scale validation.* Journal of Business Venturing, 2013. **28**(3): p. 373-396.

67. Neck, H.M. and P.G. Greene, *Entrepreneurship education: known worlds and new frontiers.* Journal of Small Business Management, 2011. **49**(1): p. 55-70.

68. Giacalone, R.A., *A transcendent business education for the 21st century.* Academy of Management Learning & Education, 2004. **3**(4): p. 415-420.

69. Vance, A., *Elon Musk: How the billionaire CEO of SpaceX and Tesla is shaping our future*. 2015: Random House.

Entrepreneurial Mindset(s) and Cycles of Learning

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The Language of Successful Entrepreneurs: An Empirical Starting Point for the Entrepreneurial Mindset

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Abstract

The concept of entrepreneurial mindset is growing in popularity within the field of entrepreneurship. Entrepreneurial mindset orients humans' behaviour towards entrepreneurial activities and outcomes. The concept lacks empirical support due to methodological difficulties in discovering how entrepreneurs think. This article aims to address this by examining the language successful entrepreneurs use in an attempt to find evidence of an expert entrepreneurial mindset. Language represents the way people think and what they think about. This paper examines interviews of 51 high-tech entrepreneurs from Silicon Valley who have successfully started companies and attracted between $20 million and $1 billion in start-up funding and have a minimum of 30 employees. The study analyses the linguistic content of what the successful entrepreneurs talk about during interviews by comparing it to a control group of spoken text from average entrepreneurs. This reveals a number of differences in the way language is used between the two groups. We find evidence supporting the presence of several orientations – action, future, customer, collective, and growth – associated with a mindset of successful entrepreneurs. We also contribute to the existing call of using new methodological approaches to study the entrepreneurship paradigm. We outline new avenues for further research into the entrepreneurial mindset.

Introduction

The search for who an entrepreneur is, and how they are different from the general population, has been ongoing for decades. The original focus has largely been on personality traits, and after 30 years it has produced only mixed results (Brandstätter, 2011; Krueger et al., 2000). Growing in popularity though has been the concept of an entrepreneurial mindset that is fluid and can be learnt unlike a personality trait (Haynie et al., 2010; Obschonka et al., 2011). Yet, after reviewing the literature there is little empirical evidence of what is entrepreneurial mindset.

In order to gather this empirical evidence, we use a word analysis tool on a collection of interview transcripts. The data for this study is drawn from a sample of 51 entrepreneurs in Silicon Valley who have achieved success as measured by the venture capital they have managed to receive and the number of employees they have. The analysis reveals a number of words that are significantly different in terms of under usage and over used. These significant results are then reviewed in context and coded for possible meaning. The results are an empirical based suggestion of how a successful entrepreneurial mindset differs from that of less successful entrepreneurs.

This study contributes in three significant ways. The first is an introduction of a new methodology by which an entrepreneurial mindset can be assessed and analysed. This methodology has proven useful in other research such as in the early detection of psychosis (Bedi et al., 2015). Second, it contributes to the discussion around cognitive element of entrepreneurship, without falling into the existing theoretical quick sand of personality traits. Third, most other literature using text analysis in the field of entrepreneurship has used a theoretical lens of persuasion (Mitra & Gilbert, 2014) or examines social entrepreneurship (Parkinson & Howorth, 2008). Our point of departure is that we adopt a different theoretical standpoint and examine a different context, while utilising a similar methodology. Lastly, the practical importance for entrepreneurs is that the paper lays a method by which we can begin to focus on the language that other successful entrepreneurs are using. Based on a social constructivist point of view, it suggests that using similar language, and discussing topics in a similar manner may impact our mindset (Ahl, 2003). Such a claim is based on the understanding that our thoughts affect our language, but that this is a two-way relationship, and that language can equally impact our thought process and actions (Ahl, 2003).

Background

The quest for the Holy Grail in entrepreneurship research has seen an endless search for how entrepreneurs are different from the general public. Successful small business owners and entrepreneurs come in every shape, size, color, and from all backgrounds (Baron, 1998). Examining differences between entrepreneurs and the general population is a flawed starting point in our opinion. This is because the difference between entrepreneurs is as great as the difference between entrepreneurs and non-entrepreneurs (Gartner, 1985). In addition, we question the fascination in the field of entrepreneurship with the average entrepreneur. Instead we suggest the field should be focused on top entrepreneurs, or those who have been highly successful (Baron & Henry, 2010). One recurring insight is that the successful entrepreneurs can be characterized by an expert mindset (Krueger, 2007), yet there is no clear understanding of what that mindset is (Baron & Henry, 2010). This study sets out to explore in what ways that expert entrepreneurial mindset might be identified through language.

Researchers have postulated that cognition has the potential to make a significant contribution to the study of entrepreneurship (Baron, 1998; Busenitz & Barney, 1997; Kickul et al., 2009; R. K. Mitchell et al., 2007). The cognition world is growing in popularity because it recognizes the importance of the mind and the dynamic approach to learning how to think entrepreneurially (Neck & Greene, 2011). There has been a growing popularity of the term entrepreneurial mindset as a cover-all term for entrepreneurial cognition (Baron, 1998), meta cognition (Haynie et al., 2010) and character adaptions (Obschonka et al., 2011). We discuss these concepts in turn, although we do not attempt to describe which of three terms, if any, is the most accurate description of an entrepreneurial mindset. A high level definition is: an entrepreneurial mindset as a growth-oriented perspective through which individuals promote flexibility, creativity, continuous innovation, and renewal (Ireland, Hitt, et al., 2003). In other words, even under the cloak of uncertainty, the entrepreneurially minded can identify and exploit new opportunities

because they have cognitive abilities that allow them to impart meaning to ambiguous and fragmented situations (Alvarez & Barney, 2002).

The challenge has been to find out how entrepreneurs think and make sense of their world—how they acquire, process, and transform information into useful knowledge. Entrepreneurial cognitions are thus defined as the "knowledge structures that people use to make assessments, judgments or decisions involving opportunity evaluation, venture creation, and growth" (R. K. Mitchell et al., 2002, p. 97). Empirical research examining the connection between entrepreneurial cognitions and venture creation has demonstrated that entrepreneurs across many different national cultures use similar cognitive scripts, although what these scripts are is not defined (R. K. Mitchell et al., 2002; R. K. Mitchell et al., 2000).

McAdams and Pals (2006) argue that an individual's personality is composed of three intertwined levels: dispositional traits, characteristic adaptations, and integrative life narratives. Dispositional traits "reflect the enduring psychological core of the individual" (McCrae & Costa Jr, 1999, p. 144) and as such are relatively enduring and unchanging. Characteristics adaptions are adaptations that are "activated in response to and ultimately shaped by the everyday demands of social life" (McAdams & Pals, 2006, p. 209), and are thus more prone to change and fluctuate throughout one's life. Obschonka et al. (2011) suggest that entrepreneurial success is linked to characteristic adaptions, even when controlling for dispositional traits. We are interested in characteristics adaptions, or that side of cognition that can be learned and improved. It is these characteristic adaptions that we associate with an entrepreneurial mindset, not the relatively fixed dispositional traits typically associated with personality.

The emerging view of entrepreneurial cognition suggests that an understanding of the mental processes of entrepreneurs will enable researchers to build a well-grounded foundation toward systematically explaining the individual's role within the process of entrepreneurship (R. K. Mitchell et al., 2002). Yet, there appears to be scant empirical evidence of what exactly an entrepreneurial mindset might be, or what the expert entrepreneurial cognition is. This might be due to the methodological challenges of reliably measuring what the thought processes are of a successful entrepreneur. Individuals are seldom able to give full explanations of their actions or intentions; all they can offer are accounts, or stories, about what they did and why, yet these are notoriously unreliable (Cope, 2005a). Despite this challenge, we still think there should be a greater emphasis on searching for evidence to support the definition of an entrepreneurial mindset. We suggest one way to examine empirically the entrepreneurial mindset is through examining the language that entrepreneurs use when discussing their business.

Language reflects what people think about, and how they think about it. Language plays a role in forming individuals reality construction (Ahl, 2003). "Language circumscribes (and makes possible) what one can think and feel and imagine doing" (Ahl, 2003, p.63). Together, in social interaction, through the processes of externalization, objectification and internalization, humans construct their reality (Ahl, 2003). Conversation is the most important vehicle of reality-maintenance, according to Berger and Luckmann (1991). That language reflects how we think and experience our reality is not a new idea. We, therefore, start our examination of the expert entrepreneurial mindset through an analysis of the language used by successful entrepreneurs.

Method

We use a language analysis tool, Wmatrix, that was developed at the University of Lancaster. The tool allows comparisons to be made between two bodies of text. We use purposeful sampling to choose the subjects for this study (Patton, 1990). We selected information rich cases for which we could learn the most from, as opposed to a random sample. In doing so, the researcher examines specific interests in the phenomenon, selecting cases of some typicality, but leaning towards those cases for which we can learn the most, (Stake, 1995).

We settled on interviews collected and posted to a website called www.cleverism.com. The site held two separate libraries of interviews, one collection from 2014 and another from 2015. Together they amounted to 76 interviews, and provide both a video of the interview and a transcript. Upon closer inspection, it was revealed that several of these were in fact venture capitalists, and were removed from the sample of interviews. Furthermore, each of the participant companies were reviewed from data made available in interviews. We selected only firms that had received between $20 million and $1 billion in funding. We wanted to ensure that we selected only those firms that we could call "successful" when using investment capital as the criteria. We used a further filter, selecting only companies having a minimum of 30 employees as a secondary benchmark for success and checked that all of the companies were based in Silicon Valley and based on a what might be described as high-tech ideas. This left us with a total of 51 interviews.

The transcripts of the interviews were checked for consistency against the audio files for the first five interviews, and no differences were detected. The transcripts were then scrubbed to remove the interviewers' questions and comments. In addition, the introductions such as "My name is…, and I am the CEO of…" were removed, along with the closing comments that typically followed the format of "thank you for taking the time today…". In doing so, we ensured that the text reflected natural patterns of speech. This resulted in a body of text containing a total of 187,842 words. As this contained 51 interviews we are confident that no one individual has skewed the results. In examining the interviews, it was obvious that participants were allowed to answer freely, and often answered questions in monologues that lasted several minutes. As such, we think the language analysed is not tightly influenced by the interviewers questions.

Our control group came in the form of a corpus of entrepreneurs/small business owners developed at Lancaster University by Mudraya et al. (2005). The corpus consisted of 98 interviews and contained a total of 840,000 words. This contained 44 interviews with restaurant businesses (331,000 words), 21 with manufacturing for outdoors (210,000 words), 10 on entrepreneurial learning (188,000 words), 10 on entrepreneurial failure (60,000 words), 11 on small businesses in general (28,000 words) and 2 on family businesses (23,000 words). This corpus represents a broad coverage on dialogue with entrepreneurs, and serves as control group for the average entrepreneur. While not specifically stated, we presume the interviews were with people from the UK.

Results

We were surprised at the significance of the results that were obtained and decided to filter the results based on only including those that were highly significant at the 99.99% level, and for which the word had been used a minimum of 15 times. Significance here refers to the log-likelihood, which measures the relative frequency of a word, compares it to the relative frequency of the same word in the control group, and measures to see if the

difference is significant. The word count limit of 15 was applied to the results to avoid obscure words that were not in common use. There were 373 words that fulfilled the criteria of being significant and commonly used (N>15). The results discussed only relate to those words that were found to be significant at 99.99% (unless specifically stated). For the sake of brevity, we do not mention that each result is significant further down in the text.

We opted to try to extract meaning through coding the individual words to themes or potential topics. We approached the data with an open mind (without preconceived propositions) to allow it to speak to us. This involved considering how the word was likely used and reviewing its usage within context (an example of which is shown in Table 2). This involved a process of subjectively attributing meaning to the way the word had been used, and speculating what this might represent. We fully acknowledge that others assessing the data might have interpreted the data in different ways. The exercise of coding the results lead to five themes that occurred repeatedly.

Discussion

Action orientated

The first major theme which seemed apparent to us was the concept of taking actions or steps towards achieving desired outcomes. The entrepreneurs interviewed seemed to have strong bias towards taking action, even under circumstances of limited information or where the situation and potential outcome was ambiguous. Entrepreneurs are generally considered to be "do-ers", people who get on and take action towards their goals instead of those who might be orientated towards detailed planning and collecting more information before acting (Fisher, 2012).

There were a total of 17 words for which we coded them as demonstrating action. The words alone have little value, but rather these words were traced back to the context in which they were used in order to understand what the word meant in its general usage by entrepreneurs. The words are displayed in Table 1.

Table 1: Words coded as action orientated

Word	Number of times used	% of total usage	Number of times used (control group)	% of total usage	+ indicates used more often (compared to control group)	log-likelihood value*
build	230	0,13	65	0,01	+	488,76
use	283	0,16	336	0,04	+	236,17
building	149	0,08	162	0,02	+	137,01
built	88	0,05	51	0,01	+	134,09
will	415	0,24	994	0,13	+	96,51
using	124	0,07	161	0,02	+	92,89

launched	53	0,03	27	0	+	86,98
creating	42	0,02	23	0	+	66,18
created	39	0,02	22	0	+	60,4
able	228	0,13	285	0,04	+	179,03
solve	73	0,04	17	0	+	165,15
create	107	0,06	62	0,01	+	163,06
going_to	431	0,24	1232	0,16	+	53,47
start	187	0,11	433	0,06	+	47,89
first	340	0,19	944	0,12	+	47,62
make_it	71	0,04	113	0,01	+	39,82
can	965	0,55	2271	0,29	+	236,14

* Significance: 99th percentile - 1% level; p < 0.01; critical value = 6.63

99.9th percentile; 0.1% level; p < 0.001; critical value = 10.83

99.99th percentile; 0.01% level; p < 0.0001; critical value = 15.13

In assessing the context in which the words were used, Table 2 provides an example of how the context is shown by the Wmatrix tool for the word "build". The Wmatrix tool allows you to see all 230 examples of where the word "build" has been used. We can see from the examples that the word "build" is in connection to entrepreneurial actions that have been or will be taken. In conjunction with the 17 words listed in Table 1, this leads us to believe that entrepreneurs are better at taking actions to achieve their goals.

Table 2: Example of words examined in their context

…ing on it . Why ? Because I want to **build** WhatsApp for this thing , I want to…
…e part of the culture , you have to **build** as well as to get these people to un…
…ill start up and it was very fun to **build** something out of nothing and we sort…
…al thought was we would go back and **build** a community of software engineers bu…
…because I have the idea . But lets **build** a company together . So thats the ki…
…same time . Thats why we decided to **build** a new solution from scratch , to add…

(note: the analysis tools limits the context to 80 characters including spaces)

There is ample evidence of this in the lore of Silicon Valley too. Bill gates was reported to have said the company that iterates the quickest will succeed the soonest. There is also the popular saying in Silicon Valley that you should fail forward or fail quickly to succeed sooner. These popular sayings are based on the idea that you have to take action in building a company to see what works and what does not. There seems to be evidence based on the language used that successful entrepreneurs have taken this to heart, and that their language reflects this propensity to act.

Future orientated

The next major theme is the tense of the language used. Successful entrepreneurs seemed to be more concerned with the future than they were with the past when compared to the control group. This was evident in two manifestations in the data. The first was the over use of future tense words, and the second was the under use of words relating to past tense. There were 15 examples of words that demonstrated this theme. An example of this is the use of the words "have to" was overused, while the words "had to" were underused. Another example is "can" (overused) versus "could" (underused).

We suggest that successful entrepreneurs are more focussed on the future, as the opportunity still exists for them to affect its outcome. Meanwhile, a focus on the past might be considered futile, as the events have already occurred and cannot be altered. This suggest that a narrow focus on what you can affect, such as the future, is correlated to success.

Collective

Another theme that stood out was that successful entrepreneurs appear to have a collective focus in the way they talk. They seem less focussed on themselves, and are more likely to use words demonstrating a collective perspective. There were a total of 15 words that support the assertion that entrepreneurs have a more collective perspective than the control group. Words that were overused included: our, we, company, us, partners, and team. Meanwhile, words that were underused were: I, me, they, him, his. At an initial glance the underused words–like they, him and his–might not appear to support this collective theme we propose. However, careful consider demonstrates that in order to talk about a person or group of people as being separate from you, then you must use these words. Interestingly, the word "her" did not make it to our list of results simply because it was not used enough (although the difference from the control group was highly significant, we set a minimum usage of 15 occurrences). The word "her" was used only 8 times by Silicon Valley entrepreneurs, while if it had been used as often as the control group then we would have expected the word to occur approximately 56 times.

We propose the reason that successful entrepreneurs have a collective approach in their language is because they have been effective at leveraging others in order to create their start-up. This has been supported by other findings such as Parkinson and Howorth (2008). Successful entrepreneurs realise that the company is not about them personally, but rather about a collective effort to generate results. In addition, this collective approach assists in motivating staff to feel like they are involved, as part of a team, instead of a separation between them and us.

Customer orientation

One theme that appeared early in analysing the results was the concept of customer orientation. The entrepreneurs seemed to have a very clear focus on their customers and understanding their customers' needs and requirements. This might seem obvious, but remembering the control group is also entrepreneurs, we did not expect to see a significant difference in the customer orientation of the language used. A total of 9 words related to customer orientation, resulting in 2585 instances whereby customers were the focus of the conversation. Not every instance was about customers; however, many of these 2585 instances were connected to the theme. One particular world stood out as being of interest, and that was the word "success." This was often used in connection with the word "customer." It likely implies that the entrepreneurs are concerned with their customers' success, not just their own personal success. This might be described as a win-win type mentality, whereby entrepreneurs are focused on doing well for themselves, by ensuring their customers are doing well.

Growth/learning orientated

One of the more tentative themes that emerged was the concept of entrepreneurial growth. This might be described as the entrepreneurs being focussed on learning, and growing as people and being the best version of themselves. There were only 4 words which were coded to this theme, however, we felt it was worthy of further investigation. We propose that entrepreneurs are lifelong learners, who are curious and who see experiences as an opportunity to learn and improve themselves. The control group for example is twice as likely to label an experience as failure as the successful entrepreneurs. This might be the case because the successful entrepreneurs might have had fewer failures, or it might be that they see them as experiences, for which they use the word "experience" three times more often than the control group. This suggests also that successful entrepreneurs are less inclined to label good or bad, but rather as simply an experience. Again this is supported by the lack of the use of the word "good", and the under usage of the word "bad" (significant at the 99% level, but not at the 99.99% level). This concept is consistent with Dweck (2006) description of a growth mindset that is supportive of success.

Limitations

We would not suggest that simply adjusting the usage of single words would be sufficient to bring about successful entrepreneurial outcomes. Nor would we suggest that collectively using all the words together as a kind of Trumpian word "salad" would be sufficient to bring about successful outcomes, but collectively these words could direct us towards a way of thinking that might facilitate the best outcomes given the limitations of the environment that entrepreneurs operate.

The corpus used by the control group is now dated, as it is approximately 10 years old. We have tried to control for this by ignoring words that have a specific context in time like Facebook, apps, data. We have chosen to ignore their presence in the discussion of results. In future research, it might be worthy to consider updating the control corpus to reflect the change in language usage.

We acknowledge that many entrepreneurs are not motivated by financial metrics, but rather by intrinsic factors, and our criteria for success might therefore be contentious. However, in acknowledging this limitation, we have clearly stated the assumptions upon which this study is based.

We have examined a single context of successful entrepreneurs from Silicon Valley. We do not suggest that these results are generalizable across all forms of entrepreneurship and all geographical regions. We acknowledge we intentionally omitted the influence of environment in this study.

Implications

The implications of this study are manifold. First, it represents an initial step in providing empirical evidence of an entrepreneurial mindset. There is a lot of work to be done to further understand and clarify what the differences between a highly successful entrepreneurial mindset is. The initial findings were encouraging, and suggest that further research should be carried out to test the propositions generated during this explorative study.

One implication for entrepreneurs is that there are mindsets that might serve as more constructive compared to other mindsets. The advantage of a mindset is that it can be learnt and adopted. It is not the same as a personality trait, which is relatively fixed. Lastly, this study goes a long way towards establishing what constitutes an expert entrepreneur mindset. This study is an initial step towards classifying the mindset based on empirical evidence.

Further research could build on the results we have by examining language use in multiple contexts. In addition, it would be interesting to see further research into the more technical aspects of language and the emotional characteristics of language. This might include using machine learning to examine spoken language in order to predict the likelihood of an entrepreneur's future success. We also encourage deeper empirical studies into entrepreneurial mindset.

References

AHL, H. J. 2003. 1 THE SCIENTIFIC REPRODUCTION OF GENDER INEQUALITY A Discourse Analysis of Research Articles on Women's Entrepreneurship.

ALVAREZ, S. A. & BARNEY, J. B. 2002. Resource-based theory and the entrepreneurial firm. *Strategic entrepreneurship: Creating a new mindset,* 89**,** 105.

BARON, R. A. 1998. Cognitive mechanisms in entrepreneurship: Why and when enterpreneurs think differently than other people. *Journal of Business venturing,* 13**,** 275-294.

BARON, R. A. & HENRY, R. A. 2010. How entrepreneurs acquire the capacity to excel: Insights from research on expert performance. *Strategic Entrepreneurship Journal,* 4**,** 49-65.

BEDI, G., CARRILLO, F., CECCHI, G. A., SLEZAK, D. F., SIGMAN, M., MOTA, N. B., RIBEIRO, S., JAVITT, D. C., COPELLI, M. & CORCORAN, C. M. 2015. Automated analysis of free speech predicts psychosis onset in high-risk youths. *npj Schizophrenia,* 1**,** 15030.

BERGER, P. L. & LUCKMANN, T. 1991. *The social construction of reality: A treatise in the sociology of knowledge*, Penguin UK.

BRANDSTÄTTER, H. 2011. Personality aspects of entrepreneurship: A look at five meta-analyses. *Personality and Individual Differences,* 51**,** 222-230.

BUSENITZ, L. W. & BARNEY, J. B. 1997. Differences between entrepreneurs and managers in large organizations: Biases and heuristics in strategic decision-making. *Journal of business venturing,* 12**,** 9-30.

COPE, J. 2005. Researching entrepreneurship through phenomenological inquiry: philosophical and methodological issues. *International Small Business Journal,* 23**,** 163-189.

DWECK, C. 2006. *Mindset: The new psychology of success*, Random House.

FISHER, G. 2012. Effectuation, Causation, and Bricolage: A Behavioral Comparison of Emerging Theories in Entrepreneurship Research. *Entrepreneurship Theory and Practice,* 36**,** 1019-1051.

GARTNER, W. B. 1985. A conceptual framework for describing the phenomenon of new venture creation. *Academy of management review,* 10**,** 696-706.

HAYNIE, J. M., SHEPHERD, D., MOSAKOWSKI, E. & EARLEY, P. C. 2010. A situated metacognitive model of the entrepreneurial mindset. *Journal of business venturing,* 25**,** 217-229.

IRELAND, R. D., HITT, M. A. & SIRMON, D. G. 2003. A model of strategic entrepreneurship: The construct and its dimensions. *Journal of management,* 29**,** 963-989.

KICKUL, J., GUNDRY, L. K., BARBOSA, S. D. & WHITCANACK, L. 2009. Intuition versus analysis? Testing differential models of cognitive style on entrepreneurial self-efficacy and the new venture creation process. *Entrepreneurship Theory and Practice,* 33**,** 439-453.

KRUEGER, N. F. 2007. What lies beneath? The experiential essence of entrepreneurial thinking. *Entrepreneurship Theory and Practice,* 31**,** 123-138.

KRUEGER, N. F., REILLY, M. D. & CARSRUD, A. L. 2000. Competing models of entrepreneurial intentions. *Journal of business venturing,* 15**,** 411-432.

MCADAMS, D. P. & PALS, J. L. 2006. A new Big Five: fundamental principles for an integrative science of personality. *American psychologist,* 61**,** 204.

MCCRAE, R. R. & COSTA JR, P. T. 1999. A five-factor theory of personality. *Handbook of personality: Theory and research,* 2**,** 139-153.

MITCHELL, R. K., BUSENITZ, L., LANT, T., MCDOUGALL, P. P., MORSE, E. A. & SMITH, J. B. 2002. Toward a theory of entrepreneurial cognition: Rethinking the people side of entrepreneurship research. *Entrepreneurship theory and practice,* 27**,** 93-104.

MITCHELL, R. K., BUSENITZ, L. W., BIRD, B., MARIE GAGLIO, C., MCMULLEN, J. S., MORSE, E. A. & SMITH, J. B. 2007. The central question in entrepreneurial cognition research 2007. *Entrepreneurship Theory and Practice,* 31**,** 1-27.

MITCHELL, R. K., SMITH, B., SEAWRIGHT, K. W. & MORSE, E. A. 2000. Cross-cultural cognitions and the venture creation decision. *Academy of management Journal,* 43**,** 974-993.

MITRA, T. & GILBERT, E. The language that gets people to give: Phrases that predict success on kickstarter. 2014 2014. ACM, 49-61.

MUDRAYA, O., RAYSON, P., CAVE, F. & WHITEHOUSE, O. 2005. Development of a Corpus of Entrepreneurship/Small Business. *Corpus Linguistics 2005*.

NECK, H. M. & GREENE, P. G. 2011. Entrepreneurship education: known worlds and new frontiers. *Journal of Small Business Management,* 49**,** 55-70.

OBSCHONKA, M., SILBEREISEN, R. K. & SCHMITT-RODERMUND, E. 2011. Successful entrepreneurship as developmental outcome. *European Psychologist*.

PARKINSON, C. & HOWORTH, C. 2008. The language of social entrepreneurs. *Entrepreneurship and regional development,* 20**,** 285-309.

PATTON, M. Q. 1990. *Qualitative evaluation and research methods*, SAGE Publications, inc.

STAKE, R. E. 1995. *The art of case study research*, Sage.

Entrepreneurial Mindset: an Empirical Starting Point

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Abstract: Entrepreneurial mindset as a concept has been growing in popularity in entrepreneurship literature. There is no clear definition over what is meant by entrepreneurial mindset, and virtually no empirical basis to support the concept. This study builds on Lynch, Kamovich, et al. (2017) by testing five hypothesis related entrepreneurial mindset as a concept; specifically that successful entrepreneurs have a greater bias towards action, they focus on the future, they have a collective orientation, are customer focussed and see the world from a growth/learning perspective. The article measures language used by successful entrepreneurs, compared to less successful entreprenurs, where language is a proxy for how entrepreneurs conceptualise their world. The study contributes to the discussion on what is an entrepreneurail mindset and sets out a method that can be used to test the cocnept of the entrepreneurial mindset in future studies.

Keywords: Entrepreneurship; Entrepreneurial Mindset; Mindset; Cognition; Quantitative; Success; Language; Narrative.

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EXAMINING ENTREPRENEURIAL MOTIVATIONS IN AN EDUCATION CONTEXT

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Introduction

In training engineers of the future, there is an expectation that they have a deep knowledge in their field of study as well various skills in problem solving, communication, networking, creativity and teamwork (Täks et al., 2014). In addition, there has been a growing call to educate science and engineering students in entrepreneurship (Duval-Couetil et al., 2012; G. R. Mitchell, 2007; Vest, 2005). Professional institutions representing engineers, such as the European Society for Engineering Education (2012), the National Academy of Engineering and the American Society for Engineering Education have also likewise called for a new focus for educating engineers that include a focus on entrepreneurship, creativity and innovation (Dabbagh & Menascé, 2006; Rover, 2005). Entrepreneurial learning is transformative, social, imaginal, emotional, and experiential learning that applies in multiple contexts (Rae, 2003).

In Norway, entrepreneurship education has been growing in popularity over the past decade. The Norwegian government aims to increase firm foundation rates as part of its strategy to support innovation (European Commission, 2006). One method of teaching entrepreneurship in Norway is to have students start a business as part of their university education. Little is known about how students who participate in this education experience it, what their motivations are, or whether they indeed feel supported as students towards starting a business. This article is exploratory in examining students' motivations for starting a business and their confidence level in their knowledge and competence to start a business. These factors form a key part of forming an entrepreneurial intention to start a business.

Background

Initial research on engineering students who have participated in entrepreneurship studies has generally found positive results (Dabbagh & Menascé, 2006; Täks et al., 2014). Dabbagh and Menascé (2006) carried out phonographic interviews with 16 students who were participating in a hands on entrepreneurial course. The feedback from students was that they found the learning challenging albeit rewarding. They students express the learning outcomes that are being called for of future engineers. Yet the study did not specifically examine students' motivations towards entrepreneurship. While Dabbagh and Menascé (2006) looked at students who played an entrepreneurial game as part of an exploratory study. The game and its learning outcomes did not seem to match what would be considered entrepreneurial learning as defined by (Rae, 2003). In reviewing engineering literature and entrepreneurship literature, there appears a gap in understanding about what specifically motivates students to start businesses. We therefore turn our attention to discussing entrepreneurial motivation, intentions to start a business and their component parts.

Research has indicated that intentions are a reliable, and for many the most effective, predictor of actual behaviour (Ajzen, 1991; Ajzen & Fishbein, 1980; Krueger & Carsrud, 1993). Intention to start a business can be described as the combination of perceived desirability of starting and perceived feasibility (Brandstätter, 2011). Perceived feasibility is closely associated with entrepreneurial self-efficacy. If you have high self efficacy this equates to a strong belief in your ability to achieve your goals (Bandura, 1994). In the specific case of entrepreneurship, it is evidenced through a belief in your ability to start a business.

In many cases, perceptions of self-efficacy are more important than actual skills as a determinant of behaviour (Krueger & Dickson, 1994). That is if you believe you have the skills and competence to achieve your goals, you will be more likely to take active steps towards achieving them.

Desirability of starting a business is based on perceptions of how it is to be an entrepreneur. People often have a surprisingly detailed mental picture of how it is to be an entrepreneur, even if it is based on very limited or even inaccurate information. Students may have a mental prototype of "entrepreneurship" that is potentially depressingly dysfunctional or at least limiting (Krueger, 2007).

Desirability is likely to be partly shaped by the extent to which a nascent entrepreneur has been surrounded by family and friends who are successful entrepreneurs (Corbett & Hmieleski, 2007). The subjective impact of a role model is a stronger predictor of intention to start, than is the mere presence of a role model (Krueger & Dickson, 1994).

It is worth noting that the desirability and feasibility are not equally important with regards to affecting intentions. Fitzsimmons and Douglas (2011) found that intentions to start a business stayed relatively the same except for when the students self-reported both low desirability for an entrepreneurial career as well as low perceived feasibility, or put differently, even low perceived feasibility could be countered by high desirability in maintaining a strong intention to enter an entrepreneurial career. Thus suggesting that where the desire to be an entrepreneur is high the student will find a way even if it does not feel achievable at the time (Fitzsimmons and Douglas, 2011).

To understand how intentions fit into the process of staring a firm we turn to Shapero's model of entrepreneurial event formation. This model states the cultural and social environment affects the decision to set out on the entrepreneurial path (Shapero & Sokol, 1982). They recognise that the intent to start a business derives from perceptions of both desirability and feasibility. A related model is Ajzen's Theory of Planned Behaviour (Ajzen, 1991), designed to predict and explain human behaviour. It centers on the individual's intention to perform a given behaviour. Building on Shapero's model, Krueger and Brazeal (1994) set out create an entrepreneurial model that places Shapero's work within the context of Ajzen's intention process.

Krueger and Brazeal's model embraces the two "attractiveness components" of the Theory of Planned Behaviour: attitude toward the act and social norms. According to the Theory of Planned Behaviour, attitude toward the act refers to the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question. Social norms, on the other hand, refer to the perceived social pressure to perform or not to perform the behaviour. These are tied to our perceptions of what important people in our lives would think about our launching a venture. The theory of planned behaviour, in its intent to explain human behaviour deals also with the antecedents of attitudes toward the behaviour and subjective norms (Veciana et al., 2005).

The theory of planned behaviour postulates that behaviour, such as starting a venture, is a function of beliefs relevant to the behaviour. It is these salient beliefs that are considered to be the prevailing determinants of a person's attitudes, intentions and behaviour (Ajzen, 1991). Beliefs are assumed to influence attitudes toward the behaviour. Each belief links the behaviour to a certain outcome, which is already valued positively or negatively. Therefore, people automatically acquire an attitude toward the behaviour. In this way, people form favourable attitudes toward behaviours believed to have desirable consequences and negative attitudes toward behaviours associated with undesirable consequences (Ajzen, 1991).

The theory of planned behaviour is important in that it suggests beliefs and attitudes will affect our intention to start a business. Intention to start a business is made up of desirability and feasibility. In order to understand what it is that is desirable about starting a business we have chosen to focus on motivations of students to be entrepreneurs. This presumes that if we understand what the motivating factors are to be an entrepreneur then we can better

educate and support aspiring entrepreneurs. The methodology described next has therefore set out to understand attitudes about students' motivations towards entrepreneurship, and what specific factors drive motivation. In addition, we have briefly set out to gain a surface understanding of students' perceptions around their feasibility.

Research context

The data was collected from a joint conference day held by two Norwegian Universities. Both universities teach a practice based entrepreneurship program whereby entrepreneurship is taught through having students start and run their own business. The students are from engineering departments at Universities, and entrepreneurship is not the main focus on their studies. The philosophy behind the courses are based on preparing students for a future in which entrepreneurial traits are deemed important regardless of whether they go on to start their own business.

The conference was held approximately a third of the way through the course for students, so that they could pitch their ideas in front of a jury, and be in to win a prize for best pitch of approximately US$1200.

Most of those attending were currently having their first experiences as entrepreneurs. At the time of the conference, the majority of the students had registered their business, clarified the idea, written a brief business plan, and made prototypes and websites to market their ideas. Few if any had started generating sales. It would be fair to generalise that the student projects were in the very early stage of the venture creation process.

Methodology

A questionnaire was sent to all students participating in the conference in as part of the registration for the conference's workshops. The questions were formulated by a doctorate student in psychology and based around known factors of motivation established in previously validated studies. However, the questions were not part of a previously validated set of psychometric tests. A Likert scale was used for all questions. The questions were sent out in Norwegian, and translated to English for this article. In translating from Norwegian to English, an attempt has been made to maintain a translation as close to the original text. Although in places, such as the Likert scale, it results in a style of English that sounds slightly out of place. We trust readers can see past this translation, as the original questions were formed in a way that made sense to native speakers of Norwegian.

The questions were focused on two themes. The first was students' beliefs around feasibility. The question here related to whether the students felt they had sufficient knowledge about entrepreneurship in general to start a business and a second question of whether they had sufficient knowledge for their specific business idea. The reason for this was to measure whether students felt they already had sufficient knowledge to get started. As students often mention that they feel like they do not know how to get started, so we wanted to collect data to see how wide spread this perception was.

The second theme related to students motivation to be an entrepreneur. Here they were given 12 different factors around their motivation to be an entrepreneur.

A total of 60 participants participated in the survey, although some questions were left unanswered by those who took part in the survey. The response rate to some questions is as low as 54 participants. It was not possible to determine the exact split between the universities, although the split was approximately one third and two thirds. This is known as it was a compulsory event for all students attending the entrepreneurship courses at each university. Given the similarity of the two programmes, the origin of the students is not expected to impact on the results. Demographic data as gender or age was not collected.

The results were imported into SPSS, and a number of statistical tests were carried out. There is not room for all of the statistics to be discussed, so those which appear to be insightful have been selected for discussion in the following section. This study is exploratory in nature, hence the open approach to data analysis. The design of the study was intended to support an ongoing process of hypothesis generation.

Results

The results have been broken into two parts, the first on whether students perceived themselves as having sufficient knowledge about entrepreneurship and their idea. The second section deals with their motivation towards wanting to be an entrepreneur. An additional section then uses statistical analysis to provide further insights.

Table 1. Descriptive results of students' perceptions of their knowledge and competence

Question:	N	Very little	Little	Enough	Much	Very much
How much knowledge and competence would you say you had about entrepreneurship before you started as an entrepreneur?	59	17%	46%	31%	3%	3%
How much knowledge and competence would you say you had about your business idea before you started as an entrepreneur?	59	37%	31%	31%	0%	2%

The results above reflects students' perceived feasibility of starting a business. Whether they feel they have sufficient knowledge about entrepreneurship and their business indicates whether they think it will be feasible. This relates to the perspective explored by Fitzsimmons and Douglas (2011) who noticed that feasibility of getting started was linked to intention, but that when desirability was high this would be sufficient to overcome low perceived feasibility.

The results from the two questions above suggest that the majority of students felt uncertain about their knowledge in relation to entrepreneurship and their own business idea. With 63% of students answering they did not have enough knowledge about entrepreneurship to start a business.

Interestingly the results seem slightly more negative in relation to their own specific business, 37% answered that they had very little competence and knowledge about their own ideas, and two thirds (68%) answered they had little or very little knowledge and competence.

These results were more negative than we would have expected, and suggest that there is some work to be done to boost students sense of self-efficacy. It might be worth focussing students attention on the fact that there is no reason to expect that any one type of person will have all the knowledge and skills needed for new venture creation. Individuals are likely to judge themselves good in some areas, and should look to team members to compensate for their perceived weaknesses. This may strengthen students beliefs in the collective efficacy of their teams, consequently strengthening their entrepreneurial intentions as well (Kickul et al., 2009).

Moving on to the theme of motivation, the results below examine students' motivations based on 12 probing questions.

Table 2. Descriptive results of motivations for entrepreneurship

Question: I am first and foremost motivated to be an entrepreneur because…	N	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
…It is easier to earn money	55	31%	38%	22%	7%	2%
…I won't need to work for anyone else	55	9%	27%	35%	20%	9%
…I can come and go as I would like	55	27%	24%	33%	15%	2%
…I will earn more money than if I took a normal job	55	33%	38%	22%	7%	0%
…I get bigger challenges	55	0%	2%	18%	44%	36%
…I can learn more	54	0%	4%	11%	37%	48%
…The results come from me and not an organisation	55	4%	11%	27%	36%	22%
…I can use my skills and competence	55	0%	2%	15%	44%	40%
…I can make my own decisions	55	0%	5%	18%	35%	42%
…I have a larger amount of freedom	55	0%	16%	25%	18%	40%
…I can be my own boss	54	2%	13%	33%	22%	30%
…I am responsible for my own efforts and results	55	0%	4%	24%	25%	47%

The first result that stands out is money does not appear to form a strong motivator for future potential entrepreneurs. Only 9% of participants agree/strongly agree that it is easier to earn money as an entrepreneur than other forms of work. This signifies that students consider earning money for themselves to be a challenging task. This is supported by a follow up question: *I will earn more money as an entrepreneur (than a normal job)*. No one strongly agreed with this, and only 7% of people agreed. These two questions support the assertion that most people do not become an entrepreneur due to financial considerations. This has implications for us as academics, as the most common measure of success in academic literature is still financial results such as sales or profit. If financial results are not the primary motivating factor for entrepreneurs, there is little reason to measure these financial results as academics. As Giacalone (2004) describes it, "Teaching students to use the single-minded materialistic value system distorts the reality of daily life, were we routinely assimilate nonmaterialistic goals" (p. 416). The finding that entrepreneurs are motivated by more than money is long-standing and quite robust across studies, and yet, we rarely tie the motivation to the entrepreneurs' own definitions of success (Neck & Greene, 2011).

The two strongest motivators appear to be that students can learn more as entrepreneurs (48% strongly agree), and that they are responsible for their own efforts and results (47% strongly agree). This implies that those engaging in these courses have adopted a growth mind-set as described by Dweck (2006), that focusses on growth through learning and challenging themselves.

That students are realistic about the challenge of starting a business is implied by the response that 80% agree/strongly agree that being an entrepreneur is a bigger challenge (than getting a job) and that this is their primary motivation.

In addition, lifestyle reasons seem to play a key role in motivating aspiring entrepreneurs. This is evidenced by the response that 58% agree/strongly agree that they have a larger amount of freedom and 52 % agreed/strongly agreed that being their own boss was one of their primary motivations.

This is largely consistent with descriptions of millennials who are described as being more focused on lifestyle than career. Millennials are said to value flexibility within their work, and are willing to sacrifice pay in order to receive this flexibility. They are also described as being motivated by having a greater sense of purpose. While we did not ask about purpose in this survey, it would be an interesting theme for future studies.

As educators we must be aware that different types of entrepreneurs may have different developmental trajectories (e.g., push versus pull motivation, growth entrepreneurs versus lifestyle) (Krueger, 2007). The above results are averages, while the individuals behind the statistics are not averages. We need to ensure that we do not think that the average motivating factor applies to all students. Instead, it is important to remember that different students will have different motivations. We need to be aware of this in ensuring we motivate students with factors that are relevant to them.

To understand how much of the motivations related to each variable, we carried out a principal components analysis. The purpose of this test is to reduce the components to a smaller set of artificial components that account for most of the variation in the initial components. The components matrix is set out below.

Table 3. Principal components matrix

	Component		
	1	2	3
…It is easier to earn money	-0,153	0,749	-0,320
…I won't need to work for anyone else	0,226	0,689	0,290
…I can come and go as I would like	0,046	0,657	0,443
…I will earn more money than if I took a normal job	-0,089	0,808	-0,108
…I get bigger challenges	0,741	-0,362	0,143
…I can learn more	0,761	-0,192	0,031
…The results come from me and not an organisation	0,794	-0,263	0,145
…I can use my skills and competence	0,830	0,154	-0,289
…I can make my own decisions	0,636	0,334	-0,388
…I have a larger amount of freedom	0,587	0,215	0,538
…I can be my own boss	0,611	0,458	-0,088
…I am responsible for my own efforts and results	0,815	-0,150	-0,201
Extraction Method: Principal Component Analysis.			
3 components extracted.			

The importance of each of the components is set our below.

Table 4. Total variance explained by principal components analysis

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4,317	36,0	36,0	4,317	36,0	36,0
2	2,773	23,1	59,1	2,773	23,1	59,1
3	1,008	8,4	67,5	1,008	8,4	67,5
Extraction Method: Principal Component Analysis. Only the first 3 factors are shown.						

The results suggest that nearly 60% of the variance can be explained by the first two components. Interestingly, in the component matrix we see a pattern of external versus internal motivations as being apparent. That is factors relating to internal motivations such as learning more; larger challenges; using their competence; responsible for their own efforts forms one set of variables (positive in the first component, negative in the second). The other set of variables appear to be extrinsic type motivations; such as: easier to earn money; can earn more money. Theory and empirical research have suggested that human motivation toward work can be categorized into two distinct types: intrinsic motivation, which arises from the intrinsic value of the work for the individual (such as its interest value), and extrinsic motivation, which arises from the desire to obtain some outcomes (such as rewards) that are apart from the work itself (Amabile, 1997). Individuals can be motivated by both, although in some instances extrinsic factors can be detrimental to motivation. Intrinsic motivation occurs when individuals feel self-determination towards their goals and work (Amabile, 1997).

We were curious as to whether experience with entrepreneurship would alter motivations towards entrepreneurship. In order to test this we split the sample based on experience. The cut-off was for those who had more than 6 months experience. Separating the two samples we carried out an independent samples test to compare motivations based on whether the entrepreneurs had more than 6 months experience. We found little variation between answers to the survey questions when split based on experience. In order to reveal if any of the results were significant we ran a Leven's test for equality of variance and a t-test.

Table 5. Independent samples test results

Independent Samples Test							
	Levene's Test for Equality of Variances		t-test for Equality of Means				
I am first and foremost motivated to be an entrepreneur because…	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.
…I get bigger challenges — EV	0,03	0,87	2,90	53,00	0,005**	0,61	0,21
…I get bigger challenges — Not EV			3,15	41,85	0,003**	0,61	0,19
…I can learn more — EV	1,23	0,27	2,07	52,00	0,043*	0,47	0,23
…I can learn more — Not EV			2,32	46,04	0,024*	0,47	0,20

EV – Equal Variance assumed. Not EV – Equal variance not assumed. * Significant (.05% level). **Highly significant (.001% level)

The significance levels of the t-test show that there was one question for which there was a highly significant difference, and another for which there was a significant difference. Respectively the questions were related to being an entrepreneur as a bigger challenge (than a normal job), and entrepreneurs having the opportunity to learn more. This result suggests that as entrepreneurs grow in experience, they come to value the challenge of entrepreneurship even more. Suggesting those who continue with entrepreneurship as those who can approach it with a growth mind-set, focussed on learning from the experience and enjoying the challenge.

Out of curiosity we split the sample based on their self-reported competence with respect to their knowledge of entrepreneurship. The split was based on whether the participant felt they had enough/more than enough versus whether they felt they did not have enough.

Table 6. Sample split on perception of knowledge and competence

How much knowledge and competence would you say you had about entrepreneurship before you started yourself as an entrepreneur?		N	Mean*	Std. Deviation	Std. Error Mean
…I can use my skills and competence	>= Enough	19	4,53	0,697	0,160
	< Enough	36	4,06	0,754	0,126
*Mean refers to answers on the Likert Scale – where 1 is strongly disagree, 5 is strongly agree.					

The results reveal only a single question for which there was a significant difference between the answers. This was the question relating to that participants felt they could make greater use of their competencies if they thought they had a greater competence to begin with.

Table 7. Independent samples test results

I am first and foremost motivated to be an entrepreneur because…		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.
…I can use my skills and competence	EV	0,300	0,586	2,259	53	0,028*	0,471	0,208
	Not EV			2,316	39,383	0,025*	0,471	0,203
EV – Equal Variance assumed. Not EV – Equal variance not assumed. * Significant (.05% level). **Highly significant (.001% level)								

The results may seem uninformative. However, upon reflection the results are consistent with previous findings in relation to intention. Fitzsimmons and Douglas (2011) found that negative perceptions of feasibility (i.e. belief in ones ability to start a business) did not adversely affect intention to start, as long as motivations were high. The

above results support this finding in suggesting student's perceptions of their skills does not affect their motivations towards being an entrepreneur (with the exception of their motivation to use their skills and competence).

Conclusion

Having examined motivation of aspiring entrepreneurs, the results support that entrepreneurs are motivated by primarily intrinsic factors, such as learning and taking on greater challenges. Financial factors do not seem to play an important role in motivating would be entrepreneurs to pursue an entrepreneurial career.

The results are rather robust with experience and self-belief not having much of an impact with the notable exception of a few significant changes. The changes in motivations based on experience relate to an increased value being placed on getting bigger challenges and learning more as an entrepreneur. While the change in motivation with relation to self-belief is, unsurprisingly, that entrepreneurs feel even more motivated to use their skills when they feel they have skills and competence in the first place.

Perhaps surprising within the results was just how low most entrepreneurship students rated their skills and competence. Suggesting most lack self-belief in their abilities.

Implications

Perceptions of desirability and feasibility of new venture creation are products of the cultural and social environment. The knowledge of this part of the environment could and should be used to take actions by public policy decision-makers (Veciana et al., 2005). Increasing our understanding of perceptions of entrepreneurship is therefore an important step in supporting entrepreneurship education. This study has made a contribution to better understanding what motivates young aspiring entrepreneurs.

Researchers often concentrate on the fact of start up, and not on career choice, motivation, or joy felt by the entrepreneur (Alsos & Kolvereid, 1998). As academics, we need to focus less on the financial results when measuring success for entrepreneurs, as there is a body of knowledge, which is supported by these results, showing that entrepreneurs do not measure their own success in terms of financial results but often through other factors such as lifestyle.

In our role as educators, there appears to be a need to ensure our students feel confident to pursue entrepreneurial careers. Also we need to focus on assisting them to achieve the factors that are important to them, such as freedom, being their own boss and making their own decisions.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes, 50*(2), 179-211.

Ajzen, I., & Fishbein, M. (1980). Understanding attitudes and predicting social behaviour.

Alsos, G. A., & Kolvereid, L. (1998). The business gestation process of novice, serial, and parallel business founders. *Entrepreneurship: Theory and Practice, 22*(4), 101-102.

Amabile, T. M. (1997). Entrepreneurial creativity through motivational synergy. *The Journal of Creative Behavior, 31*(1), 18-26.

Bandura, A. (1994). *Self-efficacy*: Wiley Online Library.

Brandstätter, H. (2011). Personality aspects of entrepreneurship: A look at five meta-analyses. *Personality and Individual Differences, 51*(3), 222-230. doi:http://dx.doi.org/10.1016/j.paid.2010.07.007

Corbett, A. C., & Hmieleski, K. M. (2007). The conflicting cognitions of corporate entrepreneurs. *Entrepreneurship Theory and Practice, 31*(1), 103-121.

Dabbagh, N., & Menascé, D. A. (2006). Student perceptions of engineering entrepreneurship: An exploratory study. *Journal of Engineering Education, 95*(2), 153-164.

Duval-Couetil, N., Reed-Rhoads, T., & Haghighi, S. (2012). Engineering students and entrepreneurship education: Involvement, attitudes and outcomes. *International Journal of Engineering Education, 28*(2), 425.

Dweck, C. (2006). *Mindset: The new psychology of success*: Random House.

European Commission. (2006, 2006). *The Oslo Agenda for Entrepreneurship Education in Europe*.

European Society for Engineering Education. (2012). *Annual Report (2011)*. Retrieved from Brussels, Belgium: http://www.sefi.be/wp-content/uploads/SEFI%20Report%202011-final.pdf

Fitzsimmons, J. R., & Douglas, E. J. (2011). Interaction between feasibility and desirability in the formation of entrepreneurial intentions. *Journal of Business venturing, 26*(4), 431-440.

Giacalone, R. A. (2004). A transcendent business education for the 21st century. *Academy of Management Learning & Education, 3*(4), 415-420.

Kickul, J., Gundry, L. K., Barbosa, S. D., & Whitcanack, L. (2009). Intuition versus analysis? Testing differential models of cognitive style on entrepreneurial self-efficacy and the new venture creation process. *Entrepreneurship Theory and Practice, 33*(2), 439-453.

Krueger, N. F. (2007). What lies beneath? The experiential essence of entrepreneurial thinking. *Entrepreneurship Theory and Practice, 31*(1), 123-138.

Krueger, N. F., & Brazeal, D. V. (1994). Entrepreneurial potential and potential entrepreneurs. *Entrepreneurship Theory and Practice, 18*, 91-91.

Krueger, N. F., & Carsrud, A. L. (1993). Entrepreneurial intentions: applying the theory of planned behaviour. *Entrepreneurship & Regional Development, 5*(4), 315-330.

Krueger, N. F., & Dickson, P. R. (1994). How believing in ourselves increases risk taking: Perceived self-efficacy and opportunity recognition. *Decision Sciences, 25*(3), 385-400.

Mitchell, G. R. (2007). Instill the entrepreneurial mindset. *Research-Technology Management, 50*(6), 11-13.

Neck, H. M., & Greene, P. G. (2011). Entrepreneurship education: known worlds and new frontiers. *Journal of Small Business Management, 49*(1), 55-70.

Rae, D. (2003). Opportunity centred learning: an innovation in enterprise education? *Education+ Training, 45*(8/9), 542-549.

Rover, D. T. (2005). New economy, new engineer. *Journal of Engineering Education, 94*(4), 427-428.

Shapero, A., & Sokol, L. (1982). The social dimensions of entrepreneurship. *Encyclopedia of entrepreneurship*, 72-90.

Täks, M., Tynjälä, P., Toding, M., Kukemelk, H., & Venesaar, U. (2014). Engineering Students' Experiences in Studying Entrepreneurship. *Journal of Engineering Education, 103*(4), 573-598.

Veciana, J. M., Aponte, M., & Urbano, D. (2005). University students' attitudes towards entrepreneurship: A two countries comparison. *The International Entrepreneurship and Management Journal, 1*(2), 165-182.

Vest, C. M. (2005). Educating engineers for 2020 and beyond. *National Academy of Engineering*.

Educating entrepreneurs in practical methods with design practices as a guide

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Abstract:
This paper argues for the incorporation of design principles into entrepreneurship education. The paper makes the case that design as a topic is analogous to entrepreneurship. The paper starts by discussing entrepreneurship as a topic and expanding on how traditional methods of teaching entrepreneurship are no longer appropriate. It then sets out to discuss the general underlying principles behind design methods. In the discussion the paper expands on how design based tools can be used to encourage students of entrepreneurship to find potential customer's needs, prototype businesses and evolve their thinking around potential opportunities. The article aims to build on a trend of incorporating design methods into entrepreneurship by adding to the discussion around methods that are appropriate for teaching entrepreneurship.

Keywords: entrepreneurship, design, design thinking, entrepreneurial practice

1 Introduction

The perceived importance of entrepreneurship is easy to observe with the increased academic attention it has received. Locally in Nordic countries the focus has been on supporting entrepreneurship as a vehicle for innovation. Growing economies and wealth creation are accepted as being one of entrepreneurship's defining objectives (Ireland, Kuratko, et al., 2003). Some even suggest that an entrepreneurial mind-set can be sufficient to support the growth of an entire economy (Ireland, Hitt, et al., 2003). It would seem reasonable then to focus on how best to train entrepreneurs in order to carry out this critical task. There is a wealth of research at the conceptual level of how best to do this, yet there appears to be an absence of papers suggesting concrete operational ways to do this. A few papers (Baron & Henry, 2010; Neck & Greene, 2011) come close to doing so, but seem to fall short of providing a concrete teaching methodology. The field of entrepreneurship has borrowed heavily from other theoretical areas such as economics, psychology and management (Kamovich & Longva, 2015). Yet this borrowing has not brought with it teaching methods from those fields.

In addition there is an absence of evidence as to whether current teaching methods are effective at producing new firms that thrive.

This paper proposes using design-based methods for training aspiring entrepreneurs. In order to make the argument for why this is appropriate the paper initially discusses several schools of thought with regards to entrepreneurship education. These schools of thought are; the traditional approach to training entrepreneurs; followed by the cognitive perspective on entrepreneurship training; as well as the evolving field of design as a methodology for training entrepreneurs. The deceptively simple ambition of training entrepreneurs is fraught with ambiguities, unanswered questions and definitional traps. Entrepreneurship is complex, chaotic, and lacks any notion of linearity, yet educators often treat the subject this way (Neck & Greene, 2011). We argue the focus should instead be on developing the discovery, reasoning, and implementation skills of entrepreneurship students so they may excel. These skills enhance the likelihood that students will identify and capture the right opportunity at the right time for the right reason (Neck & Greene, 2011). This paper sets out a discussion for how design based concepts can be used for educating students in such skills.

3 What should aspiring entrepreneurs be taught?

In accepting that entrepreneurship is something that can be taught it raises an additional question. What should entrepreneurs be learning to do? Most entrepreneurship programmes seem to offer a mix of classes on opportunity evaluation, entrepreneurial marketing, entrepreneurial finance, and managing growth (Neck & Greene, 2011). Pittaway and Edwards (2012) found that most entrepreneurship education uses traditional pedagogic methods, and focusses on teaching "about" entrepreneurship. Instead of engaging students in entrepreneurship or having them participate in entrepreneurship. The number one form of assessment in entrepreneurship course is still the business plan (Pittaway & Edwards, 2012). This is despite no evidence being found than business plans improve the likeliness of survival or improve profitability of new firms (Honig & Karlsson, 2004). Business planning was found to slow or hinder the venture creation process, and fails to lead to improved growth rates of firms once established (Capelleras & Greene, 2008). This points to a serious need to reconsider the way that entrepreneurship is taught.

There is an institutional reason for why entrepreneurship is currently taught the way it is (Honig & Karlsson, 2004) and the reason is that entrepreneurship is often thought of as a process—a process of identifying an opportunity, understanding resource requirements, acquiring resources, planning, and implementing. However, the word "process" assumes known inputs and known outputs as in a manufacturing process (Neck & Greene, 2011). Kickul et al. (2009) set out four distinct stages of the venture creation process: (1) the searching stage, (2) the planning stage, (3) the marshalling stage, and (4) the implementing stage. This assumes a linear type approach, where individual steps can be defined, and a process followed. The problem is that entrepreneurship is neither linear nor predictable, but it is easy to teach as if it were (Neck & Greene, 2011).

There has been an acknowledgement within academic circles that entrepreneurship is not just a process, and that there are human actors involved. Krueger (2007) argues that we need to look at the underlying cognition or way entrepreneurs think in order to separate those who 'do' from those who 'don't', and to therefore teach that mind set to students. Cognition camp focusses on the entrepreneurial mind-set defined as a growth-oriented perspective through which individuals promote flexibility, creativity, continuous innovation, and renewal. This mind-set means that even under conditions of uncertainty, the entrepreneurially minded can identify and exploit new opportunities because they have cognitive abilities that allow them to impart meaning to ambiguous and fragmented situations (Alvarez & Barney, 2002). Entrepreneurial mind-set is; recognizing entrepreneurial opportunities, entrepreneurial alertness, real options logic, entrepreneurial framework, and opportunity register (Ireland, Hitt, et al., 2003). How to teach such a mind set, and demonstrable examples of

this are absent from academic literature. In addition, the cognition world brings us back to the question of who is the entrepreneur? And how do we separate successful entrepreneurs from those who are not (Neck & Greene, 2011)?

A quick recap of the points covered to here will show a diverse and fractured theoretical perspective on entrepreneurship that ranges from a linear practice to a general mind-set. None of these schools of thought bring us closer to defining what actually it is that an entrepreneur does, and therefore what to teach nascent entrepreneurs. This may be because the difference between entrepreneurs is as great as the difference between entrepreneurs and non-entrepreneurs (Gartner, 1985). If we are unable to define what entrepreneurship is either as an activity or a mind-set, then it would appear to be an impasse. However this ambiguity is part of what defines entrepreneurship. It is a subject beset with uncertainty and variation. The same ambiguity has not seemed to plague other subjects to the same extent. Definitional issues has not hindered the free expression of dance, or its teaching within higher education institutions. To draw on United States Supreme Court Justice Potter Stewart's ruling on the difference between art and pornography, he states it best when saying 'I may not be able to define it, but I know it when I see it'. In the same way we might not be able to exactly state what entrepreneurship is as a method or process or even a way of thinking, however we know entrepreneurship when we see it. The reality is entrepreneurship is unclear, and indirect. As Hoholm and Araujo (2011) state, the path to an innovation often appears clear when reflecting back on the path chosen, however when walking the path it is far from clear.

4 Design as a thought process

One particular school of thought that appears comfortable with ambiguity and uncertainty is design (Nielsen & Stovang, 2015). Design is a process of divergence and convergence requiring skills in observation, synthesis, searching and generating alternatives, critical thinking, feedback, visual representation, creativity, problem-solving, and value creation (Beckman & Barry, 2007). Teaching entrepreneurship through a design lens can help students identify and act on unique venture opportunities using a toolkit of observation, fieldwork, and understanding value creation across multiple stakeholder groups (Neck & Greene, 2011). The basic tenet is that entrepreneurs think, and perhaps act, similar to designers. In our quest to define, understand, and teach entrepreneurship, the world of design is a good starting point for our inquiry. Entrepreneurship is an applied discipline, yet we are teaching and researching as if it was part of the natural sciences; yet we would be better served if we were to use design-based curricula (H. A. Simon, 1996).

By the very nature of their activities, entrepreneurs often find themselves in situations that are new, unpredictable, complex, and likely to produce information overload in many different ways (Baron, 1998). As such entrepreneurship education should make use of a principles based approach associated with design instead of rigid theories or linear processes (Sarasthvathy, 2008). Design thinking offers a breakout from the previous linear problem solving techniques associated with entrepreneurship education. Design thinking is specifically suited to handing uncertainty, and is noted as a method suitable for dealing with ambiguity and uncertainty (Dunne & Martin, 2006). One of its major differences is its epistemological starting point. Design thinking includes inductive, deductive, and abductive reasoning. In Aristotelian logic, inductive reasoning is generalization from specific instances, while deductive reasoning involves inference from logical premises. Peirce and Turrisi (1997) describes abductive logic as "the process of forming an explanatory hypothesis. It is the only logical operation which introduces any new idea."

Design thinking, therefore, combines the generation of new ideas with their analysis and an evaluation of how they apply generally. A designer uses abduction to generate an idea or a number of ideas, deduction to follow these ideas to their logical consequences and predict their outcomes, testing of the ideas in practice, and induction to generalize from the results (Dunne & Martin, 2006). Design thinking is said to have both analytic

and synthetic elements. In addition it operates in both the practical and theoretical realm. The process moves between the concrete and the abstract worlds, and it alternately uses analysis and synthesis to generate new products, services, business models, and other designs (Beckman & Barry, 2007). While the process may appear linear, it is an iterative process that can start in any place, move in any direction and can jump between steps.
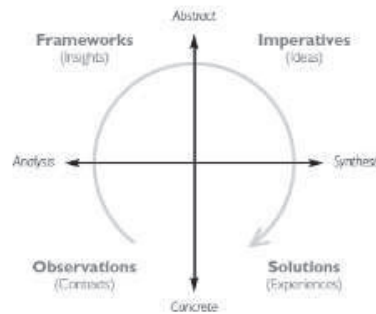
Starting with observations the design thinking process aims to gain a deep understanding of the context. Armed with the data generated from observations, the next step is to make sense of the data. This involves framing and reframing to identify patterns and insights. Staying in the abstract realm, the next step is the generation of ideas. This involves the creation of value propositions. The innovation process then returns to the concrete realm to provide solutions. As the process is iterative the process continues the cycle, testing these solutions in context, gaining further observations, that will form the basis of later insights, and so the cycle continues. While described as a linear process here, there is no "correct" order in which to carry out the steps. The important thing is to ensure that all the steps are moved through at one point (Beckman & Barry, 2007).

Figure 1. The design thinking innovation process is mapped on two axis – concrete/abstract; and analysis/synthesis (Beckman & Barry, 2007).

Design thinking involves epistemological pluralism and consciousness of the system wide consequences of decisions (Dunne & Martin, 2006). The idea of applying design approaches to solve business problems is relatively new and, as yet, largely underdeveloped in academic literature and within business schools (Dunne & Martin, 2006).

Utilising a design thinking perspective doesn't preclude the already discussed schools of thought regarding entrepreneurship, but rather builds on their perspectives. It is entirely consistent with the cognitive perspective where entrepreneurial learning theory presents entrepreneurship as a contextual process of becoming, where the entrepreneur is continually learning and developing in relation to his or her business and the wider environment (Cope, 2005b). Accepting that design methods can play a useful role in educating entrepreneurs the next sections set out to discuss how this can be done in practice.

5 Discussion on incorporating design into teaching entrepreneurship

As mentioned previously, the design thinking process is not linear, like anything though you need to start somewhere. The same could be said of entrepreneurship, that there is no defined starting point. Using a design process to guide the entrepreneurial process results in four broad stages: (1) understanding the context in which the entrepreneur(s) will operate; (2) clarifying data and insight identification about potential issues or problems within the context; (3) generating solutions that fit to both the context and the insights; (4) prototyping these solutions, and prototyping the business itself. These four stages mimic the diagram set out

in *figure 1*. In each of the below sub sections we discuss the practical steps involved in carrying out these four stages as well as discussing the learning we speculate occurs.

Observation and data collection

Starting with observation as a form of data collection, requires students to make use of several types of tools. This includes passive observation of their context of interest. They are encouraged to undertake open ended interviews. Where possible, students are encouraged to immerse themselves in their environment. The whole methodology sits very closely to modern day anthropology, although actual anthropologists might be uncomfortable with design thinking borrowing this term. In traditional design thinking this stage is called gaining empathy (Brown, 2009).

This stage is often reported as being uncomfortable for students due to the ambiguity that is present in not knowing what answer they are searching for. The goal as Krueger (2007) suggests is to move students from answer-finding to question-creating, to take personal (cognitive) ownership of their projects. This sense of discomfort that students experience in not knowing what "answer" they are searching for often generates what Erikson (1980) labels as "crises". As we move through stages in life we likely experience crises, we can only move on if we work through the "crisises" (Erikson, 1980). Erikson and others show developmental experiences need not be as profound as religious conversion or a midlife crisis when considered in light of the constructivist learning model—which asserts that developmental experiences are absolutely central to how humans really learn, as they serve to change how we structure our knowledge (Krueger, 2007). This sense of uncertainty that students experience is sufficient to provide a mini-crises, and forces students to move from answer-finding to question-creating, and leads to them taking greater personal ownership of their projects. In addition it moves them from

Data clarification and insight identification

Moving on from observation to insights requires students to make sense of their world, to make judgements about what people find important. In transitioning from observing to insights requires the collation and organization of all the data they have gained during the observation stage. It is this process of moving the information from a chaotic state to an organized state that also helps them to organize their own thoughts and insights. Students are encouraged to visually map out their interviews, to colour code repeating pieces of data, to use post it notes to summarise interviews, and then rearrange these post its into consistent themes from various interviews. Again this often represents a departure from typical business school learning, and information management. Students are used to word documents and spreadsheets. This move to a more visual representation also supports a greater freedom in thinking. Entrepreneurs tend to use heuristic-based methods rather than systematic processing to accomplish similar tasks (R. K. Mitchell et al., 2007). Heuristics however take practice to develop. Using these visualisation processes helps provide a structure for students who might otherwise be overwhelmed by the quantity of conflicting data.

Students are forced to make judgements to as to which insights are most critical, and to use these for the next step when generating ideas. Judgement refers to decision making under conditions of uncertainty, with incomplete information where there is a range of possible outcomes, and the likelihood of specific outcomes is unknown (Foss, Foss, Klein, & Klein, 2007). The critical element is that it there is no "correct" answer, and is often a shift in mind-set for students who are more used to teachers knowing and having the "correct" answer to problems. While entrepreneurs demonstrate an instinctive ability to spot opportunities and make judgements (Ardichvili et al., 2003), this may just be a case of practice (Baron & Henry, 2010). It is unreasonable to expect students to be able to recognise opportunities instinctively, which is why a more structured approach is suggested here. This step is often carried out in tandem with observation and data collection, and can be used as a form of guidance as to where to concentrate student's efforts with regards to data collection.

Idea generation

The next step focusses on idea generation. It is intimately linked to the previous step of making sense of the data. The insights gathered often are phrased as problems or themes that potential customers find important. These problems are used as the inspiration for idea generation. We encourage students to use traditional idea generation methods here, such as brainstorming. However, this can be described as brain storming with a twist. The students need to take into consideration the perspectives of various interest groups when generating ideas. In generating ideas they need to take into account three distinct perspectives; customers wants; what is financially viable; and finally what are the students capable of executing on (Brown, 2009). The students are then encouraged after the brain storming session to filter out those ideas that fail one of the criteria, or to alter the idea to better fit these perspectives. Rae (2004) argues that through practice entrepreneurs develop a theory of "what works". As students are new to entrepreneurship, they lack this instinctive filtering mechanism. The next step is designed to give student experience in what works and what does not work.

Prototyping

Following their idea generation session student teams musts select an idea to pursue further. The settling on a decision is of itself often a learning opportunity for students who must overcome discussions within the group around making judgements as to what forms a "good" idea. Having settled on an idea, the students are then encouraged to produce concrete versions of their proposed solutions in the form of prototypes. The concept of prototypes are well known within design, however in entrepreneurship they have a less known history. Although there has been a move towards prototyping businesses with the popularisation of lean methodologies (Ries, 2011) and Value Proposition Design approaches (Osterwalder et al., 2015). The idea is to de-risk launching a new business (Ogilvie & Liedtka, 2011). The students are encouraged to think of their solutions not just in terms of products or services, but rather far more holistically in the form of business models. While the process set out by Osterwalder et al. (2015) is useful from a theory point of view, an over attention to it tends to be a distraction for students. Close adherence to the book can lead to students not leaving the classroom and failing to test their ideas. Even though they may have a clearer understanding of theory. We suggest therefore leaving students "blind" to some theory, and allowing them to experience uncertainty and ambiguity as suggested in Kamovich & Longva (2015), and encouraging them to prototype their businesses.

While we emphasise a strong focus on doing, there is still theory underlying this. It is not doing just for the sake of doing, but with a clear purpose. Entrepreneurs are often blinded by their own enthusiasm regarding what they think is a good idea. They should therefore launch their businesses as quickly as possible, releasing the idea into the real world to gauge the response it receives. This idea is reiterated in design literature, that ideas should be tested in the real world, and that their true value cannot be established purely by thinking about an idea or writing a business plan about it (Ogilvie & Liedtka, 2011; Osterwalder et al., 2015; Sims, 2013). The inability to know beforehand the outcome of a new project is discussed in Gerstenberg, Sjöman, Reime, Abrahamsson, and Steinert (2015). They state that the only way to discover how an innovation will behave is to test it in the real world, as there is no way of knowing the unknown in advance and that analysis of an innovative business idea is a fictional exercise based on assumptions. Therefore releasing prototypes and learning along the way represents an effective and affordable away to test new ideas (Steinert & Leifer, 2012).

Having launched a business once, the theory goes that launching another business in the future will be less daunting (Baron & Henry, 2010). Although the evidence is mixed as to whether prior start-up experience is an advantage (Alsos & Kolvereid, 1998; Honig & Karlsson, 2004). Although it can be argued that students testing their idea in the real world and launching a business can be considered practice (Baron & Henry, 2010). Practice plays an integral part in shaping knowledge structures. Having launched a business students are then encouraged to keep working through the various steps from observation of how their business is received;

through to gaining insights about why the business is successful or not; through to creating ideas; and implementing new solutions.

Learning as part of the process

The entire process is carried out in teams and focusses on learning within a group structure. This is consistent with Burgoyne (1995) who redefines Kolb's experiential learning model from a relational perspective. His core argument is that the nature of learning from experience is not one that takes place in isolation but is something that takes place within a social context and is therefore influenced and affected by those with whom the learning takes place, and that learning is therefore a social experience. For Burgoyne, a collaborative meeting of minds is critical to the creation of both individual and collective learning. While entrepreneurship has focussed predominantly at the individual level, the reality is that entrepreneurs rarely achieve success alone. We therefore consider it important that learning should be something that takes place collectively within a group.

Reflection in addition is vital for developing knowledge from experience and is, according to Neck and Greene (2011), especially important when facing perplexing experiences, conditions of high uncertainty and problem-solving. Reflecting upon experiences should enable what Marton and Säljö (1976) characterize as deep-level processing where students gain insight by relating previous knowledge to new knowledge. They claim that when students engage in deep learning, they go beyond merely memorizing and reproducing information for assessments. Instead students will aim to make sense and thoroughly understand the subject matter and how theoretical perspectives relates to each other as well as to the real world (U. Kamovich & Longva, 2015).

6 Further research and limitations

This teaching method of incorporating experiential learning using design is relatively new to the academic field of entrepreneurship, as such there has been a lack of discussion about how to apply the design perspective in an operative way. The other consequence is there is little evidence other than anecdotal as to whether these methods in fact work. One of the difficulties in measuring effectiveness is in selecting which outcomes to measure. Kamovich & Longva (2015) gathered evidence supporting the assertion that students felt they were learning and could see the real world use of such an approach, and that they enjoyed being taught in this manner. As Baron and Henry (2010) point out, practice should not necessarily be fun. Establishing that students could see the use of the method is not the same as establishing whether deep learning has actually occurred. In addition there is no data on whether such methodology creates additional start-ups or instances of entrepreneurship. Students do not always come as far as launching their business, many often getting stuck along the way. Research into how to help students move past the mental barriers they encounter would be a fruitful field for further research. Finally, where those instances of start-ups were to occur, there is little to no discussion as to whether this is in fact a positive for the economy, or whether these students would have generated more value for the economy had they followed more traditional career paths. Finally, as Neck and Greene (2011) discuss, assuming that economic value is the only measure of success for entrepreneurs does not take into account that most entrepreneurs are motivated by factors other than financial rewards. We acknowledge that the teaching methodology described here is not supported by data demonstrating its effectiveness, this can form the basis of ongoing research.

7 Conclusion

We have set out a discussion on how design principles can be incorporated into teaching entrepreneurs. The suggested teaching method has a strong emphasis on using design based skills to carrying out activities around identifying opportunities, and launching prototypes of their businesses to test the quality of their ideas. The

process is iterative, and the learning continues throughout the process. While the process has been described in a linear step-wise process, the reality is often that students move back and forth between the steps. This becomes especially so when they become adept at understanding how to use design skills.

While the methodology focusses on doing, it does so with an underlying purpose. It provides students with a taste of the uncertainty and ambiguity that entrepreneurs face on a daily basis. As individuals approach the possibility of becoming entrepreneurs and think about the different skills required to create a new venture, their mind-set may foster some self-perceptions and inhibit others, enhancing different types of self-efficacy (Kickul et al., 2009). The purpose of engaging in the entrepreneurial process described here is to challenge some of these perceptions, and to reduce the mental barriers that may exist in student's minds. In seeing that they are capable of launching a business, and that doing so is often challenging and rewarding, they may be forced to re-asses some of those mental schemas and adopt beliefs that are closer to reality. In this way the design methods can be used to bring about what is recognised within entrepreneurship literature as a key component of becoming an entrepreneur, which is cultivating an entrepreneurial mind set.

8 References

Alsos, G. A., & Kolvereid, L. (1998). The business gestation process of novice, serial, and parallel business founders. *Entrepreneurship: Theory and Practice, 22*(4), 101-102.

Alvarez, S. A., & Barney, J. B. (2002). Resource-based theory and the entrepreneurial firm. *Strategic entrepreneurship: Creating a new mindset, 89*, 105.

Ardichvili, A., Cardozo, R., & Ray, S. (2003). A theory of entrepreneurial opportunity identification and development. *Journal of Business venturing, 18*(1), 105-123.

Baron, R. A. (1998). Cognitive mechanisms in entrepreneurship: Why and when enterpreneurs think differently than other people. *Journal of Business venturing, 13*(4), 275-294.

Baron, R. A., & Henry, R. A. (2010). How entrepreneurs acquire the capacity to excel: Insights from research on expert performance. *Strategic Entrepreneurship Journal, 4*(1), 49-65.

Beckman, S. L., & Barry, M. (2007). Innovation as a learning process: Embedding Design Thinking. *California management review, 50*(1).

Brown, T. (2009). Change by design.

Burgoyne, J. G. (1995). Learning from experience: from individual discovery to meta-dialogue via the evolution of transitional myths. *Personnel Review, 24*(6), 61-72.

Capelleras, J.-L., & Greene, F. J. (2008). The determinants and growth implications of venture creation speed. *Entrepreneurship and Regional Development, 20*(4), 317-343.

Cope, J. (2005). Toward a dynamic learning perspective of entrepreneurship. *Entrepreneurship Theory and Practice, 29*(4), 373-397.

Dunne, D., & Martin, R. (2006). Design thinking and how it will change management education: An interview and discussion. *Academy of Management Learning & Education, 5*(4), 512-523.

Erikson, E. H. (1980). Identity and the life cycle.

Foss, K., Foss, N. J., Klein, P. G., & Klein, S. K. (2007). The Entrepreneurial Organization of Heterogeneous Capital*. *Journal of Management studies, 44*(7), 1165-1186.

Gartner, W. B. (1985). A conceptual framework for describing the phenomenon of new venture creation. *Academy of management review, 10*(4), 696-706.

Gerstenberg, A., Sjöman, H., Reime, T., Abrahamsson, P., & Steinert, M. (2015). A Simultaneous, Multidisciplinary Development and Design Journey–Reflections on Prototyping *Entertainment Computing-ICEC 2015* (pp. 409-416): Springer.

Hoholm, T., & Araujo, L. (2011). Studying innovation processes in real-time: The promises and challenges of ethnography. *Industrial Marketing Management, 40*(6), 933-939. doi:10.1016/j.indmarman.2011.06.036

Honig, B., & Karlsson, T. (2004). Institutional forces and the written business plan. *Journal of management, 30*(1), 29-48.

Ireland, R. D., Hitt, M. A., & Sirmon, D. G. (2003). A model of strategic entrepreneurship: The construct and its dimensions. *Journal of management, 29*(6), 963-989.

Ireland, R. D., Kuratko, D. F., & Covin, J. G. (2003). Antecedents, elements, and consequences of corporate entrepreneurship strategy. *Proceedings of the Sixty-third Annual Meeting of the Academy of Management (CD)*.

Kamovich, U., & Longva, K. K. (2015). When theory is invisible and hidden in practice: A qualitative study of one entrepreneurship course. *Manuscript submitted for publication*.

Kickul, J., Gundry, L. K., Barbosa, S. D., & Whitcanack, L. (2009). Intuition versus analysis? Testing differential models of cognitive style on entrepreneurial self-efficacy and the new venture creation process. *Entrepreneurship Theory and Practice, 33*(2), 439-453.

Krueger, N. F. (2007). What lies beneath? The experiential essence of entrepreneurial thinking. *Entrepreneurship Theory and Practice, 31*(1), 123-138.

Marton, F., & Säljö, R. (1976). On qualitative differences in learning: I—Outcome and process*. *British journal of educational psychology, 46*(1), 4-11.

Mitchell, R. K., Busenitz, L. W., Bird, B., Marie Gaglio, C., McMullen, J. S., Morse, E. A., & Smith, J. B. (2007). The central question in entrepreneurial cognition research 2007. *Entrepreneurship Theory and Practice, 31*(1), 1-27.

Neck, H. M., & Greene, P. G. (2011). Entrepreneurship education: known worlds and new frontiers. *Journal of Small Business Management, 49*(1), 55-70.

Nielsen, S. L., & Stovang, P. (2015). DesUni: university entrepreneurship education through design thinking. *Education+ Training, 57*(8/9), 977-991.

Ogilvie, T., & Liedtka, J. (2011). *Designing for growth: A design thinking toolkit for managers*: Columbia University Press.

Osterwalder, A., Pigneur, Y., Bernarda, G., & Smith, A. (2015). *Value Proposition Design: How to Create Products and Services Customers Want*: John Wiley & Sons.

Peirce, C. S., & Turrisi, P. A. (1997). *Pragmatism as a principle and method of right thinking: The 1903 Harvard lectures on pragmatism*: SUNY Press.

Pittaway, L., & Edwards, C. (2012). Assessment: examining practice in entrepreneurship education. *Education+ Training, 54*(8/9), 778-800.

Rae, D. (2004). Practical theories from entrepreneurs' stories: discursive approaches to entrepreneurial learning. *Journal of Small Business and Enterprise Development, 11*(2), 195-202.

Ries, E. (2011). *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*: Crown Books.

Sarasthvathy, S. (2008). Effectuation: Elements of entrepreneurial expectation: Edward Elgar: Cheltenham.

Simon, H. A. (1996). *The sciences of the artificial*: MIT press.

Sims, P. (2013). *Little bets: How breakthrough ideas emerge from small discoveries*: Simon and Schuster.

Steinert, M., & Leifer, L. J. (2012). 'Finding One's Way': Re-Discovering a Hunter-Gatherer Model based on Wayfaring. *International Journal of Engineering Education, 28*(2), 251.

Combining Technology and Entrepreneurial Education Through Design Thinking: Students' Reflections on the Learning Process

Brief running title: Design Thinking in Entrepreneurship Education

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ABSTRACT

There has been a growing call to educate scientists and engineers in entrepreneurship. However, how entrepreneurship should be taught to these students is a question that scholars and practitioners are still intrigued with. Design thinking has been put forward as a pedagogy that could be particularly suitable when introducing entrepreneurship to science and engineering students. Empirical evidence to support this claim are scarce. This study therefore seeks to enhance our understanding of this issue through an exploratory case study of students' reflections during and after participation in a course that uses design thinking to teach entrepreneurial skills through a technologically challenging case. The findings indicate that the course constituted a major challenge for the students, but also an opportunity for developing both tangential skills and knowledge about the commercialization of technology. Further, there is evidence of transformational learning as students began to apply design thinking in real-life beyond the context of the course.

INTRODUCTION

In a volatile and rapidly changing world, students within science and engineering need to have advanced technological skills that meet the demands of our knowledge-based economy. However, scientific and technological skills alone are no longer enough to prosper as an employee in the 21st century (King, 2012; Litzinger et al., 2011). Scientists and engineers cannot solely rely on their technological knowledge but will also be expected to have skills in areas such as problem solving, creative thinking, written and oral communication and teamwork (Jonassen et al., 2006; Passow & Passow, 2017). It is also critical for them to understand how technology can be brought successfully to the market through commercialization (Barr et al., 2009; Bilán et al., 2005). Nevertheless, there have been indications that science and engineering students are not acquiring these skills in their education to the extent that they should (Jonassen et al., 2006; Male, 2010). Design thinking has been proposed as one way of teaching an entrepreneurial mind-set to students (Daniel, 2016; Neck & Greene, 2011; Nielsen & Stovang, 2015) and may represent a way of filling this skill deficiency. Design thinking has gained popularity within entrepreneurship education over recent decades (Huq & Gilbert, 2017; Lahn & Erikson, 2016). Yet, there is limited insight into how students perceive design thinking as a teaching method. Hence, through an exploratory case study, this paper aims to address the following research question: *How do students reflect upon their learning process of design thinking in education that combines entrepreneurship and technology?*

In order to bridge the gap between science and engineering education and the skills that employees of the 21st century need, there has been a growing call from industry bodies to educate science and engineering students in entrepreneurship (e.g., European Society for Engineering Education 2012, 2017). Introducing entrepreneurship to these areas of study has accordingly been given increasing attention both in practice and research (Duval-Couetil et al., 2012; Mitchell, 2007; Vest, 2005). With the rapid growth of the new area of engineering entrepreneurship education, there has also been a growing call for research and assessment of education within the field (Bilán et al., 2005; Täks et al., 2014). This is also an issue within the broader field of entrepreneurship education, where scholars are discussing how to teach entrepreneurship and which outcomes to expect from different teaching methods (Fayolle, 2013, 2018; Neck & Greene, 2011; Pittaway & Cope, 2007a).

This study takes a closer look at one teaching method, namely design thinking, that could be suitable for introducing entrepreneurship to science and engineering students. The context of the study is an interdisciplinary master's level course in corporate entrepreneurship. Corporate entrepreneurship is defined by the objectives of not only seeing opportunities for starting new ventures, but also of investigating opportunities for renewal or innovation within existing companies (Sharma & Chrisman, 1999). In the course, students were asked to find new entrepreneurial opportunities for a technological service. This required students to grasp both an understanding of the technology, its capacities and limitations, while at the same time searching for entrepreneurial opportunities. By analysing students' reflections during and after the course, we aim to contribute to a better understanding of the value of design thinking as a teaching method for entrepreneurship in general, and especially in a technological setting. As our research is exploratory in nature, it does not seek to categorically prove or disprove whether design thinking works as a pedagogy, but rather to guide the future direction of research on the topic.

The paper is structured as follows. First, we discuss entrepreneurship education and how design thinking has been introduced as a teaching method for entrepreneurship. We continue by describing the methodology used in the case study, before the findings are presented. The paper concludes with a discussion of the findings, our conclusions and the implications of our work for future research on design thinking in entrepreneurship education in general and engineering entrepreneurship education in particular.

LITERATURE REVIEW

An enhanced understanding of the role that entrepreneurship can have in economic growth and job creation, has resulted in a substantial increase in entrepreneurship courses and programs in higher education institutions worldwide (Katz, 2003; Kuratko, 2005; Pittaway & Cope, 2007a). With the increase, a multitude of teaching approaches within entrepreneurship education has emerged, ranging from traditional courses that teach students about entrepreneurship, to process-oriented courses focusing on business plan development, to more action-oriented courses introducing for example, effectual entrepreneurship, learn start-up or design-based learning (Garbuioet al., 2018; Neck & Greene, 2011; Pittaway & Edwards, 2012). While some have argued strongly that entrepreneurship education should strive to be actionable, others have suggested a more processual approach where learning about, for and through entrepreneurship (Hannon, 2005; Jamieson, 1984) are not mutually exclusive, but are rather complementary pedagogies that can be present in the same course (Blenker et al., 2011; Thrane et al., 2016).

It is generally agreed that it is valuable to have elements of active and practice-based pedagogies in entrepreneurship education courses (Hägg, 2017; Neck & Greene, 2011; Rasmussen & Sørheim, 2006). The action orientation is often different to what the students are used to in other courses and thereby pushes them out of their comfort zones (Sidhu & Deletraz, 2015). Being outside one's comfort zone releases the potential of personal growth and development (Dweck, 2008) and can thereby lead to deeper learning (Marton & Säljö, 1976) and perspective transformation (Mezirow, 1991). As Mezirow (1991) describes, educators need to be facilitators of learning environments that promote transformation through critical reflection on assumptions and beliefs. The strong bias towards action orientation therefore needs to be counterbalanced with reflective thinking to avoid cognitive overload among entrepreneurship students (Hägg, 2017). Applied purposefully, action-oriented pedagogies are expected to prepare students for the real world (Neck & Green, 2011). After all, in the words of Neck & Green (2011, p. 55), "entrepreneurship is complex, chaotic, and lacks any notion of linearity", and entrepreneurship educators accordingly have the responsibility to deliver courses that develop the skills that students need to excel in highly uncertain and ambiguous environments.

Science and engineering students also need these skills as employees in the 21st century job market. While their education provides them with strong technological knowledge, they will also be expected to be skilled in areas such as problem solving, creative thinking, communication, teamwork and commercialization (Bilan et al., 2005; Barr et al., 2009; Jonassen et al., 2006; Passow & Passow, 2017). However, there have been claims that science and engineering education is not providing enough opportunities to acquire these skills in its present form (Jonassen et al., 2006; Male, 2010). Entrepreneurship has been introduced as a way of enhancing the development of such skills in these areas of study (Duval-Couetil et al., 2012; Mitchell, 2007; Vest, 2005). The commercialization aspect has especially received increasing attention, as universities are becoming preoccupied with providing education programs that contribute to the establishment of new ventures or the creation of new business entities within existing companies through corporate entrepreneurship (Barr et al., 2009). The literature on the impact of entrepreneurship education on science and engineering students is limited (Huang-Saad et al., 2018). Although, there are contributions to this literature; for example, Duval-Couetil et al. (2012), who established that technology and venturing self-efficacy, ability to evaluate business ideas and risk tolerance is significantly higher for engineering students with entrepreneurship education than for those without. Further, Bilan et al. (2005) studied an engineering entrepreneurship course and found a significantly higher score for creativity, ability to generate business ideas and presentation skills in students after having taken the course. Maresch et al., (2016) compare business and engineering students, and find that although both have increased entrepreneurial intention after entrepreneurship education, the effect is less for engineering students than business students. They accordingly suggest that the pedagogy of

entrepreneurship education should be adapted to fit engineering students better and that a design approach could be a means to do so.

Design thinking is a form of teaching that aims at generating new ideas and exploring alternative solutions, instead of picking between existing alternatives (Beckman & Barry, 2007). Multiple models of design thinking have emerged over the years as design thinking has spread from the design community to a variety of other fields (Dorst, 2011). In this paper, design thinking is portrayed in line with Brown (2008) as a series of five steps: empathize, define, ideate, prototype and test. Design thinking has been regarded as an efficient approach for tackling highly ambiguous situations and unveiling unanticipated problems very early (Fixson & Rao, 2014), and several scholars have argued for its value in management education (Dunne & Martin, 2006; Garbuio et al., 2018), in entrepreneurship education (Garbuio et al., 2018; Daniel, 2016; Neck, Greene, & Brush, 2014; Nielsen & Stovang, 2015) and social entrepreneurship education (Kickul et al., 2018). Garbuio et al. (2018) state that students tend to easily handle well-defined processes that require analytical reasoning to reach a single answer with significant guidance from instructors. They argue that design cognition provides a way to introduce students to complex, ill-defined entrepreneurial problems with unclear means-end relationships, and thereby prepare them for what they will meet as graduates. Further, Penaluna & Penaluna (2019) argue that design thinking can be particularly relevant when introducing entrepreneurship education to study programs outside business schools, while Ranger & Mantzavinou (2018) highlight the opportunities it provides for non-traditional engagement with industry partners.

There has been an increased interest in understanding the processes and outcomes that take place when design thinking is used as a teaching approach. As a novel teaching method, the literature on design thinking in business education is still in its infancy. However, there have been studies conducted in other contexts that suggest that design thinking has the potential for making students in secondary education more agentic, inspired, interested in learning and developing themselves, helping them to master new skills and apply their talents responsibly (Carroll et al., 2010; Wagner, 2014). Nevertheless, the same studies indicated that there were also challenges in terms of collaborative learning and time pressure. In an entrepreneurship education context, Daniel (2016) carried out a comparative case study of design thinking and business planning, and found that students in the design thinking course felt more motivated and content with their performance. Students were however less positive in terms of the activities in the course, the assessment methods and found the course too easy. As the study is based on students' programme evaluation through the university quality assurance system, there is less insight into why this was the case, and the study thereby highlights why using standardized evaluation surveys can be problematic when aiming to understand students' perspectives. Lahn & Erikson (2016) are also advocates for a design-based approach in entrepreneurship education and argue through a thematic analysis of master theses that entrepreneurship education through design appears to strengthen systematic self-reflection and learning, compared to master students that participated in start-up internships. Finally, Huq & Gilbert (2017) emphasize how design thinking can create a learning environment with humour and fewer barriers between students and teachers, empowering the students and thereby contributing to enhanced student satisfaction and learning outcomes.

Although empirical insights on design thinking are emerging within management education, its acceptance among students and teachers may still be questioned (Nielsen & Solvang, 2015). Much is still not well understood and there is a call for further research on student satisfaction and learning outcomes of design-led entrepreneurship pedagogy (Huq & Gilbert, 2017) and how it works in different contexts (Nielsen & Stovang, 2015). Thus, despite a growing interest in using design thinking in entrepreneurship education, there is still a need to explore in-depth how students perceive design thinking. This is the point of departure for this paper, which explores design thinking in a context that combines entrepreneurship education with the commercialization of technology through corporate entrepreneurship.

RESEARCH DESIGN

Research Approach

The study applied a case study methodology (Yin, 2009, 2011) and was conducted at a Norwegian university during a master's level course in Corporate Entrepreneurship in 2015. The course had an intensive format and lasted five weeks. The data collection took place both during the course and after. The limited prior literature on design thinking in an entrepreneurship education setting guided our research design in the explorative case study. Hence, we based our data collection on the principle of triangulation, applying multiple sources of evidence in order to search for converging findings from different sources and thereby strengthen validity (Yin, 2009). The primary source of data was weekly reflective diaries written during the course and reflection essays handed in by the students after course completion. This was supplemented with secondary data, observations, and an interview with the teacher in order to better understand the context of the course.

Case Description

The master's levels course in Corporate Entrepreneurship was run at a Norwegian business school. The intensive format of the course meant that the students were expected to spend the same number of working hours over five weeks that they would otherwise do during a whole semester. The course aimed to provide students with tools and methods in tackling complex problems at the corporate level. The learning outcomes of the course as published in the course catalogue are described in Table 1 below.

Table 1: Learning outcomes described in the course catalogue

Knowledge and comprehension	• Knowledge of the design thinking methodology, and how it can be applied in a corporate environment to develop innovative solutions. • Comprehension of cutting-edge innovation topics such as crowdsourcing and human-centred design. • Understanding of how corporate culture is developed and how it can be gradually and purposefully changed towards a more entrepreneurial mind-set.
Skills	• Students should gain the necessary skills to inject any corporate environment with creative, innovative, and entrepreneurial solutions.

Competence	• Students should be able to serve as successful, creative change agents in business organizations of all types.

The teaching approach in the course relied on several practices substantiated by actionable theory (Neck et al., 2014) and were based on the design thinking process model described by Brown (2008) as a series of five steps: empathize, define, ideate, prototype, and test. The theory behind the course was largely kept hidden from students, as discussed in Kamovich and Longva (2016), with the course instead emphasising the practical activities of searching and exploring for entrepreneurial opportunities. In an interview, the course teacher emphasized that in his opinion students learned best by *doing design thinking*, rather than learning *about design thinking*. Unlike more conventional university courses where students obtain static knowledge about existing theories and models focusing on "what is" and "what has been", this course required students to be active participants in creating their knowledge with a focus on "what might be" (Dunne & Martin, 2006; Nielsen & Stovang, 2015). The course teacher is a serial entrepreneur with a background from Stanford Graduate School of Business, where he was introduced to design thinking. Besides having a theoretical understanding of the design thinking concept, he also actively applied it in a social enterprise that spun out of the Hasso Plattner Institute of Design at Stanford University (commonly referred to as the d.school). He had taught design thinking within higher education for the 5 years prior to this course. In the course, the teacher was supported by a team of four teaching assistants, who all had previously taken several courses where design thinking had been used as a teaching method.

The students were from several different masters' programmes and had mixed backgrounds, including finance, military, computer science, hospitality, literature, public relations, law and an electrician. In the course, the students were divided into four teams and introduced to four different "real-life" problems. The company is a provider of ground station and earth observation services for polar orbiting satellites with its head office in Norway. The company's services are highly technical in nature and were outside the normal subject matter taught to students. The company agreed to partner with the course in order to create and explore opportunities for the applicability of their remote sensing technology. The technology served as a basis for formulating the initial problems in the areas of the company's interest. The problems varied from predicting macro-economic trends or benefiting commercial organizations to helping commodity or equity traders to make better investment decisions using remote sensing images. The initial problems the students were to tackle were perceived as ill-defined from the outset of the course; thus, mimicking a real-world situation where opportunities and the directions of projects are vague and uncertain. The students were introduced to an existing company's problem instead of working on their own, as this was a setting that many students would be meeting in the work place. However, the problem was ill-defined and needed to be re-defined by the students.

The course was divided into five thematic time blocks, each dedicated to one step in the design thinking process as described by Brown (2008). Despite such partition, the non-linearity and iterative nature of the process was emphasized, encouraging students to freely navigate between the steps. At times, the student groups were interrupted and forced to move onto a different step. In interviews with the teacher, he commented that he actively managed this and pushed student groups that had become stuck or stagnated on a single step to move onto a different thematic block. Design thinking is iterative in nature and implies going forth and back between the five steps in the design thinking process. The feedback loops and shifts that occur foster learning and assist students to make headway towards a solution for the problem space (Nielsen & Stovang, 2015).

Since each stage in the design thinking process has its own logic and requires its own concrete tools, the course employed different activities to introduce a number of tools and methods to support each step. For example, to increase students' aptitude for empathy, several exercises were used to teach them the value of observation. Another exercise introduced them to conducting in-depth interviews. The students paired up and started interviewing each other. They were asked to avoid closed-ended questions, ask for details, ask 'why?' questions at least five times, elicit stories and emotions, and take notes. Tools and methods such as a user journey map and process blueprint, prototyping, and storytelling were also used. Unlike the DesUni model (Nielsen & Stovang, 2015) that allows for business-oriented tools and methods, this course did not employ any such tools.

Hence, from an ontological point of view, the course adheres to the "creation" approach in the entrepreneurship literature debate about the nature of opportunities. The creation approach emphasizes experimentation and the ability to learn from it (Alvarez & Barney, 2007), and students are accordingly required to exercise creativity, mental flexibility, as well as the willingness and ability to fail and learn from it (Garbuio et al., 2018). Thus, instead of assuming that opportunities already exist in the environment, design thinking focuses on making new ideas and opportunities emerge through deliberate practices (Nielsen & Stovang, 2015). In this article, given the corporate venture focus of the course with its ill-defined problems tackled by the students, the research took place in the context of entrepreneurial opportunity creation and relied on the design thinking process model by Brown (2008). Corresponding practical activities were used to master each step in the process and help students understand the underlying logic behind each activity. It is important to emphasize that this particular course uses a design thinking approach that has been adapted from design schools to management education. The approach has accordingly been criticized for oversimplifying design thinking (Dorst, 2011; Vinsel, 2018). While reviewing this debate is beyond the scope of this paper, it is important to bear in mind that the findings presented in the remainder of the paper stem from a particular view of the design thinking concept.

None of the authors were involved in teaching the course, although two of the authors observed much of the course. One of these authors acted as a teacher assistant for one of the groups. This involved meeting with the group to discuss the teams' progress once or twice a week. This contributed to a better understanding of how the students experienced the course.

Data Collection

Since our research objective was to understand the students' perceptions of the experience of participating in a course that combines entrepreneurship and technology through design thinking, the primary source of data was weekly student reflective diaries and student reflection essays. The use of student reflections as a justifiable data source in entrepreneurship education has previously been established (Heinonen, 2007; Pittaway & Cope, 2007b). Students were assessed based on a reflection essay after the course, although there were no structured learning activities on reflection during the course. Six of the students in the course agreed to write weekly reflection diaries. These were handed in at the end of each of the five weeks that the course lasted, which resulted in 79 pages of written material. The reflection diaries were not a formal part of the course and were collected specifically for this research. The diaries were guided by questions addressing the students' own perceptions of learning for each week and reflections on the application of design thinking.

The second source of written reflections were the reflection essays handed in by the students two weeks after course completion as part of their formal course assessment. While two weeks after the course is a relatively short time, we consider it balances the need for reflection with the need for the course content and highlights of the course to be relatively fresh in students' minds. From the 28 students participating in the course, 27

students gave us access to their individual reflection essays. This resulted in 229 pages of written material. Five open-ended questions were used to guide students' personal reflections. The questions revolved around the following themes: (i) Value behind the design thinking process; (ii) Major learning take-aways; (iii) Major challenges during the process; (iv) The application of design thinking in the future; (v) Distinction between design thinking and student's previous way of thinking.

In addition to the written student reflections, the data were supplemented with access to course materials, course descriptions, observations of teaching, observation of group work, as well as an interview with the lecturer in order to better understand the course specifics and the context.

Data Analysis

Recognizing that qualitative analysis is cyclical art, we carried out first and a second cycle coding as suggested by Saldaña (2012). The coding process is illustrated in Figure 1. The first cycle started with a descriptive coding strategy where the authors attempted to keep an open mind and summarize passages of qualitative data in basic topics using single words or short phrases. Two authors coded essays individually, while one author coded the reflection diaries. After coding five common essays, the coding in three of them was compared, revealing a high similarity in the use of codes. This resulted in an initial list of codes, which were used for the remainder of the essays and diaries. This cross-check of the initial essays allowed us to give sharper definitions, discuss equivocal cases, and do respective reliability checks, which led to the formulation of a common understanding around each code and its fit to the blocks of data (Miles et al, 2014). New codes were discussed and added to the list as they emerged. To aid our process of coding and analysis, we used the computer-based qualitative analysis program NVivo (version 11).

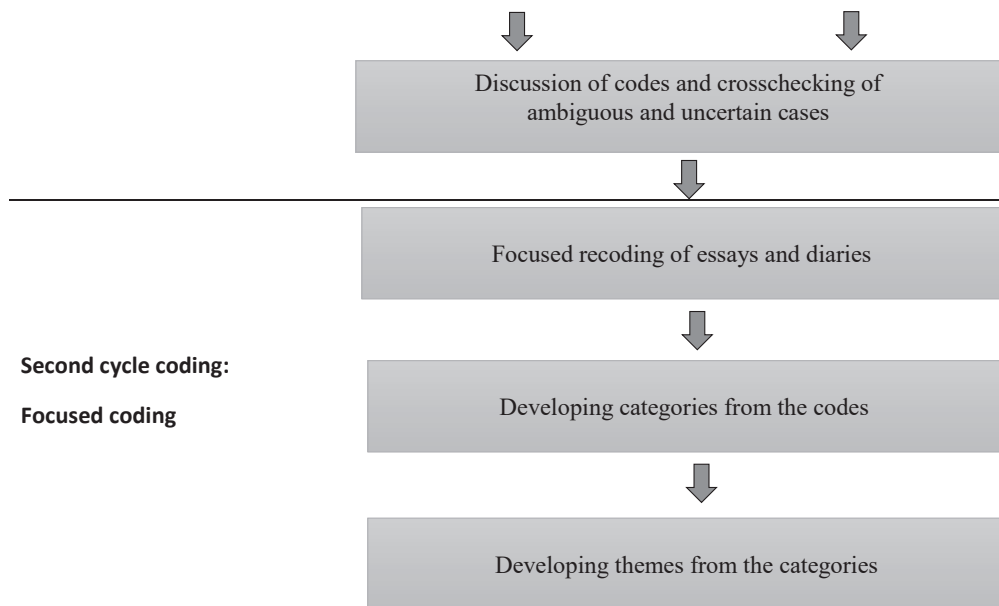| Coding stage	Reflection essays	Weekly reflection diaries
	Individual coding of five essays	
First cycle coding: Descriptive coding	Cross-referencing and creation of common codes	
	Individual coding of 22 essays using common codes	Individual coding of six diaries using common codes
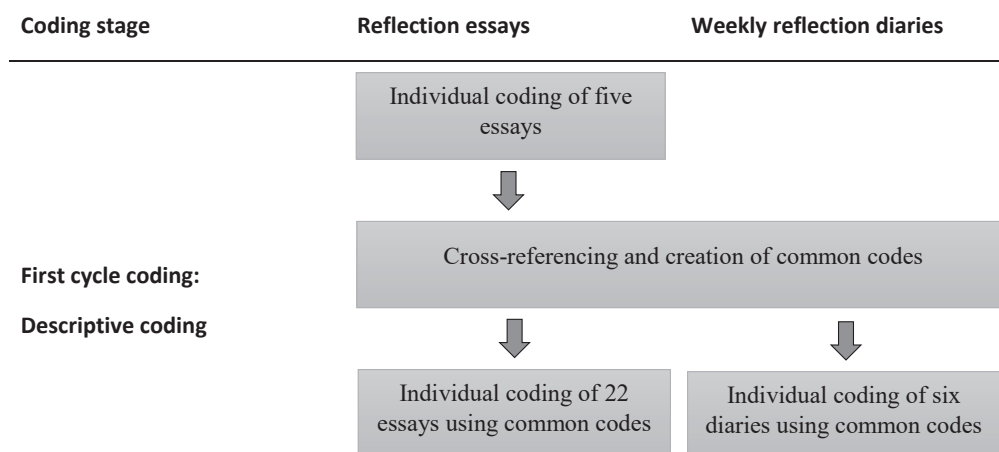
Figure 1: Stages in the coding process

After the first cycle initial coding, we advanced to second cycle coding. With the initial codes from the first cycle coding in mind, we applied focused coding when re-coding the material in the second cycle. The objective of focused coding is to look for recurrent patterns and conceptual similarity among codes (Saldaña, 2012). While coding is a highly iterative process where it is necessary to revise and refine categories and themes throughout the analysis process, the main features of the process can be described as: 1) developing categories from the recoded material, and 2) structuring the categories to arrive at broader themes.

4.0 FINDINGS

The coding of the data took us from 26 codes and 11 sub-codes in the first cycle coding, to four main themes developed from 12 categories in the second cycle coding. The main themes we arrived at are depicted in Figure 2 along with the associated categories, and the findings from these are further described in the section below.
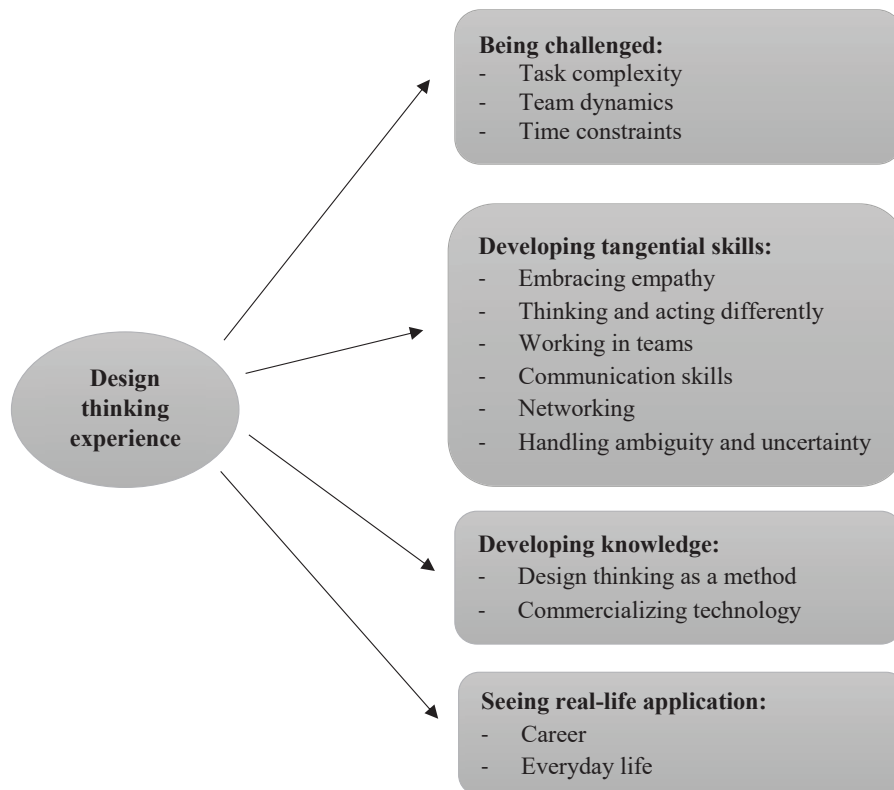
Figure 2: Main themes with associated categories

4.1 Being Challenged

One of the themes that emerged first during our coding and re-coding was how challenging the students found the course. The combination of task complexity in terms of technical and financial knowledge, working in new and rather large teams with a flat structure, and being under time pressure, appears to have caused some frustration in the beginning of the course. One student said, *"I felt powerless, and the chaos led to physical stress, with mouth ulcers and a sore neck as results, to name a few."* However, the same student said that over time, he became more comfortable, and in the end, he felt it was an overall positive learning experience. Hence, students also describe the course as a developmental experience that has had a fundamental impact. In one of the essays, a student writes, *"Yes it is challenging, and yes it is hard work - but all in all, you get to use your creative side, go out of your comfort zone and try new things."*

4.1.1 Task Complexity

The design challenge was highly technical and represented a substantial challenge for many students. Their ability to grasp two different sectors (satellite services and financial services industry) and attempt to search

for profitable intersections in these proved to be a challenge for many. In one of the essays, a student writes *"one of our main challenges was as simple as knowing how we could utilize the technology [the Company] had to solve our task. The reason why we had this challenge was because we did not have knowledge within the group on how the technology worked. As a result of this, we did use a lot of time to understand the capacity of the technology."* The students found the complexity of the task in terms of technology and industry knowledge challenging at the beginning of the course. However, following the development in the learning diaries and reflections in the essays, it appears that most students eventually came to terms with the challenge after the first couple of weeks *"Even though the complexity of the assignment at first exceeded what I really thought could be possible, at the end, I had learned so much, and the team came up with several ideas for [The Company]".* This seems to support the idea that design thinking could be valuable when training students to understand technology, its opportunities and its limitations, while at the same time having them search for commercial opportunities. The reflections suggest that the learning pushed them to the limit of their technical understanding, but that at the end of the course they felt they had come to grips with the technical element of the challenge.

4.1.2 Team Dynamics

Teamwork and collaboration amongst the team was clearly a significant challenge for many students. Many referred to conflicts or difficulties within the team in their reflections. While they were accustomed to group work, the size of the groups was larger than normal, interdisciplinary and composed of students with whom they had not worked before. As stated by one student in the learning diaries: *"My group had members with different nationalities and many strong personalities. This affected the interaction increasingly throughout the process. Overall, I think you learn more about the challenges of working in a team without a strong leader, than the design thinking method in itself. The group was quite divided at the end of the course and worked a lot to keep communication constructive."* Although teams did not experience critical meltdowns, the communication posed a challenge for many *"...we mainly worked individually, communicating through social media, and it became more 'I' than 'team'".* The lack of leadership was emphasized among many of students, as most teams had a flat structure and many were waiting for a leader to emerge. There were also indications of power struggles. The students saw the lack of leadership as frustrating and at times distracting from the overall design challenge. *"Whenever I used to do a group-work in the past, there used to be a power hierarchy and structure in the group. I always had a specific task to do and I did that. Usually the teachers corrected what they thought wasn't good enough. This time it was quite different though. There was no structure at all and no interference from the teacher".* While it might be tempting to say the teachers should have stepped in and resolved the teamwork and leadership issues, it seems like this was a key opportunity for learning to take place. One student put it succinctly and summarised the team challenges by saying the course *"demonstrates the challenges of implementing design thinking in [a] working environment and at the same time has shown how it works and which kind of challenges it brings".*

4.1.3 Time Constraints

Another aspect that students reported as challenging was the time pressure due to the intensity of the design challenge. Several emphasized that time pressure was a major challenge, especially in combination with the complexity of the technology and working in a new team. A student states, *"I think that for a task like this, we need more time. We just had five weeks on this challenge… If it is an easy challenge, you maybe not need that much time, but if the challenge is more complex, I definitely think that time is important. Concerning this [the Company] challenge, I felt we just had started when we were finished".* However, many students also saw the potential for learning time management through the induced time limits and one student writes in the

final learning diary week "*The fact that the design thinking process has time limit indicates that there is a need to manage the time and get things done quicker than we have been doing. We need to push the prototype out to the market as soon as possible because the empathy drawn on the prototype is as important as the first empathy phase. We had been hearing this a lot in the theory, but the need was much more evident when we actually did it.*" Hence, while the time constraints were a factor that really challenged the students, it was a learning opportunity where students could feel a sense of achievement in mastering the challenge despite the demanding time limits.

4.2 Developing Tangential Skills

As presented above, the challenges that the students met were demanding, but also a foundation for learning. There were many reflections on this in the data, but the main categories turned out to be embracing empathy, thinking and acting differently, working in teams, communication skills, networking and handling ambiguity and uncertainty.

4.2.1 Embracing Empathy

Throughout the essays and diaries, there are compelling indications that learning about and practising the empathy skillset was a central feature of the course. When discussing empathy, several students coupled it with their take-aways. For example, "*... I really think that any business, or person for that matter, is lost without empathy to either customers or other people, may they be co-workers, employees, friends or just random people. The importance of being able to put yourself in the shoes of another person and trying to see things from her perspective, is priceless*". Another highlighted: "*Looking back, I cannot really see how I did not make the connection at once. Now, it is so clear, so obvious; the key to making powerful innovations is understanding and addressing human needs.*" The students' reflections illustrate that going through the design thinking process enabled them to embrace a human centred focus and its importance in the entrepreneurial process and other areas.

4.2.2 Thinking and Acting Differently

Another issue that emerged was how the students contrasted the design thinking process with traditional university education. For example, "*it was quite challenging to get rid of the scientific way of working with a problem and open up for creativity with no theoretical rules on how to solve this assignment*". Several highlighted the dominance of the scientific method in previous education and that it was challenging to leave the idea of following strict rules for a predefined problem. Instead, they were allowed to define the problem area themselves and discover what the actual issues were, which made them question the limitations of traditional education. It was also experienced as a change of perspective to focus on creating value in the real world instead of focusing on academic measures. A student states, "*This was a really valuable experience for me, because it seemed like no one cared about their own grades; all they cared about was what value we could provide to [the Company].*" In terms of impact, one student writes in the learning diaries "*The insight for me this week is that design thinking process is really worth it. I really believe that it won't be exaggerating if I said this course is a life changing experience for me. It has changed the way I think and the way I look [at the world].*" Overall, the data from students paint the course in the light of having been a developmental experience for the most of them that has changed the way they see the world.

4.2.3 Working in Teams

While many emphasized that working in teams was a major challenge, this is also highlighted as a learning opportunity to develop teamwork skills. Some teams worked quite well, and one student describes in the reflection diaries how this surprised her when she was the one holding the final presentation, and everyone stayed until late to help practice. She states *"This was an extremely unique experience for me, as I have always felt alone on presentations prior to this challenge, but now I really felt that I had the whole team in my back. They were amazing."* Many students describe how positive team experiences will guide how they work in teams in the future. Others had a more challenging time and reflected more on how they would do things differently in the future. One student describes *"Well I've become better at remaining calm and constructive in a very challenging team. Further, I believe it was confirmed that those who talk the loudest is not necessarily those who say the wisest things. If we as a group had made use of everyone's' knowledge, we would have come much further, and the solution would have been better."* The students were accordingly reflecting on their experiences, good and bad, and thinking about how they would focus on team dynamics in future studies and careers.

4.2.4 Communication Skills

Several emphasized that they had developed their communication skills when communication took place within the team. In the reflection diaries, one student describes communication in the ideation process *"I learnt that communicating a lot in the group and adding up to people's idea can lead to ideas that would have otherwise been quite elusive. Sometimes, to me, it felt like I knew nothing about certain things. Then we did an ideation session where one of us had an idea and we all built up to that idea. In the process, new and supplementary ideas began to flow in dramatically."* However, communication skills were also challenged when aspiring to reach informants, doing interviews, as well as during the final presentation for the company. Students reported that they had trained and developed their enquiry skills. Many emphasized the challenge of gaining in-depth information rather than superficial information. In the first week, a student writes in his diary *"I learnt some techniques of drilling down while communicating. Building up a personal touch in communication might be quite fruitful while communicating. Starting up a communication with something exciting or catchy is often better to get the interest of the other person."* Hence, both communication within the team and communication towards external actors were highlighted as important learning experiences by the students.

4.2.5 Networking

Since the design challenge required students to make contact with people that were not connected to the course, many reported that they had made use of and advanced their networking skills. It also opened their eyes to the value of a good network when searching for information. A student had the following reflections in the second week of the reflection diaries *"The main thing I learned during this week was that I can receive much more information from the different people then I can [by] search[ing] by myself."* The students did not just advance their networking skills; they also reported having extended their network with fellow students, contacts in the company, and key individuals when searching for information outside the company. A student reflects, *"No doubt this course helped me to extend my network and I'm sure that it will bring result not only in a short-term outlook like obtaining the job but also in a long-term perspective."* The course appears to have enhanced their understanding of the importance of a network, contributed to their networking skills, and extended the students' networks.

4.2.6 Handling Ambiguity and Uncertainty
The design challenge was intended to put the students outside of their comfort zones, and this forced them to try to cope with ambiguity and uncertainty. In the reflection diaries, one student describes the beginning of the second week this way "*In the very beginning of this week I had the only one thought in my head: "I understand that I don't understand anything". It was like a mess.*" However, as the course proceeded, many students also expressed the feeling of mastery in handling ambiguity and uncertainty as they learned to live with it. One student reflected upon this in her final reflection diary week: *"What I have learned will always be helpful in a real-life setting, accepting that ambiguity and uncertainty is not bad, that feeling demotivated and stuck is sometimes what you need to open your mind to other possibilities."* Hence, it seems that this student felt more prepared for dealing with ambiguity and uncertainty in the future after experiencing the design thinking course.

4.3 Developing Knowledge
The design challenge introduced students to new technologies, industries, and methods. This was emphasized as an important aspect for developing knowledge in the students' reflections. The categories that emerged as especially important during the analysis process, was knowledge of the commercialization of technology and the design thinking process itself.

4.3.1 Commercializing Technology
Getting to know a large technology company along with the satellite and finance industry was highlighted as an important experience in the course. Some describe acquiring new technological and industry insight *"But the fact that these satellites are orbiting around the earth in a different speed, depending on their altitude, was new to me. I think this industry is really exciting - and especially when I feel that I learn new things every week."* More importantly, many of the students also reflected on the commercial opportunities that the technology could have and saw possibilities for value creation. Students were seeing opportunities for applying the company's technology for the aviation industry, environmental organizations and the farming industry. One student stated, *"I came to know that, among others, one good potential use of satellite images was to use it in agriculture to do precision farming. Here, the satellite images can be used to determine which part of a large tract needs more nutrition and which part is doing well"*. Hence, while students were acquiring technological knowledge, they were also developing insight into how to commercialize technology within a corporate setting.

4.3.2 Design Thinking as a Method
The students' reflections on design thinking as a method focused on the tools or steps that were used during the course, as well as the philosophy behind it. Although the level of reflection varied, a vast majority of the students showed good comprehension of the theory behind design thinking. They were not only repeating the theory back but were also critically reflecting on the reasoning behind it and its applicability. For instance, they interpreted the method in their own way with quotes such as *"I have concluded that design thinking is a sensational method that uses the discipline of the designer's sensibility to match people's needs with what is technologically feasible and what a viable business strategy with customer's insights can convert into products or services."* However, there were also some critical reflections on the use of design thinking. Some highlighted that it was not learning the process itself that was most important, but rather the skills they developed *by* using it. Further, there were also reflections about its appropriateness for different challenges, and one student described this in relation to the complexity of the challenge *"…this week I have learned some*

potential flaws in the Design Thinking process, and I have realized and learned more about our own mistakes and "should-haves". For starters, the time restriction in the Design Thinking process didn't quite fit with our challenge." However, in general, the students highlight the value of design thinking as an alternative to traditional teaching and problem solving methods. One student summarised this as *"The design thinking methodology is not a linear process where you start in one end and keep on going straight forward until you hold the finished product in your hands. You will have to go back and forward between the different stages of design thinking, and make changes to the idea and prototype."* The iterative process and the customer focus appears to have made an impression on students, and several also emphasize the focus on taking action and failing quickly as a new insight for them, as opposed to spending large amounts of time on planning before taking action.

4.4 Seeing Real-life Application
When discussing real-life applications in the reflection diaries and essays, students focused on how the design thinking process could be relevant for them in current jobs, future jobs, in extracurricular activities, and even in their private relationships. That students were immediately and voluntarily applying lessons learnt to their personal and professional lives stands out as an important impact of the course.

4.4.1 Career
Several of the students saw a potential for applying what they had learned in the course in their present or future careers. This concerned both the skills they had acquired, as well as the knowledge of technology, commercialization and the design thinking process. One student wrote in the final reflection diary week *"we can apply the things we have learned this week in our daily work - when we read a lot of information and we have to use only the most important. We can prototype everything we want - from an idea to a new product or business. After this project we have more knowledge about the process, and we could apply it for every new project or idea."* Others saw the potential of using insights from the course in their current start-up *"The innovation process is about giving the customer what they need by first defining what this actually is. This was very useful, and I will use it myself. It is apparent that you get a lot of insight if you dare to contact the right people and ask "stupid" and clever questions."*

4.4.2 Everyday Life
The students also saw potential for using what they had experienced in everyday life and some reported doing so both during and after the course. In the reflection diaries, one student writes, *"Also, the course has been quite influential for me as it has got me looking for rooms for improvement in everyday life. From idea of having a foot stand on the back of seats in public buses where passengers sitting can put their legs on, to installing a bus schedule at the airport, I've empathized and found out what problems users are facing and what could be done to comfort them using some tools of design thinking process within my mind."* One student had already used the design thinking process in discussions at a parent meeting at her daughter's school, while others emphasized their training in communication skills was valuable for personal relationships in general *"Generally, ability to listen the other persons and ask right questions can help not only in the professional environment. These skills are absolutely necessary both in marriage and in the other areas of our lives."*

5.0 DISCUSSION

Reviewing the results of the students' reflections demonstrates that they have learnt both the design thinking process and acquired knowledge about how to commercialize technological opportunities. This is perhaps not surprising since knowledge of these topics was specified as a learning outcome in the course description. It is an important insight that students confirm this in their reflections, but it was also something that could be expected due to the course description.

The part that seems to have been most significant for students is real world learning, which might also be considered as a tangential benefit of participating in the class. This is demonstrated through learning what we label as tangential skills. Students report that they have embraced the concept of empathy during the process and learnt to take and understand others' perspectives. Further, they describe improvements in their communication skills, their networking skills, and their team working skills, and feel more prepared to handle ambiguity and uncertainty in the future. Finally, students state that the course experience has actually changed their perspective and taught them to think and act differently. Several describe this as a contrast to other courses in their degree, where they are used to pre-defined problems with rules to follow in order to solve them. There were no structured learning activities targeted specifically at acquiring these tangential benefits. Rather, they seem to have appeared as a result of the experience itself and the context it took place in. These tangential skills are similar to the entrepreneurial competencies described in the EntreComp framework (Bacigalupo et al., 2016) which are essential in the 21st century job market, especially for engineers and scientists who are expected to contribute to developing new and improved products and services (Duval-Couetil et al., 2010; Vest, 2005). Newly qualified engineers and scientists will not meet pre-defined problems that traditional analytical approaches to education have tended to focus on, but will face ill-structured challenges where novel solutions must be developed. Hence, the skills identified by students in this study are exactly those that industry are calling for in new graduates. Industry will require workers who are not only technically competent but have human skills. Design thinking in this context has demonstrated that it can be a fruitful training ground for teaching such skills in a technological environment and thereby introducing so called soft skills to students of hard sciences. The students' reflections provide encouraging support for the claims made by those pushing design thinking as a pedagogy for training business, engineering and science students of the future.

The tangential learning that has occurred here is consistent with results reported from other types of experiential learning in entrepreneurship education (Täks et al., 2014). This fact raises the question, are the positive results experienced from a design thinking methodology specifically related to design thinking, or are they results that are the consequence of students taking a greater cognitive ownership of their learning through active experimentation, concrete experiences, reflective observation, and abstract conceptualization as described by Kolb (1984). Our findings do not suggest that design thinking is *the* best way to teach entrepreneurship, but rather as one of the approaches that appears to support the development of entrepreneurship skills, as well as several generic skills through tangential learning. Yet, the findings suggest that this particular course enabled students to develop these skills, *while* acquiring a user- and human-centred perspective when solving commercialization problems for technology. Entrepreneurs, and scientists and engineers alike, should strive to create opportunities by understanding the perspectives and latent needs of people they are designing for (Dunne and Martin, 2006; Neck et al., 2014). Design thinking is particularly valuable to promote this, as it places the user at the centre and encourages students to understand users' needs, acts and thoughts on a deep level (Nielsen & Stovang, 2015). We observed that some students struggled and felt uncomfortable, especially at the beginning of the process, to engage with users and stakeholders. However, towards the end of the course students appeared much more comfortable in this process of finding user needs, which suggests that they have acquired a more human-centred perspective for the technology they were working with. The student's engagement in the task appears to be consistent with them being on a "mission" as described by Amabile and Kramer (2011). Whereby the combination of an important task and

time pressure combines to result in creative work. Balancing this sense of urgency so as not to be overwhelming appears to have been a delicate task that the teacher has actively managed.

Another important finding from the reflection material is the fact that the students are not only repeating theory and describing experiences, but are reflecting on underlying principles, critically evaluating the knowledge, and are seeing applicability for the learning experience beyond the course. They describe application both in their everyday life when noticing disharmonies that can form the basis for entrepreneurial opportunities (Blenker et al., 2011), as well as in their present careers and in their vision of their future careers. In the words of Marton & Säljö (1976), the students appear to have moved beyond surface learning and approached learning at a deeper cognitive level. In fact, for several of the students the learning appears to have been transformational as described by Mezirow (1991). They describe their new insights as something that has changed how they view themselves (psychological transformation), how they see the word (convictional transformation), as well as how they actually act (behavioural transformation).

Finally, the challenge aspect of the course received substantial attention in the students' reflections. Traditionally, it has been considered that the teacher's role should be to make learning as easy as possible for students in order to motivate and engage them. The students' reflections tell an alternative story. The reflections emphasize the difficulty the challenge provided to them, and nevertheless describe their motivation and engagement in the task. Hence, it appears that the students found it valuable exactly because it was challenging. By introducing them to a demanding challenge that combined a technical topic with a commercial focus, it has forced them to grow as individuals by rising to the challenge. This is an aspirational outcome for a course, suggesting that students might experience personal growth, and is demonstrated here by quotes from students saying that they will take the learning experience with them for the rest of their lives. One of the ways that we grow as individuals is by having small crises and learning to overcome them (Dweck, 2008; Erikson, 1980). However, developmental experiences do not need to be as profound as a mid-life crises or religious conversion in order to bring about developmental experiences (Krueger, 2007). The course seems to have been an example of how challenges might be used as a form of learning experience. Discussions with the teacher leading the course suggested that this sense of challenge was something he created intentionally, with an awareness that it would force students to rise to the challenge. As described by Sidhu and Deletraz (2015), the course pushes students out of their comfort zone and into the challenge zone. However, if students move too far from their comfort zone, they may end up in a panic zone, feeling overwhelmed and resulting in a negative learning experience. There were indications of this at the beginning of the course, where students described both psychological and physical stress. At the end of the course, most students appeared to have come to terms with the challenge and reported that they felt a sense of achievement. However, for educators it is important to find the right balance between challenge and mastery in such courses. Students may need a push out of the comfort zone, but there should also be a level of support to avoid the panic zone, as well as opportunities for reflection. Reflection is a key component to transform experience into knowledge and can, according to Hägg (2017), counteract cognitive overload that may arise when novice learners are introduced to complex problems. Seeing that the assessment in the course was a reflection essay, teaching reflection through structured learning activities is something that could be more emphasized in such courses in order to avoid the panic zone. The real world of entrepreneurship is demanding, as is the workplaces for scientists and engineers. Thus, pushing students out of their comfort zone in a safe educational setting can contribute to preparing them for the real world.

Hence, through the design challenge, the students have developed knowledge of the design thinking process, the commercialization of technology and have acquired tangential skills. Although, no student specifically stated having developed an entrepreneurial mind-set, there is ample evidence that this has occurred. Their ability to look for opportunities for the application of technology, and to identify which might have commercial potential comes through as themes in the above findings. An entrepreneurial mind-set is defined

as the ability to rapidly sense, act, and mobilize, even under uncertain conditions (Ireland, Hitt, & Sirmon, 2003). This closely describes the process the students went through during the course, starting with unclear instructions, sensing potential opportunities, following those up with potential customers, gaining feedback and synthesising this into a coherent understanding of the commercial applications of a technology. This approach is the kind of entrepreneurial mind-set that will be required of engineers working in industry in the future. They will need to be able to sense where the commercial value lies, to quickly prototype such ideas, and work within interdisciplinary teams to generate results (Duval-Couetil et al., 2010). It is important that students practice working in such a setting. The course appears to have provided the arena to do so, and the students appear to have been engaged and to have enjoyed the opportunity to learn in this manner.

CONCLUSION

Design thinking has been suggested as a promising approach to teaching within entrepreneurship education. This study aims to add to the limited body of research on this topic by investigating how students reflect upon the experience of participating in a course that combines entrepreneurship and technology through design thinking. The data suggests that students found the course valuable and engaging. Four main findings emerged. First, the students highlighted their development of knowledge and skill as an important part of the experience. The reflections emphasized development of knowledge regarding the commercialization of technology, as well as of theoretical aspects of design thinking as a method. Further, much of the learning was tangential in nature, and was therefore based on developing generic skills such as teamwork, interpersonal communication, networking, empathy, changing ways of thinking, and gaining experience with ambiguity. Another important finding was that the students felt that much of the value stemmed from the challenge that the course represented. This might be somewhat counter intuitive, as making learning easy appears to be a more natural approach. However, students found the challenge to be of value in itself. Finally, the students appeared to have gone beyond superficial learning, as it appeared to have been deep and transformational. Students reported that they were thinking and acting differently due to things they had learned in the course and were also seeing potential for applying what they had learned in real life and their future careers.

The findings provide novel insight into students' experiences and reflections during and after participating in a course, which combines technology and entrepreneurship through design thinking. Our findings have implications for how science and engineering students can be taught about entrepreneurship in an engaging manner. While traditional entrepreneurship courses can be something that feels unfamiliar for students in these areas of study, they might feel more at home in a course with a technological context that challenges them to find commercial opportunities for the technology. Hence, students learn that entrepreneurship is not only about starting a new venture but can also involve corporate entrepreneurship in existing companies. The design thinking method provides an opening for learning to focus on the user of the technology rather than the technology itself, and thereby implies a change of perspective for study areas that are traditionally product focused. As a result, we believe that these nuances are important for educators to keep in mind when planning entrepreneurship education courses for science and engineering students, as well as for policy makers who aim to promote entrepreneurship and the development of generic skills within these areas of study.

The study is not without limitations. First, we acknowledge the challenge of using reflection essays that were part of the students' formal course assessment. To address this limitation, the data has been supplemented with weekly learning diaries that were collected only for the purpose of research and that were not accessible to the teacher. The data collection also included observations, access to course material and an interview with the teacher. Second, critical thinking was encouraged throughout the course and also in the reflection essays. Hence, the grading was not dependent on whether students were positive or negative towards the course, but rather on their abilities to reflect on their experiences. The reflection essays were written two weeks after the

course finished. While the students had the course fresh in their minds when writing the reflection essay, it would be valuable to have follow-ups in future research to see whether the course impact was temporary or lasting. Moreover, we acknowledge that the course in question is based on a particular approach to design thinking positioned within business education. As there are different approaches to teaching design thinking in higher education, empirical studies of other courses could provide other findings. Finally, this study was limited to one five-week course in a specific context. To further support the findings, it would be valuable to compare this course to other pedagogies used in entrepreneurship courses for engineering and science students.

Our study also suggests avenues for future research. First, there is a need for more studies on entrepreneurship education for science and engineering students in general, as the existing body of literature is scarce. Further, the potential for multiple case studies of entrepreneurship courses across different contexts is mentioned above, as it would allow for comparison of course characteristics, learning processes, and course outcomes. It would be valuable to understand if our findings are specific to this approach to design thinking or if they would be similar in courses applying different approaches to teaching design thinking or using other experimental learning pedagogies. Also, while our exploratory study indicates promising outcomes for this particular course, there are always opportunities for improvement. Introducing alternative assessment strategies beyond written essays and providing structured learning activities for developing reflective thinking could be some suggestions for course development. Following-up on such course changes could thereby be an opportunity for research. Moreover, the role of the teacher is a potential venue for further research. As the role of the teacher often is more a coach or a facilitator in such courses, more knowledge is needed on the teachers' perspectives and how this influence the way they are teaching. For example, how do they reflect upon challenging students to go out of their comfort zones? And are there differences in how someone from a design background and someone from a business background would teach design thinking? Finally, doing larger quantitative studies applying randomized or quasi-experimental design would enable generalization of the findings and could provide important insights into the impact of contextual factors such as culture, course duration, teachers' roles or team dynamics.

REFERENCES

Alvarez, S. A., & Barney, J. B. (2007). Discovery and creation: Alternative theories of entrepreneurial action. *Strategic Entrepreneurship Journal, 1*(1-2), 11-26.

Amabile, T., & Kramer, S. (2011). *The progress principle: Using small wins to ignite joy, engagement, and creativity at work*: Harvard Business Press.

Bacigalupo, M., Kampylis, P., Punie, Y., & Van den Brande, G. (2016). *EntreComp: The entrepreneurship competence framework*. Luxembourg: Publication Office of the European Union.

Barr, S. H., Baker, T., Markham, S. K., & Kingon, A. I. (2009). Bridging the valley of death: Lessons learned from 14 years of commercialization of technology education. *Academy of Management Learning & Education, 8*(3), 370-388.

Beckman, S. L., & Barry, M. (2007). Innovation as a learning process: Embedding design thinking. *California Management Review, 50*(1), 25-56.

Bilán, S. G., Kisenwether, E. C., Rzasa, S. E., & Wise, J. C. (2005). Developing and assessing students' entrepreneurial skills and mind‐set. *Journal of Engineering Education, 94*(2), 233-243.

Blenker, P., Korsgaard, S., Neergaard, H., & Thrane, C. (2011). The questions we care about: paradigms and progression in entrepreneurship education. *Industry & Higher Education, 25*(6), 417-427.

Brown, T. (2008). Design thinking. *Harvard Business Review, 86*(6), 84-92.

Carroll, M., Goldman, S., Britos, L., Koh, J., Royalty, A., & Hornstein, M. (2010). Destination, imagination and the fires within: Design thinking in a middle school classroom. *International Journal of Art & Design Education, 29*(1), 37-53.

Daniel, A. D. (2016). Fostering an entrepreneurial mindset by using a design thinking approach in entrepreneurship education. *Industry & Higher Education, 30*(3), 215-223.

Dorst, K. (2011). The core of 'design thinking' and its application. *Design studies, 32*(6), 521-532.

Dunne, D., & Martin, R. (2006). Design thinking and how it will change management education: An interview and discussion. *Academy of Management Learning & Education, 5*(4), 512-523.

Duval-Couetil, N., Reed-Rhoads, T., & Haghighi, S. (2012). Engineering students and entrepreneurship education: Involvement, attitudes and outcomes. *International Journal of Engineering Education, 28*(2), 425.

Dweck, C. S. (2008). *Mindset: The new psychology of success*. New York: Random House Digital.

Education, E. S. f. E. (2012). *SEFI Annual Report 2011: SEFI and the Engineering Education in 2011*. Retrieved from Brussels: http://aeer.ru/filesen/SEFI_Annual_Report_2011.pdf

Education, E. S. f. E. (2017). *SEFI Annual Report 2017-2018: Building engineering education community in Europe for 45 years*. Retrieved from Brussels: https://www.sefi.be/wp-content/uploads/2017/07/05_SEFI_AR18_web-003.pdf

Erikson, E. H. (1980). *Identity and the life cycle*. New York: WW Norton & Company.

Fayolle, A. (2013). Personal views on the future of entrepreneurship education. *Entrepreneurship & Regional Development, 25*(7-8), 692-701.

Fayolle, A. (2018). *A research agenda for entrepreneurship education*. Cheltenham: Edwar Eogar.

Fixson, S. K., & Rao, J. (2014). Learning emergent strategies through design thinking. *Design Management Review, 25*(1), 46-53.

Garbuio, M., Dong, A., Lin, N., Tschang, T., & Lovallo, D. (2018). Demystifying the genius of entrepreneurship: How design cognition can help create the next generation of entrepreneurs. *Academy of Management Learning & Education, 17*(1), 41-61.

Hannon, P. D. (2005). Philosophies of enterprise and entrepreneurship education and challenges for higher education in the UK. *The International Journal of Entrepreneurship and Innovation, 6*(2), 105-114.

Heinonen, J. (2007). An entrepreneurial-directed approach to teaching corporate entrepreneurship at university level. *Education+ Training, 49*(4), 310-324.

Huang‐Saad, A. Y., Morton, C. S., & Libarkin, J. C. (2018). Entrepreneurship assessment in higher education: a research review for engineering education researchers. *Journal of Engineering Education, 107*(2), 263-290.

Huq, A., & Gilbert, D. (2017). All the world's a stage: transforming entrepreneurship education through design thinking. *Education+ Training, 59*(2), 155-170.

Hägg, G. (2017). *Experiential entrepreneurship education : Reflective thinking as a counterbalance to action for developing entrepreneurial knowledge.* (Doctoral thesis), Lund University, Sweden.

Jamieson, I. (1984). Schools and enterprise. *Education for enterprise, 1*(1), 7-18.

Jonassen, D., Strobel, J., & Lee, C. B. (2006). Everyday problem solving in engineering: Lessons for engineering educators. *Journal of Engineering Education, 95*(2), 139-151.

Kamovich, U., & Longva, K. K. (2016). When theory is invisible and hidden in practice: a qualitative study of one entrepreneurship course. In Amdam, J., Bergem, R. & Båtevik, F. O. (Eds.), *Offentleg sektor i endring* (pp. 157-173). Oslo: Universitetsforlaget.

Katz, J. A. (2003). The chronology and intellectual trajectory of American entrepreneurship education: 1876–1999. *Journal of business venturing, 18*(2), 283-300.

Kickul, J., Gundry, L., Mitra, P. & Bercot, L. (2018). Designing with purpose: advocating innovation, impact, sustainability, and scale in social entrepreneurship education. Entrepreneurship Education & Pedagogy, 1(2), 205-221.

King, C. J. (2012). Restructuring engineering education: Why, how and when? *Journal of Engineering Education, 101*(1), 1-5.

Kolb, D. A. (1984). *Experiental learning - experience as the source of learning and development*. New Jersey: Prentice-Hall.

Krueger, N. F. (2007). What lies beneath? The experiential essence of entrepreneurial thinking. *Entrepreneurship Theory and Practice, 31*(1), 123-138.

Kuratko, D. F. (2005). The emergence of entrepreneurship education - development, trends and challenges. *Entrepreneurship Theory and Practice, 29*(5), 577-598.

Lahn, L. C., & Erikson, T. (2016). Entrepreneurship education by design. *Education+ Training, 58*(7/8), 684-699.

Litzinger, T., Lattuca, L. R., Hadgraft, R., & Newstetter, W. (2011). Engineering education and the development of expertise. *Journal of Engineering Education, 100*(1), 123-150.

Male, S. A. (2010). Generic engineering competencies: A review and modelling approach. *Education Research and Perspectives, 37*(1), 25.

Maresch, D., Harms, R., Kailer, N., & Wimmer-Wurm, B. (2016). The impact of entrepreneurship education on the entrepreneurial intention of students in science and engineering versus business studies university programs. *Technological Forecasting & Social Change, 104*, 172-179.

Marton, F., & Säljö, R. (1976). On qualitative differences in learning: I—Outcome and process. *British Journal of Educational Psychology, 46*(1), 4-11.

Mezirow, J. (1991). *Transformative dimensions of adult learning*. San Francisco: Jossey-Bass.

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative data analysis: a methods sourcebook* (3 ed.). Thousand Oaks: Sage.

Mitchell, G. R. (2007). Instill the entrepreneurial mindset. *Research-Technology Management, 50*(6), 11-13.

Neck, H. M., & Greene, P. G. (2011). Entrepreneurship education: known worlds and new frontiers. *Journal of small business management, 49*(1), 55-70.

Neck, H. M., Greene, P. G., & Brush, C. G. (2014). *Teaching entrepreneurship: A practice-based approach*. Northampton, MA: Edward Elgar Publishing.

Nielsen, S. L., & Stovang, P. (2015). DesUni: university entrepreneurship education through design thinking. *Education+ Training, 57*(8/9), 977-991.

Passow, H. J., & Passow, C. H. (2017). What competencies should undergraduate engineering programs emphasize? A systematic review. *Journal of Engineering Education, 106*(3), 475-526.

Penaluna, A. & Penaluna, K. (2019). 'I'm a designer, get me out of here': can entrepreneurial education advance through learning from design education. In Fayolle, A., Kariv, D. & Matlay, H. (Eds.). *The role and impact of entrepreneurship education – methods, teachers and innovative programmes.* Cheltenham, UK: Edward Elgar Publishing.

Pittaway, L., & Cope, J. (2007a). Entrepreneurship education: a systematic review of the evidence. *International Small Business Journal, 25*(5), 479-510.

Pittaway, L., & Cope, J. (2007b). Simulating entrepreneurial learning: Integrating experiential and collaborative approaches to learning. *Management Learning, 38*(2), 211-233.

Pittaway, L., & Edwards, C. J. E. T. (2012). Assessment: examining practice in entrepreneurship education. *54*(8/9), 778-800.

Ranger, B. J. & Mantzavinou, A. (2018). Design thinking in development engineering education: a case study on creating prosthetic and assistive technologies for the developing world. Development Engineering, 3, 166-174.

Rasmussen, E. A., & Sørheim, R. (2006). Action-based entrepreneurship education. *Technovation, 26*(2), 185-194.

Saldaña, J. (2012). *The coding manual for qualitative researchers* (2 ed.). Thousand Oaks: Sage.

Sharma, P., & Chrisman, J. J. (1999). Toward a reconciliation of the definitional issues in the field of corporate entrepreneurship. *Entrepreneurship Theory and Practice, 23*(3), 11-28.

Sidhu, I., & Deletraz, P. (2015). *Effect of comfort zone on entrepreneurship potential, innovation culture, and career satisfaction.* Paper presented at the ASEE Conference, Seattle.

Thrane, C., Blenker, P., Korsgaard, S., & Neergaard, H. (2016). The promise of entrepreneurship education: Reconceptualizing the individual–opportunity nexus as a conceptual framework for entrepreneurship education. *International Small Business Journal, 34*(7), 905-924.

Täks, M., Tynjälä, P., Toding, M., Kukemelk, H., & Venesaar, U. (2014). Engineering students' experiences in studying entrepreneurship. *Journal of Engineering Education, 103*(4), 573-598.

Vest, C. M. (2005). *Educating the engineer of 2020: adapting engineering education to the new century*. Washington: The national academic press.

Vinsel, L. (2018, May 21). Design thinking is a boondoggle. *The Chronicle of Higher Education.* Retrieved from www.chonicle.com

Wagner, T. R. (2014). *Students' and Teachers' Perceptions of the Benefits and Challenges of Design-based Learning in a Middle School Classroom.* (Doctoral thesis), Virginia Tech,

Yin, R. K. (2009). *Case study research: design and methods* (4 ed.). Thousand Oaks: Sage.

Yin, R. K. (2011). *Applications of case study research* (3 ed.). Thousands Oaks: Sage

Promoting strategic entrepreneurship at the firm level: A case study on training staff within a large organisation

Matthew Lynch; Uladzimir Kamovich; Martin Steinert

Abstract: The entrepreneurial mindset of staff is considered a key strategic asset for firms. This case study examines how aspiring leaders were trained to be more innovative using predominantly design thinking methodology as a pedagogy. The case focusses on narratives as volunteered by participants about how they applied their training in their organisational roles. The article describes how the training was run, so as to provide insights into how others might lead similar training. The outcomes from the training are viewed through the lens of strategic entrepreneurship, to explain how the training generated a more entrepreneurial mindset amongst participants, improved their entrepreneurial leadership skills, and affected the organisational culture. The article also highlights the limitations of only training staff while leaving existing organisational structures in place.

Keywords: Design thinking training; Organisational training; Entrepreneurial mindset; Strategic entrepreneurship; Entrepreneurial leadership; and Entrepreneurial culture.

1 Introduction

Innovation as a strategy is crucial to the long term survival or firms (Hitt, 2000; March, 1991; Shepherd et al., 2010).

Firms can either optimise for generating short term results, or apply part of their resources to exploring and exploiting

new opportunities. The resources that need to be applied to innovating are not just in the form of financial backing,

but also in terms of human capital (Hitt, 2000; Shepherd et al., 2010). An entrepreneurial mindset of staff is

considered to be a key strategic asset for firms that can be used to identify and leverage new opportunities (Ireland,

Hitt, et al., 2003; Shepherd et al., 2010). An entrepreneurial or innovative mindset is considered a skill that can be

trained for and strengthened within individuals (Dyer, Gregersen, & Christensen, 2011; G. C. O'Connor et al., 2018).

As a field we have moved on from discussing whether it is possible to train individuals to be more entrepreneurial.

Instead, the focus is now on the different methods and their effectiveness for training individuals and in turn

organisations to be more innovative (Neck & Greene, 2011; Nielsen & Stovang, 2015). This article highlights one potential method for training staff to be more entrepreneurial and innovative – that is design thinking. This training method is explored through a case study of a large organisation who recognised a need to become more innovative in order to prepare themselves for a digital future. In order to facilitate this shift, the company decided to use an external training company to design and implement the training program.

Theory is the basis through which we can make sense of the environments we observe and in order to make sense of this case we have chosen to view it through the lens of strategic entrepreneurship as described by Ireland, Hitt, et al. (2003). The case is outlined in two major elements. First, the training, which is the input that has caused the status quo to shift with the individuals observed. The second element is based on the feedback from the participants or, in other words, the output of the training. We have chosen to focus on five vignettes that explain how participants had applied the training in their organisational setting. The article contributes to the extant literature in two ways. First, it discusses how design thinking methodology can be used to train individuals to be more entrepreneurial and innovative. Second, how the training has impacted workers within the organisation, and the organisations capacity for strategic entrepreneurship. The paper closes with a discussion on the implications of the case and suggestions for future research.

2 Literature review

Opportunity identification and exploitation is key to continued growth and wealth maximisation (McMullen & Shepherd, 2006). In order for firms to grow, they must first be able to identify opportunities, and then act on them (Hitt, 2000; Hitt et al., 2001; Shepherd et al., 2010). If they fail to act on perceived opportunities, then they will not realise potential wealth creation, and thus under reward stakeholders. Firms that have the capacity to both perceive and act on opportunities, will have a competitive advantage – as wealth is only created when firms effectively combine opportunity-seeking and advantage-seeking behaviours (Ireland, Hitt, et al., 2003; Shepherd et al., 2010). Small firms tend to be relatively skilled at identifying opportunities; however, often lack the resources to act on these perceived opportunities. As such, they lack both parts of the equation. Larger firms traditionally have shown a propensity for developing and sustaining competitive advantages, but have been less effective at spotting new

opportunities that can be exploited with their resources. Thus, they lack both parts of the equation required to maximise wealth creation. This broadly mimics the challenges set out by March (1991) who pointed out the need to balance exploration for new ideas with the incentive to exploit current opportunities in order to create long term financially-sustainable firms.

In order to generate wealth through a competitive advantage, four antecedents need to be present (Ireland, Hitt, et al., 2003). The four distinctive antecedents are entrepreneurial mindset, entrepreneurial culture, entrepreneurial leadership, and strategic management of resources. These four elements need to be present in order to actively create and develop innovative opportunities (*Figure 1.*).
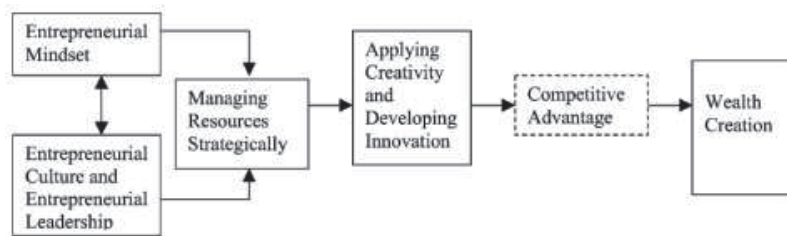

Figure 1. A model of strategic entrepreneurship (Ireland et al., 2003a)

We now briefly describe each of the antecedents required for strategic entrepreneurship to successfully occur, and with that wealth to be created. The definition of an entrepreneurial mindset is still a matter of debate (Naumann, 2017). For example, Ireland, Hitt, et al. (2003) define it as a growth-oriented perspective through which individuals promote flexibility, creativity, continuous innovation, and renewal. Alvarez and Barney (2002) state that even under the cloak of uncertainty, the entrepreneurially minded can identify and exploit new opportunities, because they have cognitive abilities that allow them to impart meaning to ambiguous and fragmented situations.

Yet, having an individual with an entrepreneurial mindset is insufficient. In addition, strategic entrepreneurship requires the existence of an entrepreneurial culture and leadership. An effective entrepreneurial culture is one that is committed to both opportunity seeking and advantage seeking behaviours, a culture in which new ideas and creativity are expected, as is risk taking. The culture where failure is tolerated, learning is supported, and where the structure of the business supports such attitudes and behaviours (Ireland, Hitt, et al., 2003; Shepherd et al., 2010). Entrepreneurial

culture fosters and supports the continuous search for entrepreneurial opportunities that can be exploited with sustainable competitive advantages (McGrath & MacMillan, 2000).

Entrepreneurial leadership is about influencing others within a firm to act entrepreneurially, which is described as enabling others to engage in opportunity-seeking and advantage-seeking behaviours (Ireland, Hitt, et al., 2003). The final antecedent is the strategic management of resources. Resources are split into three broad categories: financial, human capital, and social capital. Within an existing firm, the key category for applying creativity and developing innovation is the management of human capital (Ireland, Hitt, et al., 2003).

We use the model from *Figure 1* and the four elements discussed above as a lens through which to view the case study of a large organisation trying to impart more strategic entrepreneurship in order to assist the firm in its quest to be more digitally innovative. The value of strategic entrepreneurship and the value to organisations of being more entrepreneurial is integral (Hitt et al., 2001; Ireland, Hitt, et al., 2003; Ireland, Kuratko, et al., 2003; McGrath & MacMillan, 2000). Yet, there is still an ongoing debate about how best to train individuals to become more entrepreneurial (Pittaway & Cope, 2007).

3 Methodology

3.1 Research design

The study applied a case study approach (Yin, 2009, 2011). We based our data collection on the principle of triangulation, applying multiple sources of evidence in order to search for converging findings from different sources and thereby strengthen validity (Yin, 2009). The primary source of data was from narratives offered to us by participants voluntarily. In addition, we reviewed weekly reflective diaries written during the program by the participants and noted verbal reflections shared at set points during the training. The authors also reviewed written feedback from the participants gathered by the organisation. Lastly, we met with top executives and the managing director of the organisation, the human-resource department; got access to and reviewed company documents; and attended meetings where the training and the outcomes were the topic of discussion. Two of the three authors participated in facilitating the training. Another academic who has not participated in conducting and writing this research facilitated the majority of the program. The authors acknowledge the potential for bias in writing this case

due to their involvement in delivering parts of the training program. Participant observation and the struggles it presents for objectivity is not a new challenge. Ethnographic methods to study innovation have been used in the past (Hoholm & Araujo, 2011; Hoholm & Olsen, 2012). In addition, there have been calls to make greater use of ethnographic methods in the study of innovation due to the richness of detail it can yield (Van Maanen, 2011; Watson, 2011). Accounting for how organisations become altered, destabilised and then re-stabilise is not the same as the typical social science studies that measure 'input' and resulting 'output' to demonstrate cause and effect (Hoholm & Araujo, 2011). Simply measuring hard facts would be insufficient to demonstrate the nuances of the ways in which staff undergoing training would be impacted. Ethnographic studies offer a way to provide 'thick descriptions' of the social contexts being studied (Geertz, 1973). Narratives as told through vignettes represent a way to illustrate how innovation is occurring within an organisation (Hoholm & Araujo, 2011). This has influenced the design of the study, whereby the data selected for the main discussion is based on narratives volunteered by participants. These narratives were in addition supplemented with secondary data, observations, and several interviews with the lead facilitator of the program in order to better understand the context of the training program. The authors' involvement in the program has also provided a unique perspective that would have been unavailable to an 'outsider'. We acknowledge the amplified social bias that likely exists when an 'insider' asks participants questions related to their research, with participants saying what they think the researcher wants to say (Blenker, Trolle Elmholdt, Hedeboe Frederiksen, Korsgaard, & Wagner, 2014). To limit the negative impact of this, we did not interview participants, and instead primarily relied on the information volunteered by the participants during discussions and feedback sessions.

All narratives were shared during or after the final training modules and originate from different individuals. We use purposeful sampling to choose the narratives for this study (Patton, 1990). We selected information rich examples for which we could learn the most from, as opposed to a random sample. In doing so, the researcher examines specific interests in the phenomenon, selecting cases of some typicality, but leaning towards those cases for which we can learn the most (Stake, 1995). While the vignettes form the basis of the discussion, we are of the opinion that these perspectives demonstrate what seemed to have been relatively typical experiences for the participants of the program. We were not consciously soliciting for narratives to include in research, and gathering a large enough sample to be

considered generalizable was not the intention of this study. By clearly stating the potential bias, we move on to present the case at hand and discuss the set-up of the program and teaching method in detail.

3.2 Case description

The case focusses on a large organisation that has a global presence in 75 countries and staff of approximately 20,000 people. The company is based in a traditional industry and has an operating legacy of over 130 years. The company is still controlled by the founding family, although is publicly listed. The CEO recognises the need to be more innovative and be prepared for a digital future if they are to continue to be profitable in the near and distant future. He openly discusses the need to innovate more rapidly. The company previously had large holdings of fixed assets of a traditional nature. By selling their holdings of these assets, the firm shifted its focus to a more service-based business model. This represented a transition point for the organisation and led to it undergoing re-structures and changes in the company's strategic goals. To facilitate the ongoing changes, a tender was placed for a training organisation to provide agile innovation and leadership training to help prepare the next generation of aspiring leadership. A global innovation training company, with trainers who have academic backgrounds, won the tender.

3.3 The design of the training program

The training program consisted of four modules spread over four months. The program took place in August-December 2017. The course was repeated a second time in 2018 for different staff members, but was condensed to only 3 modules. Each module was 3-4 days long in the first iteration and 5 days long in the second iteration. There were participants from several locations around the globe, including staff from Asia, Central Europe, and Scandinavia. There was 24 participants in 2017 and 22 in 2018; selected for the course by their managers who had identified the participants as having high leadership potential.

A decision was made by the head of the training organisation before the training began that if the program was to be successful and have impact, then there was the need for top management to be involved right from the start. This was designed into the program structure in the following ways. First, the CEO and his top executive team were invited to a two-day condensed version of the training program where the main focus was the design thinking methodology. The

purpose behind this was that if top leadership got familiar and understood the basic principles then they might find it less threatening and be more supportive of the initiatives that would later spring out of the program.

In order to press home to the program participants that top leadership was behind this initiative, to train them to be more innovative and agile in their approaches, the CEO was invited in to the first day of the training program and asked to share his perspectives. During this time he expressed his opinions that their industry was in a state of change and that they must innovate in order to continue the company's legacy.

A number of top executives in the organisation (a hierarchical tier above those being trained), were asked to become mentors for the program participants. This served multiple purposes; first, it allowed the top executive team to keep tabs on what was happening within the program, which many of them had an interest in tracking given it was the first time it had been run. The mentor-mentee meetings allowed them to monitor the projects the participants worked on, as well as an opportunity to influence many of the projects in the direction that they thought would be best for the company.

Figure 1. Structured approach to implementing training

Lastly, one of the many challenges that organisations often face when trying to implement change in culture is that of spreading the new cultural perspective. In order to assist with this, the final module of the program had participants run sessions for their colleagues, thereby spreading their new knowledge further into the organisation in what could

easily be described as a pyramid scheme. The added benefit of this approach is that it raises participants' belief in their own abilities to teach others and convey new knowledge, and highlights to the participant just how much they have learnt in the training. It also attends to the highest levels of Bloom's taxonomy of learning (Anderson et al., 2001) in which teaching is considered an ideal way to integrate learnt knowledge.
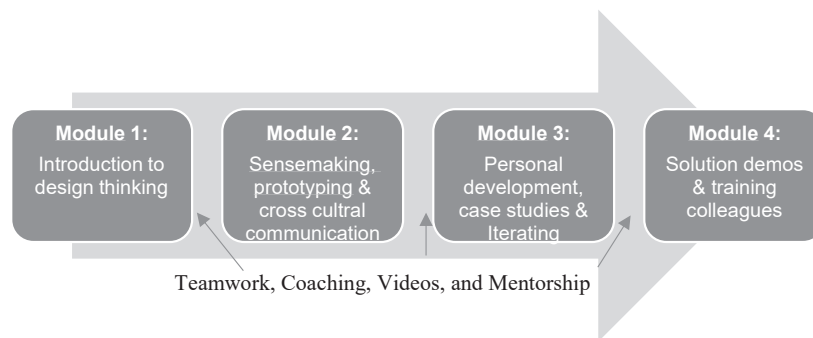

Figure 2. Timeline of training modules

The participants on the program were given an organisational challenge to work on during the course of the four-month program. The challenge served as a learning conduit, through which the techniques and skills they were taught could be applied to a context that was relevant for their organisation. The participants were placed into five teams of 4-5 persons, loosely based on the geography of their local office. Between the modules participants would meet once a week for half a day to work on their designated challenge. One of the facilitators would also call in via video chat to discuss the team's progress, be a sounding board, and provide feedback or guidance. Videos were also used to communicate content to participants when it was obvious that several teams were struggling with similar issues. In addition, the participants were encouraged to meet with their mentors, although the frequency of this varied from person to person. Lastly, participants were encouraged to keep an online journal to encourage reflection throughout the training period. The facilitators of the program had access to these journals as a way of monitoring the participants learning throughout the program. In the second version of the course in 2018, participants were encouraged to keep a paper journal instead of an online version.

3.4 The teaching method

The program content was structured around the design thinking methodology, with some additional components included. These additional components were made up of personal development, teamwork, communication exercises, feedback practices, mindfulness, case studies, presentation techniques, and lectures on digitalisation to name a few. Although the overall theme of the teaching focussed on participants "doing" activities rather than just listening – consistent with experiential learning practices (Kolb, 1984). The teaching style as described by the lead facilitator is 80% participation, 15% examples or narratives, and 5% theory. In this sense, it differs from many traditional teaching approaches in that it is not focussed on passive listening in a classroom. The teaching method largely leaves theory hidden (see Uladzimir Kamovich and Longva (2016) for a full discussion on this).

Design thinking is a form of teaching that aims at generating new ideas and exploring alternative solutions, instead of picking between existing alternatives (Beckman & Barry, 2007). Differing forms of design thinking have emerged throughout the past three decades (Dorst, 2011), the form of design thinking taught in this program was largely consistent with that described by Brown (2008) and consists of five steps: empathy, definition, ideation, prototyping, and testing. While design thinking may sound linear in nature, the course emphasised the non-linearity, cyclical nature of the steps, and students were encouraged to move freely between the steps as required. As each stage of the design thinking process has its own logic and requires its own tools, the course employed different activities and methods to assist the students with their learning. For example, in the empathy stage, participants were coached on interview techniques and practised with each other, before interviewing members of the public, and eventually applying these skills to tackle their own challenges. In order to learn about prototyping, a full day was used where differing levels of prototyping were experimented with, moving through higher orders of fidelity as the participants refined their ideas.

 There is a growing body of literature discussing the purported benefits of design thinking (Beckman & Barry, 2007; Dunne & Martin, 2006; Lynch et al., 2019; Ogilvie & Liedtka, 2011); and more specifically the benefits of design thinking for teaching students to think more entrepreneurially (Neck & Greene, 2011; Nielsen & Stovang, 2015).

4 Findings

While the teaching method largely describes the input in this context, the output is what the program participants receive out of the training, or the way the training shaped their behaviours in the workplace. We highlight this change in behaviour through vignettes that exemplify the experiences course participants. These narratives were shared voluntarily in conversations with the authors, feedback from half of the participants a year after the program ended, and email correspondence from those who wished to share their post-program experiences and reflections. As outlined in the methodology section, we draw on several sources in presenting the outcomes. However, due to space limitation, we found it suitable to structure the findings into vignettes and label them as follows: cross culture communication; new workflow; conflict de-escalation; prototyping; a year after; and round two – product development.

Cross-cultural communication

One narrative comes from an area manager, who had a large number of direct reports in the Asia area. The area manager himself was from the UK, so had a different cultural background to most of his reports. He tells the narrative of struggling to implement the desired work culture amongst his reports. He described an event where one of his reports filed an expense claim that on the surface appeared to be incorrect or potentially even warranting disciplinary action. He said he would have normally dealt with this matter swiftly, and used it as an example to other employees. However, having taken the course, with its emphasises on understanding others perspectives, empathy, listening and digging deeper into issues. He decided to try a different tactic, and invited the direct report to explain the expense report to him. While he did not describe the details of the expense or what the report told him, he did say that this simple act of asking the employee to explain the claim completely changed his perspective. The result being that there was no need to adjust the expense claim or reprimand the employee. The area manger explained that he credited the training with giving him new perspectives on how to tackle such tricky situations.

New workflow

Another narrative comes from a participant who shared a situation after he was back in his normal work routine and had a conversation with the other employee in his team. They were collectively discussing their concerns about a particular workflow that irritated everyone, and seemed needlessly bureaucratic. He said as he sat there listening to himself complain, he had the sense that he had now learnt new tools that might be applicable to handling such a situation. As it was nearing the end of the day, he gathered his colleagues and by using post-it notes and whiteboards, they began to map out the workflow as it existed at that time (a technique he had learnt during the training). They quickly began to discuss ways it could be simplified and improved. Then, they created a visual way to show how the process could work, and used several hours to complete this after the end of the workday. The following day they showed the process to their line manager who approved the new work flow, leading to a simplification in the way the team was carrying out one of their tasks.

Conflict de-escalation

The third narrative comes from an employee whose team was in perpetual conflict with another team in the organisation. It was fast approaching time to again meet with the opposing team, and she found herself dreading the upcoming meeting. She was deliberating on how to change the atmosphere of the discussions that existed between the two teams. When the meeting came around, she choose to start the meeting by running a five minute mindfulness session for all participants of the meeting. The employee describes the meeting as filled with old, traditional men who she says were stuck in their ways. She said it was amusing to be a somewhat younger woman instructing these men to listen to the sound of their breath. She said that the entire atmosphere of this meeting was much different to any of their prior meetings, and she attributed it to the mindfulness session. She said the dialogue between the two teams was the most constructive it had been in all her time working for the organisation, and that members of the opposing team also commented on the productiveness of the meeting.

Prototyping

One participant found himself bantering with colleagues (who were not on the program) about a potential new idea. He said normally the discussion would not have progressed beyond friendly banter, although he was tempted to try something different given the new skills he had learned. So he suggested that they try out some of the new methods he had learnt. The colleagues were receptive, so he lead them through an ideation session where they used brain storming to further elaborate on the idea and try to develop a more concrete solutions. They then voted on the ideas, and decided to prototype the idea using cardboard and paper. The purpose was to provide a visual and tangible representation of the idea instead of simply trying to use words to describe the idea. The following day they sought feedback from their manager, who liked the idea enough to grant them a small amount of resources, in the form of allotted time, to work further on the idea and see whether there was genuine potential behind it. The course participant said he was surprised about how he could take the learnings from the program and apply them immediately to his day-to-day work, and that his manager was so receptive to this new way of working.

A year later

A year after the program ended, we talked to approximately half the participants to discuss with them how the prior year had been since the course had ended. Two had left the organisation during this time. Those that remained with the organisation expressed surprisingly similar experiences. They felt they had personally grown as individuals and benefitted from the training, yet they felt that their new skills were not being utilised by the organisation. Some had participated in small scale projects to spread the content they had learned throughout the program, like travelling to other offices to teach the skills they had learned to other employees. This initiative was grassroots in nature, and not suggested by their managers or leadership. In some ways they had changed their own approach to how they worked. However, they felt that there was a lack of knowledge within the firm about what they were capable of, and a lack of projects for which they could join and make use of their skills. During a discussion with the senior HR officer for the organisation and her deputy, they said they were aware of this issue and were taking steps to address it. During the second round of training one of the teams created a solution to solve the issue of creating a better way to integrate

staff into innovative projects and pitched it to top management who suggested that work be continued on their project in the organisation's digital accelerator.

Round two - Product development

While the participants were being followed up from the first round of the training, a second round of training was just starting in 2018. During the prior year the company had acquired a new company, and was attempting to integrate this new company into their existing corporate structure. The employees in the purchased company worked in a different location and were somewhat independent from the acquiring company, and were much smaller in size. It was decided that several of the senior staff members from the acquired company would attend the training in 2018.

Four months after the training was completed, the managing director of the acquired firm, and who had attended the training, sent an email to the authors where he shared his learnings after program, particularly the value of rapidly developing and prototyping a new product. He stated that he and his team had managed to move from idea to (digital) product launch in 3-4 weeks and that the new product had now been used by customers over a 1000 times with the feedback being overwhelmingly positive. He also discussed how he was surprised that the average age group of those in the project group was above 50, and in his words "debunked the myth that innovation is done by the young and restless". He also stated that he found it useful to drop the jargon associated with design thinking, and said that "you can easily arrange a rapid prototyping workshop without having to call it that." Lastly, he said that they were using the techniques acquired during the program to develop an additional product.

5   Discussion

Viewing the vignettes through the lens of strategic entrepreneurship, we can begin to discuss whether there was an impact on the human capital, which is the source of strategic entrepreneurship behaviours (Ireland et al., 2003). We can examine whether there was evidence of an increase in entrepreneurial mindset, greater entrepreneurial culture within the firm and entrepreneurial leadership, and how these elements contributed to strategic management of the firm's resources to enable innovations and create a competitive advantage.

Entrepreneurial mindset

The narratives highlight the ways in which the staff became more entrepreneurial in their approach. The narrative of re-designing a work flow is an example of this, whereby the employee saw an opportunity whereby a process could be improved, and choose to act on it. McMullen and Shepherd (2006) discuss the role of an entrepreneur as being able to spot third-party opportunities that are available to everyone, and then deciding to act on these opportunities to turn them into first-person opportunities. First-person opportunities are those where the entrepreneur is uniquely placed to be able to profit from an opportunity. This is consistent with the way strategic entrepreneurship is defined at an organisational level, whereby an organisation both spots opportunities, and then acts on them (Ireland, Hitt, et al., 2003). As the narrative suggests, the other staff who had not gone through the training were complaining about the process, but either did not see it as an opportunity and/or were unwilling to act on it. In this sense, the training influenced the staff member to have the creative confidence to act on the opportunity he saw. Giving people the creative confidence to have a sense of agency and change their environment is one of the key outputs of design thinking training (Kelley & Kelley, 2013). As McMullen and Shepherd (2006) point out, one of the basic tenets of entrepreneurship is not just deciding that an opportunity exists, but deciding to act on it. In this case the narrative of redefining the workflow, and prototyping a new idea both represent taking concrete actions to try to bring about change and a shift to a more entrepreneurial mindset.

Entrepreneurial Leadership

Entrepreneurial leadership requires influencing others to behave more entrepreneurially. The narratives of designing a new workflow, and prototyping a new idea both illustrate such influence. In both cases, the employee who had been through the training inspired and lead the other staff to work on the ideas/issues at hand and to further refine them. This is despite having no mandate to do so, and no designated resources. This represents classic entrepreneurial behaviour, as defined by the concept of effectuation (Sarasvathy, 2001), whereby entrepreneurs focus on the resources they do have, and make the best out of the resources at hand, rather than focussing on the resources they wish they had. The remaining two narratives also represent elements of entrepreneurial leadership, in that leading a group of men through a meditative practice at the beginning of a meeting was a daunting task according to the woman telling the narrative. While this might not sound initially like entrepreneurial leadership, it again shows an entrepreneurial way of thinking. Which is she recognised the status quo was not working with the meetings resulting in high levels of

conflict. Instead, she saw an opportunity to re-define how the meeting could be, and choose to use the skills she had learnt to lead the meeting participants through a practice that led to a more constructive dialogue – something that likely has a positive benefit for the organisation.

Entrepreneurial Culture

Developing an entrepreneurial culture is about supporting staff to be more entrepreneurial, and that collectively the organisation acts in ways that are more flexible, open and focussed on generating wealth through the creation of new opportunities (Shepherd et al., 2010). The first narrative of the expense claim does not necessarily represent an obvious example of an entrepreneurial culture. However, if we dig deeper we see the antithesis of an entrepreneurial firm is one that is defined by rigid rules and policies – exactly the hallmark of large firms like the one this case is about. In this instance, the manager was able to treat the claim in a way he considered appropriate – something rigid rules might have been unable to do. A key tenet of entrepreneurial firms or culture is being able to respond in ways that best match the situation, and often requires agility and flexibility. The narratives of developing a new workflow and prototyping an idea also show that those trained were able to spread the entrepreneurial culture to their direct reports or co-workers. Also, the program facilitated spreading a more entrepreneurial culture through having participants train others in their organisation as part of the final module, thereby spreading the new methods and behaviours throughout the firm. In addition, after the program ended, several of the program participants organised for themselves to travel to different offices to spread the skills they had learnt. They ran workshops, thus helping contribute to the entrepreneurial culture. A learning organisation that diffuses its knowledge within its boundaries is likely to go on to develop an innovative culture (Hitt, 2000).

An entrepreneurial culture is one in which new ideas and creativity are expected, as is risk taking. However, the reality of the situation is that changing an organisation with 20,000 staff members requires more than just training twenty-four staff members and a few additional workshops. Such a shift in culture requires supporting systems, structures and incentives (G. C. O'Connor et al., 2018), which brings us to the final element of the strategic entrepreneurship model.

Strategic management of resources

The final element is the strategic management of resources, whether it be financial, human or social. Following up approximately half of the twenty-four participants one year later, we were able to discuss with them the ways they had been managed as human capital, and the way in which financial resources had been allocated for them to continue working on their projects that had been part of their training. None of the projects had been continued after the first round of training; and of those we spoke with, all felt that they were not being fully utilised as a resource.

As the strategic entrepreneurship model shows, all four elements, including the strategic management of resources is required in order to bring about innovations and wealth creation (Ireland, Hitt, et al., 2003). It is not sufficient to simply have the resources to be entrepreneurial, but these must be appropriately managed (Sirmon, Hitt, & Ireland, 2007). As McMullen and Shepherd (2006) state, it is insufficient to only identify opportunities. In order to create value, opportunities need to be acted upon. This suggests the major issue within this particular organisation was not necessarily the availability of resources but the strategic use of them. There were other strategic initiatives taking place within the firm, such as the establishment of innovation incubators. This suggests the firm was investing in the resources required for innovation; however, there was a misalignment of these investments that were creating issues.

The organisation did not seem oblivious to this missed opportunity, and in the meeting with senior HR staff, they discussed the ways in which they were improving the structure of the second round of training to ensure that the same did not occur again. Suggesting the organisation was learning along the way how best to strategically manage their resources. Such learning is essential to the creation of entrepreneurial spirals, whereby a firm can manage its entrepreneurial human capital in such a way that encourages them to continue to be more entrepreneurial, creating an upward spiral (Shepherd et al., 2010).

The second round of training was successful in supporting digital product development to occur, which was in-line with the strategic aims of both the organisation and the purpose of the training. There were differences between the first round of training and the second. For example, a greater focus on digital prototyping in the second round. While this likely supported the push for digital solutions, we doubt this fully explains the difference in outcomes between the first and second round of training. We suggest that the smaller business unit (that had been acquired) was likely more

flexible, and agile in its ability to incorporate new ways of working, compared to the more established and larger business units in the acquiring business.

This points to one of the key insights of this research, which is that effective training can be undermined by large organisational structures that do not effectively manage the strategic innovative human resources. Hence, greater freedom and flexibility of employees, combined with new ways of work, can result in product developments that align with strategic organisational goals.

How a 20,000 person organisation uses its human capital is likely outside the influence of an external training organisation. Indeed, even the head of the HR department was aware of the need to make better use of the new skills the participants had received. However, changing these structures is cumbersome, and likely slow. Although setting up organisational structures that support innovation is not only possible, but also crucial (G. C. O'Connor et al., 2018). We propose that trainers need to point out to prospective clients that training alone is not sufficient to make an organisation innovative and engage in strategic entrepreneurship. Moreover, clients must ensure that they create the space and the structures for their staff to be able to create strategic innovations.

6 Limitations and implications for future research

Like all case studies there is an issue with generalisability. It is difficult to say whether the same results would be seen with a different set of participants, or in a different company, or a different cultural setting. Given the global nature of the participants, and that the program was run from different geographic locations, this again provides some support for the generalisability across culture and location. The major issue with generalisability relates to the role of the main facilitator. Participants often describe him as inspirational in nature, and while there were other facilitators, the lead facilitator is synonymous with the teaching program. It would be interesting to observe what impact running the same structured course with a different facilitator would have on participant outcomes. This study has clearly stated its biases with regards to participant observation by the authors, and the subjectivity of the narratives and events described. Such subjective studies pave the way for highlighting what areas could be the focus of future research. We would suggest that future research continues to explain in detail their teaching methods, so that studies can be

matched for comparability. In addition, it would be useful to see the role of a facilitator in similar training programs, by having similar program material covered by different facilitators in different organisational contexts.

7   Conclusion

Innovation is recognised as pressing need for all firms (Hitt et al., 2001; Shepherd et al., 2010), and many larger firms struggle with being entrepreneurial enough to identify and act on opportunities in order to create wealth (Ireland, Hitt, et al., 2003). The strategic entrepreneurship model sets out four elements that need to be present in order to be entrepreneurial and maximise the chances of wealth creation. This case examined whether training staff within a large organisation could lead to innovation in accordance with the strategic entrepreneurship model. The training appeared to be effective at meeting three out of the four antecedents. The feedback from staff suggested that they had a more entrepreneurial mindset; that they were being entrepreneurial leaders; and that they were doing their best to generate a more entrepreneurial culture within the firm. However, the final element – strategic management of resources – appeared to be not fully aligned with the training program. As an outcome, the projects worked on during the course of the training were not adopted and integrated into the firm. This represents a missed opportunity for the organisation. It is a challenge for trainers to change organisational structures, and is arguably outside their mandate. It does highlight that training can support innovation only if there is alignment between corporate structures and innovation goals. The implication is that training needs to be managed in order to ensure that there is strategic alignment with the firm, which is well-supported by earlier research (Ireland, Hitt, et al., 2003; G. C. O'Connor et al., 2018; Shepherd et al., 2010).

References

Alvarez, S. A., & Barney, J. B. (2002). Resource-based theory and the entrepreneurial firm. *Strategic entrepreneurship: Creating a new mindset, 89*, 105.

Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., . . . Wittrock, M. C. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives, abridged edition. *White Plains, NY: Longman*.

Beckman, S. L., & Barry, M. (2007). Innovation as a learning process: Embedding Design Thinking. *California management review, 50*(1).

Blenker, P., Trolle Elmholdt, S., Hedeboe Frederiksen, S., Korsgaard, S., & Wagner, K. (2014). Methods in entrepreneurship education research: a review and integrative framework. *Education+ Training, 56*(8/9), 697-715.

Brown, T. (2008). Design Thinking. *Harvard Business Review, 86*(6), 84-92.

Dorst, K. (2011). The core of 'design thinking'and its application. *Design studies, 32*(6), 521-532.

Dunne, D., & Martin, R. (2006). Design thinking and how it will change management education: An interview and discussion. *Academy of Management Learning & Education, 5*(4), 512-523.

Dyer, J., Gregersen, H., & Christensen, C. M. (2011). *The innovator's DNA: Mastering the five skills of disruptive innovators*: Harvard Business Press.

Geertz, C. (1973). *The interpretation of cultures* (Vol. 5043): Basic books.

Hitt, M. A. (2000). The new frontier: Transformation of management for the new millennium. *Organizational Dynamics, 28*(3), 7-17.

Hitt, M. A., Ireland, R. D., Camp, S. M., & Sexton, D. L. (2001). Strategic entrepreneurship: Entrepreneurial strategies for wealth creation. *Strategic management journal, 22*(6-7), 479-491.

Hoholm, T., & Araujo, L. (2011). Studying innovation processes in real-time: The promises and challenges of ethnography. *Industrial Marketing Management, 40*(6), 933-939. doi:10.1016/j.indmarman.2011.06.036

Hoholm, T., & Olsen, P. I. (2012). The contrary forces of innovation. *Industrial Marketing Management, 41*(2), 344-356. doi:10.1016/j.indmarman.2012.01.013

Ireland, R. D., Hitt, M. A., & Sirmon, D. G. (2003). A model of strategic entrepreneurship: The construct and its dimensions. *Journal of management, 29*(6), 963-989.

Ireland, R. D., Kuratko, D. F., & Covin, J. G. (2003). Antecedents, elements, and consequences of corporate entrepreneurship strategy. *Proceedings of the Sixty-third Annual Meeting of the Academy of Management (CD)*.

Kamovich, U., & Longva, K. K. (2016). 10 When theory is invisible and hidden in practice: a qualitative study of one entrepreneurship course. In *Offentleg sektor i endring* (pp. 157-173).

Kelley, T., & Kelley, D. (2013). *Creative confidence*: Books On Tape.

Kolb, D. A. (1984). Experiential learning: experience as the source of learning and development.

Lynch, M., Kamovich, U., Longva, K. K., & Steinert, M. (2019). Combining technology and entrepreneurial education through design thinking: Students' reflections on the learning process. *Technological Forecasting and Social Change*, 119689. doi:https://doi.org/10.1016/j.techfore.2019.06.015

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science, 2*(1), 71-87.

McGrath, R. G., & MacMillan, I. C. (2000). *The entrepreneurial mindset: Strategies for continuously creating opportunity in an age of uncertainty* (Vol. 284): Harvard Business Press.

McMullen, J. S., & Shepherd, D. A. (2006). Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *Academy of management review, 31*(1), 132-152.

Naumann, C. (2017). Entrepreneurial Mindset: A Synthetic Literature Review. *Entrepreneurial Business and Economics Review, 5*(3), 149-172.

Neck, H. M., & Greene, P. G. (2011). Entrepreneurship education: known worlds and new frontiers. *Journal of Small Business Management, 49*(1), 55-70.

Nielsen, S. L., & Stovang, P. (2015). DesUni: university entrepreneurship education through design thinking. *Education+ Training, 57*(8/9), 977-991.

O'Connor, G. C., Corbett, A. C., & Peters, L. S. (2018). *Beyond the champion: institutionalizing innovation through people*: Stanford University Press.

Ogilvie, T., & Liedtka, J. (2011). *Designing for growth: A design thinking toolkit for managers*: Columbia University Press.

Patton, M. Q. (1990). *Qualitative evaluation and research methods*: SAGE Publications, inc.

Pittaway, L., & Cope, J. (2007). Entrepreneurship education: A systematic review of the evidence. *International Small Business Journal, 25*(5), 479-510.

Sarasvathy, S. D. (2001). Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of management review, 26*(2), 243-263.

Shepherd, D. A., Patzelt, H., & Haynie, J. M. (2010). Entrepreneurial Spirals: Deviation–Amplifying Loops of an Entrepreneurial Mindset and Organizational Culture. *Entrepreneurship Theory and Practice, 34*(1), 59-82.

Sirmon, D. G., Hitt, M. A., & Ireland, R. D. (2007). Managing firm resources in dynamic environments to create value: Looking inside the black box. *Academy of management review, 32*(1), 273-292.

Stake, R. E. (1995). *The art of case study research*: Sage.

Van Maanen, J. (2011). Ethnography as work: Some rules of engagement. *Journal of Management studies, 48*(1), 218-234.

Watson, T. J. (2011). Ethnography, reality, and truth: the vital need for studies of 'how things work'in organizations and management. *Journal of Management studies, 48*(1), 202-217.

Yin, R. K. (2009). Case study research: Design and methods (applied social research methods). *London and Singapore: Sage*.

Yin, R. K. (2011). *Applications of case study research* (3 ed.): Thousand oaks: Sage.