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Build your own entrepreneur

entrepreneurship in makerspaces and FabLabs

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BUILD YOUR OWN ENTREPRENEUR

ENTREPRENEURSHIP IN MAKERSPACES AND FABLABS

CORNE VAN KESSEL

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1 Contents

2 INTRODUCTION

Entrepreneurship has often been recognized as a major driver for economic growth. Due to advances in technology, the bulk of economic growth in recent years has come from successful small and medium enterprises which tend to be more flexible than the traditional larger corporations (Wennekers & Thurik, 1999). Intensification of competition, increase of uncertainty and flexible automation are all noted as drivers for this shift towards favoring entrepreneurship and the formation of new enterprises. This has resulted in a shift of political viewpoints as well, with many European governments and universities trying to foster and boost entrepreneurship in an attempt to stimulate economic growth. (Hart, 2003)

In order to create effective policy and design successful interventions which promote and encourage entrepreneurship it must be understood what drives people to become entrepreneurs in the first place. And perhaps equally important is the opposite perspective; what drives people away from entrepreneurship. In academic research a large number of such antecedents of entrepreneurial behavior have been investigated, including but not limited to; creativity (Zampetakis, 2008), familial background (Carr & Sequira, 2006), education (Peterman & Kennedy, 2003), propensity to risk taking and cognitive style (Barbosa, Gerhardt, & Kickul, 2007). The choice to become an entrepreneur can literally be a life-changing moment so it should come as no surprise that antecedents for entrepreneurship are found in such diverse areas.

A highly suitable environment for investigating such alternative influences on entrepreneurial intent can be found in so-called Makerspaces, locations where people can use various rapid prototyping machines and which often have a strong and highly creative community where experimentation and self-improvement is greatly encouraged (Forest, et al., 2014). Such an environment could provide an excellent starting point for both technical and artistic entrepreneurs alike, offering a social network, inspiration and access to (prototype) production facilities. For example, makerspaces have already been an important driving element in the formation of several successful companies in, amongst others, the consumer 3d-printer machine market.

Universities have been the traditional domain for entrepreneurship promoting interventions where the interventions often focus solely on teaching its participants entrepreneurship-specific

skills (Luthje & Franke, 2003) (Fayolle & Gailly, 2004). By shifting the perspective away from (business) students it may become possible to design interventions taking place outside of universities. Alternative approaches to promoting entrepreneurship can perhaps be found in the effects of communities, by fostering an innovative and creative mindset or by removing perceived obstacles on the path to entrepreneurship.

By combining these observations an interesting field of enquiry becomes apparent. There is a large societal interest for promoting entrepreneurship and an environment that potentially does so is identified. Furthermore, existing research and theoretical frameworks can only partially resolve the question if makerspaces are in fact breeding pools for entrepreneurs and if so, by which means this effect is achieved. This thesis seeks to answer that question by first investigating existing literature, followed by a qualitative study to indentify the relevant constructs and their dependencies, to be concluded by a quantitative study that seeks to measure the strength of the found relationships.

3 LITERATURE REVIEW

3.1 STATE OF THE ART

For all the varied influences found on entrepreneurship, the most important predictor for entrepreneurial behavior is entrepreneurial intent (Kim & Hunter, 1993). Simply put, if a person intends to become an entrepreneur the likelihood that entrepreneurial behavior is actually displayed is high. While this may seem like a somewhat obvious insight, its theoretical implications are far reaching. For instance, this opens the door for intent based models such as the Theory of Planned Behavior (TPB) which has been widely used for predicting various types of behavior, including entrepreneurial behavior (Ajzen I. , 2002) (Krueger, Reilly, & Carsud, 2000).Within these models antecedents are grouped in larger categories, such as attitudes, social influences or feasibility of the behavior.

Although the Theory of Planned behavior has been shown to be a viable and robust framework for predicting entrepreneurship (Aldrich, 1992), there are several unresolved theoretical and methodological issues. The focus of scholarly research into entrepreneurial behavior has been to validate such models in the entrepreneurship context. The result of which is that a lot of support

has been found for the general model itself, but that only limited entrepreneurship specific improvements or additions to the model have been made. While the theory of planned behavior offers an excellent basis for predicting entrepreneurial behavior, increasing our conceptual understanding of the highly complex phenomena of entrepreneurial behavior can lead to improvements of the model. Furthermore the more abstract concepts of the TPB have sometimes not been fully understood. This has led to some confusion about their actual meaning and implication, something which has been pointed out by one of the creators of the theory of planned behavior (Ajzen I. , 2002)

3.2 STRUCTURE

Firstly, different theories and frameworks employed in investigating entrepreneurship are examined and compared in order to select the most appropriate framework to be used in the following research. Several different theoretical viewpoints might exist, so it is sensible to carefully compare the different alternatives. When an appropriate framework has been selected, a more extensive viewpoint is employed to expand upon the understanding of this specific theory. Preceding research using the selected framework or a modified version of the framework is compared and the different aspects of the model are elaborated upon. From this closer examination a research gap should become apparent. Based upon this research gap suggestions for further investigation can be made and relevant literature can be selected and summarized.

3.3 PREDICTING BEHAVIOR

Human behavior is difficult to predict. Not only is the behavior often (seemingly) erratic and illogical but it can also be influenced by a multitude of different environmental factors, personality traits or even the current mood an individual. Research into this matter is further frustrated by sense-making and storytelling tendencies displayed by people when asked for their reasons and motivations for performing certain actions, leading to a retrospective bias. Numerous different approaches have been utilized in an attempt to explain human behavior, ranging from sociological, personality traits and cognitive approaches (Ajzen & Fishbein, 1977). Yet, low empirical relations have been found between individual personality traits and specific behavior, where general attitudes have been demonstrated to also have comparable poor predictive capabilities for specific behavior (Ajzen & Fishbein, 1977).

The poor predictive capabilities of both traits and attitudes can be explained by the existence of unique circumstances and conditions that influence the decision making process that may vary based upon the specific situation or the type of behavior being displayed. This notion is supported by the fact that aggregated, more general behavior can more accurately be predicted by traits and attitudes as the different unique conditions tend to cancel each other out (Ajzen I., 1991). Aggregation can in fact increase reliability and external validity, which both are significant issues in behavioral research; however specific errors are introduced and it inevitably broadens the scope of the research (Epstein, 1980).

3.3.1 BEHAVIORAL AND ENTREPRENEURIAL INTENT

A possible solution can be found when motivation and inclination are seen as preceding action. Before a person undertakes action it can be reasoned that specific reasons or *intent* exists to do so. Two assumptions underlay this reasoning; the *volition assumption* which states that individuals have volitional control over the behavior (e.g. There are no factors preventing the actual performance of the behavior) and secondly *individuals are to a certain degree reasonable* by which is meant that reasons exist for performing certain behavior and some consideration has been put into performing the behavior (also called the sufficiency assumption). Strong support for intent being an antecedent for behavior has been found, summarized in the meta-analysis by Kim and Hunter (1993) who found a strong relationship between intent and actual behavior.

It is possible, however, to think of behavior in which intent has little influence indeed; impulsive decisions that received little to no consideration beforehand and which are made on a whim arguably have little to do with intent. But as others have already pointed out, in such cases volitional control over the action is questionable and the reasonability assumption required for intent based models is violated (Bagozzi, Baumgartner, & Yi, 1989). So, when predicting entrepreneurship it becomes important to determine if this type of behavior can be considered (mostly) rational and planned or can rather be seen as impulsive and behavior.

One does not become an entrepreneur on a whim. While it can be argued that the actual decision of becoming an entrepreneur might be a heat of the moment choice and perhaps not completely planned, the complete entrepreneurial process can hardly be considered without preparation and planning. Entrepreneurs face numerous obstacles and difficulties which can all cause a new enterprise to fail before it has had a chance to take off. Entrepreneurship consists of a chain of

sequential and parallel actions which are regarded as a whole in the context of entrepreneurial intent. During this so called entrepreneurial journey, entrepreneurial intent functions as a driving motivational force (Cha & Bae, 2010). It can therefore be concluded that using intent is particularly useful for predicting entrepreneurial behavior.

3.4 MODELS FOR ENTREPRENEURIAL INTENT

Several theoretical frameworks for predicting entrepreneurial intent exist. Most notable is the *theory of reasoned action* (TRA) developed by Ajzen and Fishbein in 1975 which was later expanded upon by Ajzen to form the *theory of planned behavior* (TPB). Both theories are general frameworks that are applicable to a host of situations and behaviors, not exclusively to the domain of entrepreneurship. Also relying on the theory of planned behavior is the entrepreneurship specific *Entrepreneurial event (SEE)* developed by Shapero (1982). Al three theories are first elaborated upon and their relative strengths and weaknesses are discussed, based on which a choice is made for which theoretical framework to employ.

3.4.1 THEORY OF REASONED ACTION

The theory of reasoned action states that reasoned behavior can be predicted by intent. Intent is defined as the motivational forces associated with performing a certain action. It places intent as an antecedent between attitude and behavior, hereby linking the two. This approach was proposed by Ajzen and Fisbhein in 1975, as attitude and behavior often displayed limited predictive capabilities except for very general types of behavior. Another interesting aspect of the theory of reasoned action is the inclusion of both beliefs and the evaluations of those beliefs. Simply put, not only a belief itself is regarded but also how important that specific belief is in the individual's decision making process. For example, there might be societal pressure to not perform certain actions but the actual effect this has on an individual will differ as not everyone is equally sensitive to such external pressure. The relative importance is measured for each of the beliefs and opinions individually, which allows for a very broad application of this theory across various cultural settings.
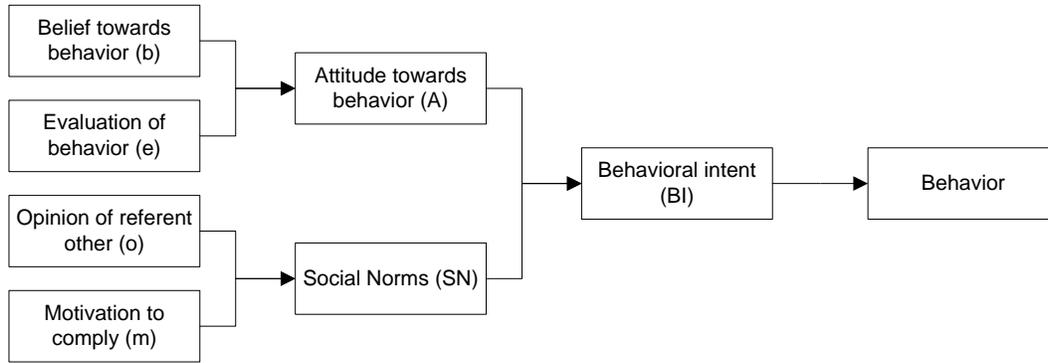
Figure 1: Theory of reasoned action

Beliefs are subdivided into two groups, attitude towards behavior, which regards beliefs held by an individual related to the behavior, and social norms which regards beliefs held about the opinion of others regarding the behavior. Another way to view this distinction is to regard the distinction as personal versus interpersonal. Attitude towards behavior involves the personal beliefs associated with the specific behavior and social norms involve the interpersonal and social beliefs. Behavioral intent is influenced by two distinct internalized questions; (1) Do I want to perform this behavior and (2) does my environment want me to perform this behavior. The relative importance of these respective questions can vary based upon the behavior in question and/or the sample under investigation. For instance, in highly individualistic societies, attitude towards behavior tends to be more important than social norms in forming behavioral intent.

In formula the TRA can be expressed as following;

$$BI \propto A + SN$$

Where BI is behavioral intent, A is attitude towards behavior and SN is the social norms. Social norms and attitude towards behavior are expressed by the following functions;

$$A \propto \sum_i b_i * e_i$$

$$SN \propto \sum_i o_i * m_i$$

In which B are beliefs, E is the evaluation of beliefs, O the perceived opinion of others and M the motivation to comply. Ajzen and Fishbein (1977) suggested this formula, using beliefs and their

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associated, unique, weights. Alternatively, an additive structure could be used, but this would not be in correspondence with the theory of planned behavior as this would remove the relative weights of each belief. It can easily be argued that not every belief is equally important for everyone and should therefore not be treated as such.

3.4.2 THEORY OF PLANNED BEHAVIOR

The theory of planned behavior is a highly influential and frequently employed theory that has received considerable support in predicting behavior in highly versatile situations. What separates it from its predecessor, the theory of reasoned action, is the inclusion of the construct *Perceived Behavioral Control (PBC)* (Ajzen I., 1991). The theory of reasoned action assumed complete volitional control, an assumption made in order to ensure that the link between intent and behavior was strong. The theory of planned behavior discards this assumption and includes the constructs perceived behavioral control and actual behavioral control. Perceived behavioral control is a non-motivational influence on intent, as opposed to attitude towards behavior and social norms.

FIGURE 2: THEORY OF PLANNED BEHAVIOR
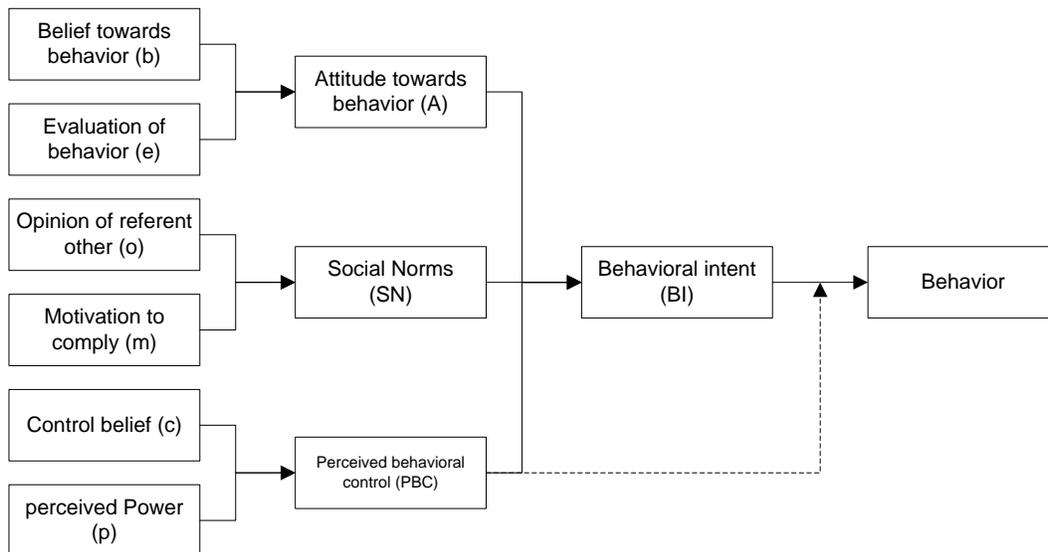
Perceived behavioral control has a dual function in the theory, having both a direct influence on intent and a moderating influence on the relation between intent and behavior. It should be noted that, as with the theory of reasoned action, only voluntary behavior can be predicted in this manner. The inclusion of perceived behavioral control adds a construct that accounts for the

perceived difficulty of successfully performing the action. The argument for including perceived behavioral control is that people are less likely to perform a certain action if they believe that they don't have control over the behavior. Perceived behavioral control moderates the relation between behavioral intent and behavior based on the reasoning that obstacles and difficulties can prevent people from actually performing the behavior. For example, in the case of entrepreneurship, insufficient financial assets can prevent even highly motivated entrepreneurs from starting a new business.

Behavioral intent in the TPB is based upon the internalized questions; (1) Do I want to perform this behavior,(2) does my environment want me to perform this behavior and (3) do I have control over the outcome of this behavior? As with the TRA, the relative importance of these considerations can vary and their relative weight is measured alongside the considerations themselves.

In the TPB behavioral intent (BI) can be expressed as follows;

$$BI \propto A + SN + PBC$$

Where both attitude and social norms are similar to the theory of reasoned action and perceived behavioral control (PBC) is expressed as follows;

$$PBC \propto \sum_i c_i * p_i$$

Where C is control beliefs and P their relative power.

3.4.3 ENTREPRENEURIAL INTENTION MODEL

The entrepreneurial intention model was developed by Krueger (1993) and it combines the cognitive approach of the theory of planned behavior with the entrepreneurial event theory devised by Shapero (1975). An important distinction between this theory and the TPB is that a *displacement* is assumed to occur before a person decides to become an entrepreneur. This displacement is a change in the current situation, either positively or negatively, that either creates a necessity or an opportunity to become an entrepreneur. For example, loosing ones job can be considered a negative displacement while identifying a latent need of a market can be considered a positive displacement.

This displacement is the possible start of a career as entrepreneur, however not all such displacements result in new ventures. The entrepreneurial intent model states that, aside from a displacement, two other factors are required; *feasibility* and *desirability.*
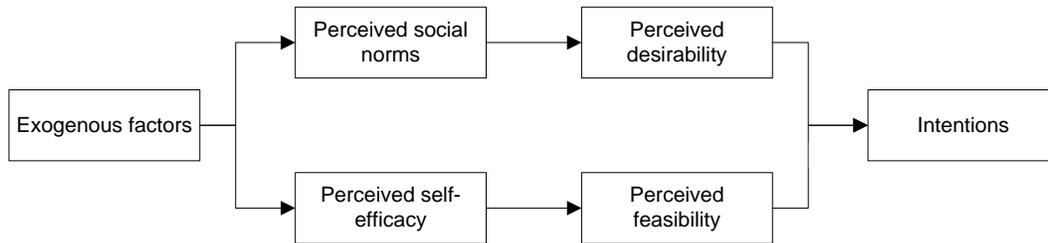
Perceived feasibility is based upon perceptions of required resources and skills, including but not limited to; financial means, human resources, intellectual property or even time. Links have been drawn between the TPB's perceived behavioral control and perceived feasibility (Krueger, Reilly, & Carsud, 2000). The two constructs are rather similar and perhaps even mutually exchangeable although the moderating effect of perceived feasibility on the intent–behavior relationship is not considered in the entrepreneurial intent model.

Perceived desirability regards the overall desirability of becoming an entrepreneur. Once more, the link between the theory of planned behavior and the entrepreneurial intent model can be drawn; attitude towards behavior and social norms can be argued to describe the same motivational factors that perceived desirability describes. It is concluded that apart from the displacement preceding entrepreneurial behavior, the theory of entrepreneurial intent offers little additional insight in the decision making process.

3.4.4 COMPARISON OF INTENT MODELS

As already briefly touched upon before, the theory of planned behavior and the entrepreneurial intent theory share many similarities. Krueger et al. (2000) reached a comparable conclusion based upon the large similarities between the constructs being described. This line of reasoning can be taken one step further even, as the displacement required for the behavioral change can also be explained within the theory of planed behavior. When a positive displacement occurs, it can be argued that perceived behavioral control increases significantly and hereby increases entrepreneurial intent. Furthermore, a positive displacement might also influence attitude towards behavior.

Based upon the theoretical similarities of the two theories, it is opted to use the theory of planned behavior because of two reasons. First, it has received much greater support in literature and has simply been put to the test more often. Using the theory of planned behavior as framework allows for much easier integration of this research into the existing body of knowledge. Secondly, the TPB separates the motivational part of behavior into social norms and attitude towards belief, allowing for better generalizability across cultures.

3.5   IN DEPTH ANALYSIS OF THEORY OF PLANNED BEHAVIOR

Since the theory of planned behavior is used as the core framework for this research, a more extensive analysis and some elaboration on previous findings is in order. In this chapter the various elements of the model such as beliefs are examined in detail. Furthermore, past research using (modified) versions of the theory of planned behavior are also discussed per construct.

3.5.1 *BELIEFS*

While it is not directly required to know how beliefs are formed in order to accurately predict behavior, it can be useful to understand belief formation if the actions of a group or of an individual is to be directed. Belief formation is not relevant for measuring beliefs but for influencing (future) action. If the formation of beliefs can be influenced, according to the TPB, the associated attitudes can be influenced which eventually results in a change on behavioral intent and actual behavior. (Ajzen I. , 2002) As mentioned before, the scope of this research lies not only with predicting entrepreneurship, but also increasing understanding in how entrepreneurship can be promoted. Entrepreneurial intent research tends to focus on verifying the theory of planned behavior and operate on a much more practical level, although it can be argued that a more rigorous perspective that also includes behavior formation or their structure can provide valuable insights into designing effective interventions. Measuring beliefs can provide a starting point for designing an intervention, but it can be reasoned that without understanding how beliefs are formed or changed, the designed solution will target the right belief but will not employ the right method for bringing about the desired change.

3.5.1.1 *Types of beliefs*

Fishbein and Ajzen (1975) distinguished three different types of beliefs; (1) descriptive beliefs which are formed by direct observation, (2) inferential beliefs which are formed by association or combination of existing beliefs and (3) informational beliefs which are formed based on

information that is provided by others. It is suggested that descriptive beliefs tend to be the strongest, as they are based upon direct observations and people tend to rely on their own senses. Direct observations tend to strongly influence the formation of beliefs. Inferential beliefs are more susceptible to change as challenging or adding a belief upon which the inferential belief is built can change the reasoning upon which it is built. Informational beliefs are formed based upon the reliability of the source that provided the information. The higher the perceived reliability, the more likely formation of a belief becomes.

From this categorization of beliefs two additional characteristics become apparent. First, beliefs can differ in their relative strength; some might be stronger held than others and can thus have a stronger influence on their respective attitudes. Secondly, some beliefs are based upon other beliefs. The first characteristic, relative strength has already been accounted for in the theory of planned behavior, but the second one might prove troublesome when influencing behavior. For instance, a person might hold the belief that starting his own business is hard work and the belief that hard work is rewarded in the long run. A possible inferential belief resulting from these two beliefs is that entrepreneurship itself is rewarding. Challenging the belief that hard work is rewarded can influence the attitude towards entrepreneurship, although the observation that led to this shift in belief might have nothing to do with entrepreneurship.

3.5.1.2 Salient beliefs

Another problem with beliefs is that informational beliefs can be formed by investigating beliefs. For example, if a test subject is asked if there is a relation between, say, financial gain and entrepreneurship, a belief can be formed linking those two together. This in turn can change the attitude towards the behavior. This characteristic of beliefs explains why researchers seeking to use the TPB should attempt to only measure salient beliefs in order to avoid influencing the attitude and intent of the test sample under investigation, which is in correspondence with the suggestions of Ajzen (2006).

The mutual interdependence and correlations of beliefs also offers a theoretical explanation why the three constructs in the TPB, attitude towards behavior, social norms and perceived behavioral control have some degree of interdependency. Since the beliefs which they are based upon are related, it can be argued that the resulting constructs also have some relation between each other. For example, a family member telling a person that entrepreneurs have to work hard is likely to

influence both social norms and attitude towards behavior and perhaps even to some degree perceived behavioral control. It should be noted however that this specific event did not influence each of the three TPB constructs directly, this event influenced the formation or strengthening of various beliefs that each in turn influenced the TPB constructs.

3.5.2 *ATTITUDE TOWARDS BEHAVIOR*

Attitude towards behavior is the construct that describes how performing the behavior is valued, either positively or negatively, by an individual. It is based upon the salient beliefs that concern possible outcomes of the behavior and beliefs directly linking the behavior with certain attributes. As mentioned before, it is important to identify the relevant behavioral beliefs that together form attitude towards behavior. A good starting point for identifying beliefs is to look at previous research. However, care should be taken to also include information about the sample being investigated, as salient beliefs can change from one group to another (Ajzen I. , 2006). As such, some care should be taken to verify if the beliefs are in fact salient beliefs for the sample being studied.

TABLE 1: ATTITUDINAL BELIEFS IN LITERATURE

Study	Sample type	Location	Method of determining salient beliefs	Beliefs
(Carr & Sequira, 2006)	Business networking organization members	Northwest US	Method described by Ajzen	No specific beliefs, directly measures attitude trough bipolar adjectives
(Schwarz, Wdowiak, Almer-Jarz, & Breitenecker, 2009)	Students (business, humanities and science/technology)	Austria	Unknown	Financial gain, also directly measure attitude towards behavior
(Shook & Bratianu, 2010)	Students	Ukraine	Previous literature (Krueger, Reilly, & Carsud, 2000)	-Autonomy -Tenseness -Financial gain -Personal satisfaction -Quality of life
(Engle, et al., 2010)	Business students	12 countries	Previous literature	-Autonomy -Financial gain -Achievement motivation
(Krueger, Reilly, & Carsud, Competing models of entrepreneurial intentions, 2000)	Students	unknown	Unknown	-Fianancial gain -Stressful -Autonomy -Personal satisfaction -Personal quality of life
(Souitaris, Zerbinati, &	students	France & England	Previous literature	-Financial gain

Al-Laham, 2007)				-Challenge
				-Autonomy
				-Authority
				-Self realization
				-Participation in whole process

To summarize, the following behavioral beliefs where used in previous literature;

- Financial gain
- Achievement motivation
- Challenge / self-realization
- Autonomy
- Personal satisfaction
- Personal quality of life
- Stressful

When determining which beliefs where used in previous literature, it became apparent that not all authors measured beliefs; some opted to measured perceived behavioral control directly. A more in depth discussion of this method can be found in the methodological review section, together with the method used to determine which beliefs to include in the research.

3.5.3 SOCIAL NORM

Social norms is the construct that concerns the perceived opinion of the social environment with regard to the behavior. There seems to be some controversy regarding whether or not social norms are relevant, as in some researchers have reported insignificant influence of social norms on entrepreneurial intent, but as Engle et al. (2010) mentioned, the relative influence of the constructs of the TPB are expected to differ across cultures. In their research they showed that in some cultures social norms where not important, but in others social norms where the only significant antecedent for entrepreneurial behavior.

TABLE 2: SOCIAL BELIEFS

Study	Sample type	Location	Method of determining beliefs	Beliefs
(Carr & Sequira, 2006)	Business	Northwest US	Not described	-parents

				-Partner
	networking organization members			-Co-workers
				-Siblings
				-Relatives
				-Neighbors
				Acquaintances
				-Close friends
(Schwarz, Wdowiak, Almer-Jarz, & Breitenecker, 2009)	Students	Austria		University support
(Shook & Bratianu, 2010)	Students	Ukraine	Previous literature (Krueger, Reilly, & Carsud, 2000)	-Parents -Friends -Partner -Other important people
(Engle, et al., 2010)	students	12 countries	Previous literature	-Family -Role model -Partner/best friend
(Krueger, Reilly, & Carsud, Competing models of entrepreneurial intentions, 2000)	students	Unknown		-Family -Role model -Friends -Partner
(Souitaris, Zerbinati, & Al-Laham, 2007)	Students	England & France		-Closest family -Closest friends -Other important people

The opinion of the following referent others are suggested in previous literature;

- Family, where in some cases the distinction is made between close and general family. In some cases the distinction is made even more precise by distinguishing parents and siblings from each other
- Significant other / partner
- Friends, where in some cases the distinction is made between close friends and acquaintances
- Role model or mentor, mostly referring to an experienced entrepreneur.
- Other important people

From this list the opinion of *"other important people"* has been excluded in further research on the basis that it is too vague. Not only can the interpretation of other important people vary from one person to another, the variable itself is of questionable theoretical use. It should be clear who is meant, and it is difficult to argue how other important people differ from the existing groups whose opinion is included.

3.5.4 PERCEIVED BEHAVIORAL CONTROL

The predominantly used approach to determine perceived behavioral control is by measuring entrepreneurial self-efficacy. The differences and commonalities of entrepreneurial self-efficacy and perceived behavioral control have been the topic of quite some scholarly debate. The two constructs have been used interchangeably in many instances and there seems to be some confusion about the exact distinction between the two. This was resolved by Ajzen (2002) who stated that while the two are very comparable empirically, there is a conceptual difference. Perceived behavioral control concerns outcome expectancies and perceived self-efficacy regards the perceived ability to perform a behavior.

TABLE 3: BEHAVIORAL BELIEFS

Study	Sample type	Location	Method of determining salient beliefs	Beliefs
(Carr & Sequira, 2006)	Business networking organization members	Northwest US	Pilot study and factor analysis	Entrepreneurial self-efficacy
(Schwarz, Wdowiak, Almer-Jarz, & Breitenecker, 2009)	Students	Austria		Environmental obstacles, financial support
(Shook & Bratianu, 2010)	Students	Ukraine	Previous literature	Entrepreneurial self efficacy
(Engle, et al., 2010)	Students	12 countries	Previous literature	Entrepreneurial self efficacy
(Krueger, Reilly, & Carsud, 2000)	Students	Unknown	Previous literature	Entrepreneurial self efficacy
(Souitaris, Zerbinati, & Al-Laham, 2007)	Students	England & France		Entrepreneurial self-efficacy

The result of this confusion and the fact that the construct is only directly measured is that limited information is available about which beliefs to consider including. It can be argued that entrepreneurial self efficacy is, in fact, a belief that impacts perceived behavioral control. Not only would this explain why in some cases the both constructs are empirically similar, but this also offers an interesting avenue for further study. Situations where the two are expected to share high similarities is when most of the outcome of the behavior lies with the person performing the behavior; being able to perform the behavior is then quite similar to getting certain outcomes. If

it is possible to discern situations where certain obstacles impact the successful performance of the behavior, these could very well improve the model.

3.5.5 OTHER VARIABLES AND CONTROL VARIABLES
3.5.5.1 Technology
Attitude towards technology positively impacts entrepreneurial intent via self-efficacy (Martin-Cruz & Rodriguez-Escudero, 2013), with the reasoning that people with a high attitude towards technology feel more able to overcome technical obstacles. In the case of technological entrepreneurship, it can be expected that the role that technology plays on perceptions of entrepreneurship and the feasibility of starting a new venture is greater. This seems like a promising avenue of approach for technological entrepreneurship and is a good candidate for inclusion in further research. Its relative importance or position in the model should also be investigated, but it seems most sensible to include it as a belief in perceived behavioral control.

3.5.5.2 Past behavior
A relative straightforward and successful method of predicting behavior is looking at past behavior. This approach has been used for predicting entrepreneurship (Carr & Sequira, 2006), but merely looking at past behavior does not offer insight in first time entrepreneurs and how or why they first start an enterprise. But it stands to reason that previous entrepreneurial experience is a factor that should at least be included as a control variable. Krueger (1993) showed that is true, although there is no particular reason to specifically include them in the TPB, apart as a control variable, as the influence of experience and background impact attitudes and beliefs and are already incorporated into the model.

3.5.5.3 Creativity
One of the most simple and straightforward definitions of creativity is provided by Sternberg et al (2004) *"The process of producing something that is both original and worthwhile"*. Even at this basic level the link between entrepreneurship and creativity can already be observed; creating value (something worthwhile) is one of the core activities of entrepreneurship. Successful entrepreneurs are able to identify needs on the market, address those needs with a new service or product and successfully get this product to the customer. Within this simple description of entrepreneurship both the newness and value component of creativity are encountered. It should not come as a surprise that creativity has been linked to entrepreneurship both theoretically and empirically.

Creativity can be considered an important characteristic of entrepreneurs, for creating useful products and services, identifying new opportunities and even creating methods and approaches to convince others of the value of their ideas and projects (Ward, 2004). This notion already touches upon the relative diverse functions that creativity can have for entrepreneurs. It can be argued that the creativity required for creating new products and services is different from the creativity that enables entrepreneurs to think of new ways to convince people to support their endeavors. Although, even when looking at creativity as a single construct, a relationship between entrepreneurial intent and creativity has been found (Hamidi, Wennberg, & Berglund, 2008).

A more cognitive approach on entrepreneurial creativity has been employed by Ward (2004) in an attempt to explain the underlying cognitive principles in entrepreneurial creativity. For instance, a great deal of creative new product ideas are clever and creative recombination's of existing concepts and or products, whom are combined in such a way that their value is more than the sum of its parts. The insight into different approaches of combination, analogies and abstraction in the creative process is valuable, but does not answer the question if there perhaps are multiple distinct types of creativity that are relevant to entrepreneurship.

That creativity is not an uniform coherent construct is also suggested from a somewhat different angle. Creative people themselves do not agree upon what exactly creativity is and is not (Glück, Ernst, & Unger, 2002). At first glance this might not seem like a strong argument in favor of dividing creativity, it should not come as a surprise that a relative complex and difficult to understand concept elects different responses from different people. What makes this insight relevant to this research is that the salient beliefs about creativity seem to differ. When utilizing a model such as the TPB which heavily relies on salient beliefs, this can have serious repercussions. A more robust method should be found, as opposed to simply measuring self-reported creativity.

A possible division is suggested by (Hart, 2003), who subdivides creativity in the following categories;

- Technological creativity (innovation)
- Financial creativity (entrepreneurship)

- Artistic or cultural creativity

This division is sensible when taking a sociological perspective on creativity or perhaps from a broad macro-economic viewpoint, its use for research in entrepreneurial intent is perhaps somewhat limited. An alternative is provided by (James & Asmus, 2005) whom divide creativity in the following groups;

- Problem solving
- Artistic creativity
- Social creativity

Their research shows that these different types of creativity are somewhat independent of each other. Their categorization is interesting for use in research into entrepreneurship because each of the types of creativity is related to activities that are important to entrepreneurs. Problem solving for overcoming obstacles encountered, artistic creativity in order to create something of value or beauty and social creativity for effectively communicating their ideas to buyers and/or investors.

A strong case for researching creativity not solely as a product of certain cognitive processes or personality traits is presented by Amabile (1983). Creativity should be seen within a certain social context, in which certain cognitive abilities and personality traits result in creativity, a view that resulted in the *componential framework*. The componential framework describes three different types of requirements of creative behavior; (1) *Domain relevant skills* such as technical skills and domain relevant knowledge, (2) *creativity relevant skills* such as the right cognitive style and idea generating skills, and (3) *task motivation* which depends on attitudes towards the task and social constraints. It is interesting to note that this view on creativity shares similarities with the theory of planned behavior. Attitude towards the behavior and social norms can be observed in the task motivation construct and some elements of perceived behavioral control in the required skill sets.

The aforementioned divisions of creativity can be placed in the componential framework as different categories of domain relevant skills. For the follow up research of entrepreneurial intent, in particular due to its context of highly creative social environment especially the social aspects of creativity are interesting.

3.6 CONTEXT (MAKER SPACES)

An interesting context for researching entrepreneurial intent can be found in so called maker spaces. Maker spaces are locations that offer access to various production and prototyping machinery such as laser cutters, CNC machinery and 3d printers. These makerspaces differ in what kind of machines and services they offer and in their business model, but what they have in common is that they have the potential of enabling entrepreneurial activity as the threshold of creating and producing a product is lowered. Unfortunately, since Makerspaces are a relatively new phenomena, only very limited scholarly research has been conducted on their nature and their potential influence on entrepreneurship. As a result, this section of the literature review will rely mostly on non-academic sources.

Makerspaces can be seen as the product of the so called *maker subculture*. The maker culture places a heavy emphasis on experimentation, obtaining practical skills required to make something and the acceptance of risks (Mike, et al., 2013). A mindset that is arguably also useful for entrepreneurs. This could be an explanation why policy makers have already begun to support and nurture the development of makerspaces or provide grants for FabLabs (Benton, Lori, Shelley, & Dempsey, 2013). Some authors even go so far as labeling FabLabs as a driver of regional economic and entrepreneurial growth (Troxler & Schweikert, 2012). Others muse about the impact of makerspaces on artists and how they can become more entrepreneurial (Barniskis, 2014). It should be noted however that only anecdotal evidence exists to back these claims, for instance in the research of Willemaerts et al. (2011) who observed an increase in practical quality and usability of designs made by engineering students when they had access to a FabLab. It would seem that most sources, both scholarly and non-scholarly, seem to believe that makerspaces can influence behavior and teach valuable skills, but more thorough research is required in order to substantiate these claims.

3.7 METHODOLOGICAL REVIEW

In the process of reviewing the existing literature regarding entrepreneurial intent both theoretical and methodological gaps have become apparent. Three major methodological issues are indentified and discussed in detail in the subsequent parts.

3.7.1 MEASURING BELIEFS OR MEASURING THE CONSTRUCT

After the decision is made to use the TPB or a modified form thereof, the decision has to be made at what level certain variables or constructs will be measured. Simply put, two alternatives exist; either beliefs and their respective importance can be measured from which attitude towards behavior, social norms and perceived behavioral control can be calculated or these three constructs can be measured directly.

Some researchers use only direct measures (Martin-Cruz & Rodriguez-Escudero, 2013) but most employ a mixed approach. Social norms is almost always measured by asking the opinion of referent others and motivation to comply, where perceived behavioral control lies at the other end of the spectrum and is almost always measured directly (frequently substituted with self efficacy measures) (Engle, et al., 2010). The middle ground is taken with attitude towards behavior, although some authors have opted to omit the relative importance of each belief, and simply average over a set of beliefs in order to obtain the construct (Souitaris, Zerbinati, & Al-Laham, 2007). While this does decrease the overall length of a survey, information about differences in importance of beliefs is lost.

Ajzen (2002) also commented on this issue, and indicated that while measuring the construct directly was a reasonable approach, quite a bit of information was lost about the cognitive processes that lead up to behavior. Not only does this reduce the value of the information gained, this also greatly impedes the ability to design a possible intervention to influence the behavior. For instance, if it is known that people see entrepreneurship as very difficult (low perceived behavioral control) it is possible to offer entrepreneurial classes, but it's difficult to determine what the content of the actual classes should be.

3.7.2 SALIENT BELIEFS

Salient beliefs are difficult and time consuming to measure, especially for heterogeneous groups. Pilot studies are sometimes conducted (Engle, et al., 2010) in order to test the measurement instruments, but the decision to include certain beliefs is mainly directed by previous research (Luthje & Franke, 2003) or in logic deduction (Engle, et al., 2010). However, reminding a test person that, for instance, financial gain is a possible characteristic of entrepreneurship, might bring this belief to the attention of a person, temporarily increasing salience. The result of the measurement might be that financial gain does in fact impact entrepreneurial intent, while it is

possible that this only holds for true the duration of the survey. If resources allow it, salient beliefs should be indentified beforehand.

Ajzen (2006) suggested a method for constructing a questionnaire for the TPB which consisted of two distinct parts; first salient beliefs should be elicited by an open question format after which a survey could be constructed. Luthje & Franke (2003) for example, did conduct interviews to determine belief structures but the goal of this research was to create a theoretical model. It seems as if qualitative methods are not frequently employed in entrepreneurial research outside of theory building.

It should be noted, that only including salient beliefs is nearly impossible when investigating a group of people as the salient beliefs tend to differ from person to person. However, care should be taken to include as many modal salient beliefs as possible where highly specific personal salient beliefs can be omitted from the research.

3.8 CONCLUSION

It has become clear that, even though there is an extensive body of literature on the subject, several research gaps still exist. There is still room for improvement in three major areas being (1) theoretical contributions, (2) methodological contributions and (3) practical contributions. The research that uses this literature review as its basis strives to make contributions in all three of these areas. The literature research itself can also be seen to contribute to academic literature as it identifies some shortcomings in existing literature.

3.8.1 THEORETICAL CONTRIBUTIONS

The confusion regarding the distinction between entrepreneurial self efficacy and perceived behavioral control has hampered the development of the TPB. Indentifying and validating the hypothesis that, besides entrepreneurial self efficacy, other behavioral control factors impact entrepreneurial intent can increase our understanding of entrepreneurial behavior. For example, factors such as creativity can perhaps be placed within the confines of the TPB itself.

Additionally, the influence that one's social environment has on the decision making process is only regarded in the context of opinions. It can be argued that a social environment also impacts intent by offering would be entrepreneurs access to certain knowledge and human resource which are required for starting a successful enterprise.

3.8.2 METHODOLOGICAL CONTRIBUTIONS

The follow up research on this literature review will strive to design a new methodological approach that includes not only the currently favored quantitative methods but also includes qualitative methods in order to increase internal validity and allow for a more explorative way of working in line with the suggestions of Aldrich (1992).

A second methodological gap can be found in the population studied. The large majority of research employed student sample sets, but in order to increase external validity other sample sets should also be considered. Therefore a shift in sample set is proposed and the follow up research will research maker space members instead of students. Aside from the relatively straightforward benefit of increasing external validity the change in sample set might also reveal certain beliefs that were simply not present in students.

3.8.3 PRACTICAL CONTRIBUTIONS

Although not directly based on a distinct research gap, the follow up research will attempt to make a practical contribution alongside the aforementioned methodological and theoretical additions to the existing body of knowledge. Both the suggestions for methodological and theoretical contributions serve to create the possibility of designing successful interventions that seek to improve entrepreneurial intent. Since the follow up research will take place in the context of maker spaces it will also increase our understanding of this phenomenon and provide future researchers suggestions for further research.

Other stakeholders might also benefit from the results of the follow up research. The makerspaces themselves will be able to adjust their value proposition in order to more effectively cater to the needs of (starting) entrepreneurs. Policymakers seeking to foster entrepreneurship will be able to make better substantiated decisions about effective interventions, information that is now sorely lacking. And finally there is also a sociological benefit; there has been little research into the culture and way of working of the emerging maker culture. Seeing as how the open source culture has significantly boosted innovation in the software industry, it is interesting to understand if such innovative climates can exist for physical product development.

4   FIRST STUDY

The goal of the qualitative study is twofold. Its first goal is to establish which beliefs associated with entrepreneurship are in fact salient beliefs within the investigated population. According to Ajzen (2006) this distinction is meaningful as beliefs that are readily accessible in a person's mind have the most influence on the decision making process. Administering a survey which exclusively tests beliefs obtained from literature increases the chance of including beliefs that have little predictive power. The qualitative study is therefore utilized to test the beliefs employed by previous research.

The second goal is to increase overall understanding of what role makerspaces play in the formation and facilitation of new enterprises. Not only should new beliefs be identified, their mutual dependencies should also be considered. If possible, it should be determined how these beliefs are formed and how they might be influenced. What is effectively being investigated is how visitors of makerspaces regard entrepreneurship.

To summarize, the following questions have served as guidelines for this study;

- Which beliefs are salient beliefs?
- Which other beliefs are overlooked by previous research?
- Are there any control beliefs that should be accounted for?
- How useful is the theory of planned behavior for the population under investigation?
- What role do makerspaces play for starting entrepreneurs?
- How can makerspaces promote or support entrepreneurship?

The qualitative study strives to provide a sound theoretical basis upon which the quantitative study can be built. Although its results and methodology should be regarded in conjecture with the qualitative follow up study, the qualitative study can regarded independently as a stand-alone study. The qualitative study will serve as an empirical grounding for the quantitative study. The qualitative part will take a critical look at the findings of previous researchers as presented in the literature review and seeks to add to the same. Finally, it provides a detailed basis for which constructs should be included in the survey of the quantitative study and provide promising new lines of inquiry.

4.1 LITERATURE

Aside from the theoretical framework as discussed in the literature review section, several other, less general literatures should be reviewed for this study. Unfortunately, very limited scholarly research has been conducted regarding makerspaces, so the information presented below relies on (mostly) non-scholarly sources.

4.1.1 EXAMPLES OF ENTREPRENEURSHIP IN MAKERSPACES

Before delving into the matter of entrepreneurship into makerspaces the question must first be asked if there even is entrepreneurship directly originating from or related with makerspaces. And if so, are these ventures and the associated entrepreneurs different from what is already known? In order to create a somewhat more vivid picture of these matters a short description of various companies that are heavily involved in makerspaces or have evolved from a makerspace are listed below. These examples will serve as a practical context and provide some insight into what kind of companies might evolve from makerspaces. The projects range from successful business to open source projects and even the development for military technology.

These examples also serve to demonstrate the potential of makerspaces as a driver of technological innovation and economic growth, deserving of further (academic) research. It's interesting to take note of the high level of support that some makerspaces enjoy from large industrial partners and government, especially because the effect of makerspaces on entrepreneurship has only been demonstrated by anecdotal evidence. Furthermore, a great deal of these enterprises received little to no backing from venture capitalists or other financial partners. Instead, they employed iterative designs and made to order production processes that eliminate the need of high upfront investments.

4.1.1.1 Ultimaker

Ultimaker is a Dutch company that produces consumer grade 3d printers. The company was founded three years ago by three active members of the protospace, a FabLab located in Utrecht. Part of the development was performed in the protospace as was obtaining customer feedback and in some cases, technical support or idea generation. Currently the company is quickly growing and people and is one of the leading European companies in the consumer 3d printing market.

4.1.1.2 Doodle 3d

Doodle 3d was developed by one of the founders of the FabLab Amersfoort where it was first built as a demonstration tool which allowed people to quickly generate simple 3d drawings suitable for 3d printing. After very positive reactions from the public a crowd sourcing campaign was started, collecting about 70.000 USD from the public for further development of the product. The FabLab Amersfoort served as both the inspiration and the environment where the product was developed.

4.1.1.3 DARPA and Techshop

Techshop is the largest commercial makerspace in the United States which has started a joint collaboration project with DARPA. The goal is to develop new production methods, emphasizing extreme flexibility both in required resources and time schedules. Although not directly related with entrepreneurship, DARPA is seeking to tap into the innovative potential of makerspaces and its customers.

4.1.1.4 Start-up Winipeg

A not for profit makerspace offering counseling, support and expertise to start ups in the Winipeg region in Canada. In addition to the regular services most makerspaces offer, this maker space also offers services specifically aimed at entrepreneurs such as financing, office space and networking events. This maker space is supported by local government and local businesses alike, both of which who are seeking to stimulate the formation of new businesses in the region.

4.1.1.5 Open ROV

Open ROV is an open source robot for under water exploration. It was developed to be as cost efficient as possible. Development, prototype creation and even parts of production are performed in Techshop, where the founders also learned various skills required to build the robot. Notable is the high number of prototypes (35) that were developed before the robot was launched.

4.2 SAMPLE

A sample of nine people was selected and each of them was interviewed using a semi structured interview approach. A theoretical sampling method was used, where participants were selected based on their expected contribution and insight on entrepreneurship. Theoretical sampling, as opposed to purposeful sampling was found to be most applicable to this research, as it was uncertain in which direction the study would lead, but it was clear where the phenomena under

investigation existed (Coyne, 2008). The participants were recruited in one commercial makerspace and two different FabLabs and each participant was; a member, a volunteer or an employee at the makerspace or FabLab in question. Additional participants were recruited until theoretical saturation was obtained and no further beliefs or relations between beliefs where revealed during the subsequent interview. In total, nine participants were interviewed.

4.3 METHOD

A semi structured interview was selected as the main research instrument, as the main goal is to probe the underlying mechanisms of entrepreneurial behavior, for which interviews are better suited than surveys (Yeung, 1995). As has been noted by previous researchers, qualitative research is best employed to capture highly complex situations where context is of paramount importance (Conger, 1995). Since the goal of this study is to indentify suitable variables and their underlying structure, qualitative methods are the most suitable. A final argument can be found when looking at previous research done in regard to entrepreneurial intent; most, if not all, have relied heavily on survey based method, despite several authors' calls for investigating alternative methodologies (Aldrich, 1992). While this is most likely caused by the presence of strong theoretical frameworks like the TPB, diminishing the need for explorative research, the unique context and suspected influence of the community in this study requires a fresh look on the underlying structure.

4.3.1 DATA COLLECTION

All participants were interviewed by the researcher using a semi structured interview, which took about 30-60 minutes to complete. All interviews were recorded with verbal permission of the participants. The interview questions were written in English but were conducted in either English or Dutch, depending on the preference of the participant in question. The recordings where later converted into detailed summaries and a list of salient and non-salient beliefs which can be found in the appendix. Both were made as quickly as possible after the interview took place, and the audio recording was used to confirm the list of beliefs. All participants were told that their responses would be reported anonymously. Furthermore, it was stressed that the goal of the research was not objective truth finding, and that opinions and visions where also relevant in order to ensure that the participants would feel at ease discussing their beliefs and opinions.

The interview is comprised of five different parts; (1) introduction, (2) attitude towards behavior, (3) social norms, (4) perceived behavioral control and (5) control variables and general questions. The interview plan, together with a brief motivation for including each question and variable is presented below, listed per part. The various parts of the interview were conducted in the same order, unless a participant provided information relevant to an earlier or later part. The interview plan consists of main questions, which might open up a more detailed line of questioning. The additional questions listed in the interview plan are more in depth questions which were asked in case not enough information was obtained by the broader, less specific, parent question. Furthermore, a detailed reasoning for asking each question is also provided.

Each part has a strict order from which was not deviated. First an open ended question was asked in order to obtain the salient beliefs of participants. When participants could not think of any other additional answers, the participants were asked if they shared the beliefs found in literature if these had not already be named. The participants were not told that some of the beliefs tested thusly were in fact not obtained from previous research but were thought of by the researcher. This was done in order to ensure that each belief was considered to be equally likely to occur and to reduce confirmation bias of participants, as the participants might think of either the researcher or literature as a more credible source.

4.3.2 INTRODUCTION SECTION OF THE INTERVIEW

The introduction part of the interview serves three purposes. Its first purpose is to get the interview going and obtain some basic information that can be used to ask specific questions that allow for a much smoother flow of the interview. Secondly, information is obtained about the person's background which allows for determining if that person is an entrepreneur, previous experience in entrepreneurship and desire to become an entrepreneur. And finally, allowing the participant to tell about him or herself helps establish rapport and might open up new lines of questioning and increases the flow of the interview. The introduction part of the interview was not modified during the course of the study since it performed as expected and no problems were encountered.

TABLE 4: STRUCTURE OF INTRODUCTION QUESTIONS

Main question	Additional questions	Goal

Can you give a short introduction about yourself?	What do you do for a living?	Establish connection, good start of interview, provides good openings for further lines of questioning. Also provides some demographic and background information
What are your motives for attending a FabLab/makerspace	• Has this changed during the time that you have been a member? • Have you attended similar initiatives such as FabLabs / maker spaces?	Determine motivation, investigate possible change in reasons
• **Do you want to become an entrepreneur?** **Or** • **Do you consider yourself to be an entrepreneur**	• What kind of business? • For how long have you wanted to start a business Or • For how long have you been an entrepreneur?	Required for classification of people into opportunity entrepreneurs, non-entrepreneurs and necessity entrepreneurs. Gives insight into what kind of entrepreneurship is considered / present.

4.3.3 ATTITUDE TOWARDS BEHAVIOR

As mentioned in the literature research part of this thesis, attitude towards behavior is the construct that represents how positively (or negatively) a person views the outcome of a certain behavior. In the case of entrepreneurship this means how attractive entrepreneurship is as a career choice. From previous literature several beliefs have been derived. Additional beliefs have been included in the interview based on field observations of the researcher. One such belief is the belief that entrepreneurship might require (too) much time and effort, which might also, in some way, be coupled to another belief that entrepreneurship is risky.

During the study it became clear that the risky nature of entrepreneurship was conceptually better located in the perceived behavioral control part, but participants tended to mention risk as a negative aspect of entrepreneurship on their own. As such, it has not been moved during the course of the study. Participants did have difficulties ordering beliefs relevant to each other, especially when comparing good and bad characteristics. Furthermore, participants tended to name one or two characteristics as most important and had trouble ranking the characteristics they felt to be of lesser importance. Instead, it was opted to ask participants; "which of the characteristics you named are most important", a change which greatly improved the flow of the interview.

TABLE 5: STRUCTURE OF QUESTIONING REGARDING ATTITUDE TOWARDS BELIEF

Main question	Additional questions	Goal
What are the most important characteristics of entrepreneurship as a job option for you?	• What are the most important positive aspects • What are the most important negative aspects	Determine salient beliefs regarding the attitude towards belief construct. Identify new relevant beliefs
How important are the characteristics you named relative to each other?	Can you order them by importance?	Establish the relative importance of each characteristic.
How important are the following characteristics • **Financial gain/risk (lit)** • **Chance for self-realization (lit)** • **Autonomy/freedom (lit)** • **Risky (proposed)** • **Time required (proposed)**	How do these characteristics compare to the ones you already mentioned? Are they of equal importance or not?	Create link with characteristics found in literature. Useful investigate if pointing out a potential characteristic increases its relative importance.

4.3.4 SOCIAL NORMS

The construct *social norms* regards the social desirability of the behavior. Examples of beliefs that are associated with social norms are the opinions of significant others, friends or family. There seems to be some controversy on the significance of social norms however; some researchers report significant impact on entrepreneurial intent where others report non-significant impact. It might be that these differences are caused by cultural differences (Krueger, Reilly, & Carsud, Competing models of entrepreneurial intentions, 2000) or that a yet unexplained moderating value influences the relation between social norms and entrepreneurial intent. Due to the difference in the sample set as compared to previous research, social norms requires additional attention in the semi structured interview. For example, relatively little students have to support a family financially, which might influence the importance of the opinion of family.

A possible addition that was investigated during the semi structured interview is the possible influence of the government's opinion on entrepreneurship. It might be possible that not only people with close social ties to a person influence the decision making process, but also society as a whole in the form of policies, legislation or institutionalized action. During the interview a slight modification was made to the question regarding the opinion of role models and friends. A hybrid of these two questions was added, since a number of participants made a clear distinction

between entrepreneurial and non-entrepreneurial friends. Since the importance of both role models and friends was not homogenous, it was opted to ask participants if in-group differences existed. For instance by asking; "is the opinion shared by all your friends" or "Is the opinion of all your friends equally important?"

TABLE 6: STRUCTURE OF QUESTIONS REGARDING SOCIAL NORMS

Main question	Additional questions	Goal
Whose opinion is important to you when making career choices	Is this the same for the career of becoming an entrepreneur? • Does this list also include certain groups whose opinion matters Or • Does this also include certain individuals whose opinion matters?	Determine beliefs regarding social norms and determining influential opinions.
Whose opinion is most important of the ones you just mentioned?	Could you rank them by importance?	Determine relative importance to each other
How is the opinion of the following groups and/or persons important to you when making career choices such as becoming an entrepreneur? • **Role models (lit)** • **Government/institutes? (proposed)** • **Friends (lit)** • **Family (lit)**	How do these characteristics compare to the ones you already mentioned? Are they of equal importance or not?	Create link with characteristics found in literature. Useful investigate if pointing out a potential characteristic increases its relative importance.

4.3.5 PERCEIVED BEHAVIORAL CONTROL

Certain skills and environmental factors can influence the chance of success of a new venture and as such influence the likelihood that a person will consider starting one. However, only entrepreneurial self-efficacy has been investigated in this context. It is expected that creativity and the presence of technical obstacles can have an influence on entrepreneurial success (and also that the target population believes these to be of importance). Furthermore, it is expected that other environmental factors exist that also have an impact on entrepreneurial intent.

As with the relative importance of beliefs associated with attitude towards behavior, participants had difficulties making an ordered list for the importance of each factor. Asking which factors or

skills where the most important proved much easier and greatly increased the flow of the interview. During the interview it became apparent that some participants had retroactive bias; they reported that certain elements were important for an entrepreneur, but they did note that this was information that was unavailable to them when they started as an entrepreneur. An additional question was added to each main question for experienced entrepreneurs to investigate if certain aspects were relevant for starting entrepreneurs as well. For instance, certain financial aspects of running a business were reported to be much more of a hassle than some entrepreneurs had originally expected.

TABLE 7: STRUCTURE OF QUESTIONS REGARDING PERCEIVED BEHAVIORAL CONTROL

Main question	Additional questions	Goal
What factors influence the success of a new business?	• Which environmental factors influence the chances of success? • Which skills do you think are required to be successful as an entrepreneur? • What other factors can you think of?	Determine salient beliefs regarding perceived behavioral control. Identify new relevant beliefs
How important are each of these factors?	Can you order them by importance?	
Do you think that the following skills/characteristics are important for entrepreneurs? • **Creativity** • **Entrepreneurship specific skills (management, finance, finding investors etc)**	How important are these characteristics compared to the other characteristics/skills mentioned?	Create link with characteristics found in literature. Useful investigate if pointing out a potential characteristic increases its relative importance.
Do you think that technical obstacles influence the success rate of new ventures?	What kind of technical obstacles do you think are the most critical? How important are technical obstacles compared to the other factors mentioned?	Gain insight about technical obstacles and their associated beliefs.

4.3.6 DATA ANALYSIS

The interviews were recorded, and transcribed after the interview took place. During the transcription process notes were made about potential relationships or thoughts about what had been said. These notes and thoughts were written down before any coding was performed in order to ensure an as open perspective as possible. This approach shares some similarities with the multi grounded theory approach but a much stronger emphasis was placed on theoretical

grounding since a strong and well defined theoretical framework was employed as the foundation of this study. Both deductive and inductive analysis was employed. Deductive analysis was especially clear when reviewing the existing concepts in the theory of planned behavior. Inductive reasoning was also employed as it allowed for identifying new themes in the raw data (Thomas, 2006).

The study was performed within the theoretical context of the Theory of planned behavior. Therefore, the coding structure employed in this study closely follows the structure of the theory of planned behavior. Statements and answers to questions where coded based upon their similarity to the existing or proposed concepts and beliefs in the theory of planned behavior. Besides using coding to categorize responses of participants, relative strengths of certain beliefs were also noted. Originally the goal was to obtain a hierarchal list of each beliefs importance, but this turned out to be somewhat difficult to express for participants, so a distinction was made between major and minor beliefs.

The coding procedure was first conducted for each participant, following the order of the actual interview. This was done to maintain the narrative of the interview and find correlations between categories and beliefs for each individual. In order to ensure that the coding procedure was performed reliably, it was opted to do the coding a second time at a later date using a slightly modified tactic. The second time all responses of the participants were grouped per question and the coding procedure was done for each question. If the second coding yielded different results, the result of the last coding effort was used to determine if the difference disturbed the narrative of the first coding.

4.4 FINDINGS

The findings of the semi structured interview are presented below, grouped per construct of the TPB. For each belief associated with their respective constructs several characteristics are discussed. First is its salience; whether or not a participant mentioned the belief in question on their own accord. Second is the relative importance of each belief. Any remarks placed by the participants or conditional relationships are also discussed.

4.4.1 ATTITUDE TOWARDS BEHAVIOR

Financial gain appears to be worded incorrectly; most participants were not at all interested in financial gains although the financial aspects of entrepreneurship were considered. Financial gain

was hardly considered as a driving factor but financial *stability* was. Only one participant had financial gain as a salient belief and even this participant partially considered the financial gain as a measurement of an enterprises success. Two participants had financial risk as salient beliefs and both worried about being able to provide a stable income as entrepreneurs. When asked about financial gain all but one of the participants responded that stability and being able to obtain a sufficient income were important. It appears that the participants are interested in obtaining a stable income above a certain income level and not so much in significantly improving their financial position.

Almost all participants shared the salient belief that entrepreneurs have higher chances for self-realization. In most cases this belief was tightly linked to freedom; the participants believe that the high freedom of entrepreneurs provides much greater chances of self-realization. Participant 4 described that certain people flourish in an environment in which there is not too much freedom but that this is what sets entrepreneurs apart, supported by statements made by participant 7. Entrepreneurs have greater chances for self-realization when they are not placed in a too restrictive environment.

Freedom was agreed upon by all to be an important and very desirable characteristic of entrepreneurs. Some participants remarked upon the fact that freedom could sometimes be a double edged sword, since it requires discipline and determination to make use of that freedom. Participant 3 remarked that freedom was only useful if a person knows what to do with that freedom; a certain level or proficiency is required before the freedom could be benefited from.

The opinions regarding learning were somewhat mixed; some believed that entrepreneurs are in a better position to learn where others saw no difference between regular employment and entrepreneurs. Those whom saw no difference did remark that the direction of learning was less restricted for entrepreneurs. An entrepreneur decides for themselves what to learn, something which was seen as desirable. Only one participant saw more learning opportunities when working in regular employment.

Although being an entrepreneur requires much time, most participants agreed that this was not negative per se as long as the work was fun and as long as there was freedom in how and when the time was invested.

"If you like it, it's easy, then you just do it. From that point, you can spend twenty hours a day doing what you like."

-Participant 7 (audio)

Although this is also a double edged sword as participant 6 and 9 mentioned that entrepreneurs tend to invest too much time in their business. Sometimes to the extent that their social environment has to remind them to take time off.

For three participants time required was a salient belief.

4.4.2 SOCIAL NORMS

The importance of social norms as an antecedent of entrepreneurial intent varied greatly between participants. Some had the strong opinion that social norms were not at all important or should only be seen as informative and not binding or constrictive. Participants who did see social norms as important tended to place a high value on social norms. Little room was left in the middle of the spectrum, although for the participants where social norms are important, certain referent others opinions are considered to be more important. It is interesting to note that a large number of participants described a similar method when asked about the role of their social environment. They described that not only the opinion of referent others was important, their knowledge and advice was also considered. Participant 3 for example stated when asked about whose opinion was important;

"The people who, in my opinion, have a good view on how things work and who know me as a person"

-participant 3 (from audio interview)

Indicating that besides a personal relationship, certain knowledge about the matter improves the influence of an opinion. As such, during later interviews, more emphasis was placed on in group differences of referent others. Especially the distinction between entrepreneurs and non entrepreneurs was clear to most entrepreneurs. The opinion of other entrepreneurs was considered to be more valuable and more likely to influence behavior by entrepreneurs or people who wanted to become entrepreneurs. The participants who had little entrepreneurial intent did not make such a clear distinction between entrepreneurs and non-entrepreneurs.

Differed in salience and in importance, something which was expected as not everyone has an equally good relationship with their family. Two participants remarked that the greatest influence of family was in how a person was raised and in providing a background. An entrepreneurial family was considered to be positively influencing entrepreneurial intent according to these two participants.A clear example of the often longstanding influence that family can have can be found in the following quote;

"People expected me to become an entrepreneur from a very early age, so it did not come as a surprise to them (the family) at all"

-Participant 6 (from audio interview)

The influence of family can not only be seen in opinion but also in the values and culture being imparted. While the social norms construct only regards the influence of the actual opinion of family, the role that family plays in the formation of entrepreneurial intent is likely to be much more expansive than just perceived opinion and motivation to comply with that opinion.

During the interview it became apparent that a difference should be made between entrepreneurial and non-entrepreneurial friends. The opinion of entrepreneurial friends was considered to be more influential and valuable than those of non-entrepreneurial friends. This is in line with the aforementioned observation of a participant that knowledge of a referent other increases the value of their opinion. This is also supported by a statement of participant 9, who stated that *"These people (entrepreneurial friends) are in the same place as you are, they understand better what's going on"*

Role models are mostly seen as a source of inspiration and learning. Their example not only provides motivation but could also be used to see how things should or should not be done. None of the participants mentioned the importance of a role models opinion, although being able to consult experienced entrepreneurs was considered to be quite helpful and deemed likely to improve entrepreneurial intent. From this it would seem that perhaps the phrasing of this belief was somewhat wrong. It is not so much the opinion of the role model that is of importance, but their existence, visibility and advice. While definitely a part of the social environment, it's clearly distinctive from the other segments in the social norms construct in the sense that it's not

opinion based. Role models serve more to lower the barrier by providing a clear example and providing practical information or caveats about entrepreneurship.

While the policy of a government can seriously improve or hamper the prospects of entrepreneurs, the opinion of the government isn't considered to be important. This might be caused because of the large distance of the government to entrepreneurs, or as one participant described it;

"It's too abstract, too far away. I can understand the opinion of a person much better than that of the government. It's not one opinion; it's a mix of all sorts of things coming together"

-Participant 9 (from audio interview)

The opinion or even the role of the government is never mentioned as a salient belief by any of the participants. When asked about the role that the government plays, most participants agree that it can have an effect, but it's simply not considered to be a huge influence. Participant four mentioned that this is especially important for companies trying to grow above the scale of SME and that a government can play a crucial role in such cases. It's interesting to note that some participants believe that the Dutch government is not very supportive of entrepreneurship while others think the exact opposite. Based on the narrative provided by the participants, their opinion seems to be based on a number (or the lack thereof) encounters with governmental institutions or officials. Again this supports the notion that government as a whole is too vague a concept; it's difficult to express the social impact of a government due to its size and complexity. As such it should probably be omitted from the follow up study as subdividing it into smaller clearer concepts distracts from its core research questions.

4.4.3 PERCEIVED BEHAVIORAL CONTROL

A great number of characteristics of entrepreneurs are provided by participants when asked about the skills that an entrepreneur needs to have. While the personality traits of (would be) entrepreneurs is not the focus of this study, it's worthwhile to mention them as they serve to illustrate the notion that there seems to be a clear picture regarding what an entrepreneur looks like. It can be argued that confirming to this stereotype might influence perceived behavioral control. After all, when one has all the characteristics that are commonly associated with successful entrepreneurs, the mental step that one could be a successful entrepreneur is not so

great. Entrepreneurs are seen as courageous, visionary, independent, sociable, likable, adventurous, talkative and inspiring.

Initially this was seen as entrepreneurial self-efficacy, but it immediately became clear that this concept was too vague for participants. However, certain skills associated with entrepreneurship such as managerial and financial skills were much easier to understand. Interestingly enough, opinions on their importance vary quite a bit. Especially the small entrepreneurs seem to think that these skills are not that important and only a basic understanding or level of proficiency is required. For instance, participant 8 (jokingly) states several times that his financial skills are next to non-existent. For larger companies these skills would be more useful. Non entrepreneurs and entrepreneurs running companies with several employees agreed that these skills are valuable for all entrepreneurs. For the non-entrepreneurs and entrepreneurs running larger companies these beliefs are salient, whereas these are not salient for the small entrepreneurs. Due to the small sample set it's dangerous to derive any conclusions from this, but the distinction remains curious.

Domain specific skills are mentioned as being important several times, being a salient belief for six participants. While it's not always considered to be the most important skill for an entrepreneur, most participants agree that having certain practical skills related to the field in which one is active as an entrepreneur is useful. The reasons why this is considered useful do differ however. For some the domain specific skills are seen as mandatory as being an entrepreneur might mean that you work on your own for quite some time, where for others it is seen as a method of getting inspiration and being able to identify problems before they can occur. Especially for the self employed without personnel the domain specific skills are considered crucial, or as mentioned by one participant;

"They are after all the basis of what you are trying to sell"

-participant 5 (from audio interview)

Participant seven also agrees with this statement, reflecting that these skills tend to develop by themselves as one gets more experience.

While the removal technical obstacles was theorized to be one of the main reasons why makerspaces could influence entrepreneurial intent, none of the participants have salient beliefs

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concerning technical obstacles. When asked about the importance of technical obstacles the responses range from reluctant acknowledgement of their existence to responses indicating that technical obstacles are simply underestimated or ignored when starting a business. Looking back, participant 5 mentions *"In the beginning you are very naïve about these things"*. While some participants do agree that technical obstacles can influence the success of enterprises they do state that technical obstacles can be bypassed or overcome by getting outside help or employing ones network. For instance, participant one stated that he recruited help for electronics as he lacked the technical knowledge. It seems that technical obstacles have little impact on perceived behavioral control while their impact on actual behavioral control stands without reason. Participant 6 even mentioned that he sometimes actively ignores the presence of technical obstacles *"otherwise you would never start"*.

The interesting thing here is that tactics to avoid the impact of such obstacles are being employed, but that the existence of the problems themselves is not acknowledged explicitly. All participants agree that entrepreneurship is quite risky and that, if one starts a business, certain tactics should be employed to increase the chances of success. However, what exactly causes the high rate of failure seems difficult to express. In practice, the entrepreneurial participants seem to diminish the number and magnitude of problems, but at the same time they do take precautions and employ tactics to deal with them. An interesting paradox; they underestimate problems but employing coping strategies and value problem solving skills.

Creativity has a curious place in the participant's belief structure. While only one participant mentioned creativity without being asked specifically about it, most agree that creativity is important, if not very important for the success of an entrepreneur when asked directly. Aside from communication skills this belief is the strongest of all beliefs. Only one participant stated that creativity can be useful for some businesses and not for others. Even though creativity ranks very poorly on salience, the strength of the belief is quite remarkable.

Participants indicated that creativity could help entrepreneurs in overcoming obstacles which are bound to be encountered. Other uses for creativity such as setting up creative communication plans and thinking of creative new market approaches were also given. The confronting question *"Do non-creative entrepreneurs also exist?"* elicited curious responses from some participants. All agreed that non-creative entrepreneurs did in fact exist, but that creativity still was crucial for

being a successful entrepreneur. The mental image of an entrepreneur seems to be one of a creator or maker, finding creative new solutions. While un-creatively starting a franchise business is also seen as entrepreneurship, the salient image of an entrepreneur is of the much more adventurous and creative nature.

That entrepreneurs should have strong communication skills is a strong and salient belief for all participants. In many cases communication skills were ranked as the most important skill for an entrepreneur to have even before identifying a need or being able to create a product. As participant 4 reflected; *"If you can sell something, you'll quickly find something to sell"*. Being able to connect with fellow entrepreneurs, customers, suppliers and other useful partners, groups or individuals was seen as crucial for the success of any entrepreneur. While some participants acknowledged that they were somewhat lacking in these skills, they did acknowledge that this shortcoming could or was already hampering their performance as an entrepreneur. Having a valuable network was seen as a direct extension of this skill, following the reasoning that good communicative skills will result in a high value network.

"It's all those skills that you exactly don't learn in school. How to talk to people, how to get a network, how to sell your services, stuff like that you learn the hard way"

-Participant 8 (from audio interview)

4.4.4 CONCLUSIONS
A few interesting observations can be made based on the interviews. The mental image of an entrepreneur appears to be quite consistent and strongly developed. While slight variations of the perception of this stereotype can be seen, the core of the independent, sociable, headstrong and creative entrepreneur remains the same. In fact, this stereotype is so strong that some actual entrepreneurs don't consider themselves to be "real entrepreneurs" as their self-image doesn't correspond with the stereotype. Still, this hasn't stopped them from starting a business. The notion of what exactly moves a person to be become an entrepreneur appears to be a complex combination of personal traits, having useful skills and a supportive environment.

A good example of this complexity can be found in the perception of obstacles. Technical obstacles are difficult to predict and quite often underestimated by (nascent) entrepreneurs. They are aware of their existence; most agree that they do occur and that their potential for disrupting

their business is substantial. But even though these technical obstacles are difficult to predict and they are of a highly disruptive nature, their existence does not seem to impact entrepreneurial intent. Even experienced entrepreneurs whom have encountered such technical obstacles before admit that they do not consider technical obstacles, not even when considering starting a new business. Even experienced makers, whom undoubtedly have encountered numerous technical problems during their projects, seem to disregard the importance of these obstacles. In a sense this could be seen as an occurrence of cognitive dissonance; even though there is evidence to the contrary is available, technical obstacles considered important.

The occurrence of this paradox could partially be explained by the highly unpredictable nature of the technical obstacles and the planning fallacy. Even though entrepreneurs admit that they do not include technical obstacles in their decision making process they do suggest tactics to mitigate their impact. Creativity and problem solving capabilities are seen as a crucial ability of entrepreneurs. But if you don't perceive any problems, what use is a problem solver? The link between technical obstacles and creativity follows a simple reasoning; if technical obstacles occur and are highly unpredictable in nature then the person best suited to overcome them has to have a strong problem solving skill set and creative capabilities that allow for the creation of out-of-the-box solutions. Are entrepreneurs like the great explorers of old then, who, looking at maps labeled with *"here be dragons",* simply shrugged and packed for the journey best they could? In the end it might boil down to an issue of perception. It is difficult to imagine unknown-unknowns, but most people have little problem identifying creative people or indicating if they themselves are creative.

Another way of dealing with the uncertain nature is the active search for new information and the importance of finding a social network that could provide it. Again the underlying reasoning of this tactic is simple; to overcome the highly unpredictable and diverse problems that could occur, a broad and heterogeneous network can be a great asset in overcoming these obstacles. In a sense the two methods for overcoming these problems can be seen as interpersonal and intrapersonal. The intra personal approach requires a highly creative individual and strong problem solving skills where the interpersonal approach employs a network of diverse knowledgeable people in order to overcome obstacles.

This insight sheds new light on the perceived behavioral control variable used in the TPB. While environmental factors most certainly influence the belief that one has control over the behavior, some of these factors are simply not easily predicted, understood or even perceived. Such problems are of course not limited to the occurrence of technical obstacles, the same reasoning might be applied to other fields of entrepreneurship as well.

Last but not least is the insight in what role the social environment plays. The TPB includes a motivation to comply with an opinion of a referent other, but from the interviews a two reasons to comply can be deduced. The first is social; the closer the relationship with the referent other, the more influential the opinion. The second one is based on knowledge. The more knowledgeable a referent other is, the more influential the opinion. In case of entrepreneurship research it makes sense to include the opinions of those who score high on both fields such as the opinion of entrepreneurial friends or family members.

4.4.5 IMPLICATIONS FOR SECOND STUDY

In order to shed light on this conundrum, further research is required on the differences in problem solving strategies between entrepreneurs and non-entrepreneurs. Most visitors of makerspaces and FabLabs have experience with overcoming comparable obstacles in the process of making, yet some become entrepreneurs and others do not.

5 SECOND STUDY

Several questions are left unanswered by the first study. While there was a strong indication that the theory of planned behavior could indeed be employed to predict entrepreneurial intent, and the study was successful in indentifying the required (salient) beliefs in order to do so, another interesting avenue of inquiry was unveiled. Overcoming problems plays an important role in the uncertain existence of entrepreneurs, yet how these problems are then overcome, or why entrepreneurs believe they can succeed given the risky nature of starting a new business remains unknown.

The first study resulted in a few interesting narratives and insights, but in order to better position the obtained information into the existing academic knowledge a qualitative study can prove valuable; whilst providing new avenues of research in the form of constructs and possible links

can be useful, the actual validation of these findings is even more valuable. Based on exclusively a qualitative study it is also difficult to assess the magnitude of the influence that makerspaces have on entrepreneurship. While all participants perceive a positive influence of makerspaces on entrepreneurship and the first study has been able to indentify several reasons why this could be the case, it remains unclear what the relative importance is of each of these explanations.

Another reason to conduct the second study can be found in the practical contribution that this thesis seeks to make. In order to design a effective intervention to promote entrepreneurship using makerspaces, quantitative data is required. If preferable, the degree of affectivity of such an intervention should be predicted or at least predictable to some extent.

From the first study a slight preference of entrepreneurs for engaging problems instead of evading them was indentified, consistent with the findings of (Boyd & Begley, 1986) who found that entrepreneurs tend to take riskier courses of action as opposed to managers, a notion further supported by meta research done by Stewart et al (2001). This tendency is a central part of the philosophy of makerspaces; to make something you are going to encounter problems. As such, this is one possible path by which makerspaces can promote an entrepreneurial mindset. It has also been observed that this distinction is more pronounced for nascent entrepreneurs coming from regular employment (Caliendo, Fossen, & Kritikos, 2009). Further evidence that a distinction between entrepreneurs and non entrepreneurs in regard to problem solving styles has been provided by (Buttner & Gryskiewicz, 1993), showing that entrepreneurs are more innovative than managers of large firms. Furthermore, there is a observable difference in how novice entrepreneurs deal with problems as compared with experienced entrepreneurs (Dew, Read, Sarasvathy, & Wiltbank, 2009). As such, the following hypothesis is derived;

H1: Entrepreneurs tend to prefer approaching a problem as opposed to avoiding it

Not only is it likely that entrepreneurs prefer to engage problems, there has been considerable evidence suggesting that entrepreneurs perceive risks differently, estimating their chances of success to be much higher than in reality (Cooper, Dunkelberg, & Woo, 1988). Two possible explanations for this phenomenon are investigated; entrepreneurs simply don't see the myriad of problems associated with entrepreneurship, or they do, but believe that they can easily overcome these obstacles. This lead to the following hypothesis;

H2a: Entrepreneurs perceive less problems associated with starting a new business as opposed to non entrepreneurs

H2b: Entrepreneurs have a higher confidence in their problem solving skills

The role that makerspaces play in all this is of interest as well. From the first study it could be derived that the community of likeminded individuals was one of the main benefits of visiting makerspaces. As such, the following hypothesis is postulated;

H3: Entrepreneurs visit makerspaces for the help that the community can offer in overcoming obstacles.

5.1 METHOD

5.1.1 SAMPLE

590 subscribers to an online mailing list of a foundation doing research into the maker community were invited to participate in the online survey. 259 members and former members of a Dutch commercial makerspaces were also sent a digital invitation to the same online survey. In both cases, potential participants were explained that the goal of the research was to investigate the influence of makerspaces on entrepreneurship and that the research was part performed as part of the master thesis of the researcher. In total 849 people were invited to participate in the study and a total of 33 complete responses were obtained, a response rate of 3,4%. For both populations reminders were sent, but the response rate remained low.

5.1.2 SCALES

Several scales were employed in this study, alongside several open ended questions. The complete survey structure can be found in appendix 1

5.1.2.1 The personal problem solving inventory (PPSI)

The personal problem solving inventory (PPSI) developed by (Heppner & Petersen, 1982) was selected as one of the scales. The scale measures three constructs; (1) the confidence in ones problem solving capabilities called *Problem solving confidence*, (2) the tendency to either engage or avoid a problem called *approach-avoidance style* and (3) *personal control* indicating the level of control a person feels he has. This inventory was felt to be particularly useful in this instance due to its high degree of similarity with constructs used in the theory of planned

behavior; both problem solving confidence and personal control can easily be linked to *perceived behavioral control* from the TPB. Furthermore, the results of the first study suggested that entrepreneurs have a strong "can do" mentality and like face problems head on, making a strong case for differences in approach avoidance style between entrepreneurs and non entrepreneurs.

5.1.2.2 *Individual entrepreneurial intent scale (IEIS)*
Both entrepreneurs and non entrepreneurs will participate in the survey. Entrepreneurial intent of the non entrepreneurs will be measured using the individual entrepreneurial intent scale (IEIS) as developed by (Thompson, 2009). This scale was selected as it directly measures the required construct of entrepreneurial intent and was specifically developed to be usable for international research.

5.1.2.3 *Independent interdependent problem-solving scale*
The third and last scale employed was developed by (Rubin, Watt, & Ramelli, 2012). While this particular scale has not been employed often, it does measure a difference in problem solving style which was observed in the first study. In essence this scale measures if a person prefers to solve a problem by oneself or would rather enlist the aid of others in order to overcome it. A notion that directly corresponds with the inter/intra personal problem solving approaches derived from the semi structured interviews in the first study.

5.1.3 OPEN ENDED QUESTIONS
Existing entrepreneurs were asked if they felt that access to a makerspace had influenced their decision to become an entrepreneur and how it influenced their decision. Furthermore, it was also asked if access to a makerspace had enabled them to be more successful as an entrepreneur.

All participants were asked to think of potential problems that a imaginative high tech start-up company would encounter, in order to investigate the problem perception of participants. Participants were asked to also classify the problems based on how disruptive they could be on the actual performance of a new venture.

5.2 RESULTS
A very low response rate was obtained to the survey invitations, despite several reminders. The small sample size hinders both statistical analysis and has a significant impact on both the power and generalizability of the results.

5.2.1 SCALE VALIDITY

Construct	Cronbach's alpha
Problem solving confidence (PSC)	0,744
Approach avoidance style (AAS)	0,64
Personal control (PC)	0,525
Inter/intra personal (IP)	0,684

Table 8: Cronbach's alpha

The low values of the Cronbach's alpha are, in all likelihood, caused by the small sample size. The scales can still be used in this study since they are validated scales found in literature.

5.2.2 DESCRIPTIVE DATA

In table 9 an overview of descriptive data of the scales can be found. Skewness and kurtosis fall within acceptable ranges, although the high kurtosis for the AAS construct gives rise to some concern. Based on the Shapiro-Wilk test, $(p>0,01)$ we cannot reject the null hypothesis that the data has a non normal distribution.

	Mean	Std. Deviation	Skewness	Kurtosis
PSC	3,9274	,44109	-,168	-,017
AAS	3,2212	,37621	-,315	1,401
IP	3,1136	,52325	-,395	,248
PC	3,2727	,60066	-,013	,550

Table 9: descriptive data of measurement scales

5.2.3 ANOVA

Generally speaking, conducting multiple ANOVA instead of MANOVA should only be favored when the constructs being measured are highly independent in nature or when the constructs have not been combined before (Huberty & Morris, 1989). While this is not the case in the current study, one of the assumptions of MANOVA, the presence of sufficient correlations between the dependent variables is violated. The correlations between the dependent variables do not exceed 0,3 in all cases except for the correlation between personal control and problem solving confidence (correlation =0,467). As such, the main advantage of MANOVA over ANOVA, the ability to examine multivariate differences between groups is negated.

No statistical significant results were found for any of the dependant variables using a one way ANOVA, with the groups being entrepreneurs, non entrepreneurs and participants who were uncertain if they considered themselves entrepreneurs.

PSC $F_{(2,28)} = 0.972$, p=0.391

AAS $F_{(2,29)} = 0.147$, p =0.864

PC $F_{(2,30)} = 0.491$, p =0.617

IP $F_{(2,30)} = 0.544$, p =0.586

5.2.4 *OTHER MEASUREMENTS*

Existing entrepreneurs who visited makerspaces were asked to reflect on the impact that makerspaces had on their choice to become an entrepreneur and on their success as an entrepreneur. Entrepreneurs report a slight positive effect of makerspaces on their success as an entrepreneur (M=3.37, SD =0,890). The influence on becoming an entrepreneur is less strong (M=3.04, SD=1,16), although both the choice disagree (2) and agree(4) are chosen more often than the neutral option (2).

How makerspaces influenced the decision to become an entrepreneur was mainly reported as making it easier to create prototypes and products. Furthermore, inspiration and examples that other members provide were also reported as influencing the decision. The ease of making products and prototypes is also reported as one of the main effects on the perceived success of an enterprise. Together with self realization, learning opportunities and cost reduction (not having to buy expensive machinery).

Participants were also asked to reflect on what kind of problems a hypothetical startup company selling consumer 3d printers might encounter. The response rate for this question was even lower, netting only 15 responses after cleaning the data. For the critical problems (problems that are, if left unresolved, highly likely to kill the business) the three main issues described are (1) financial, (2) legal and (3) marketing. For financial issues, both cash flow issues and troubles with investors are given. The legal issues given by the participants focus exclusively on patent and intellectual property. The marketing problems are described as a potential mismatch between customer and product or not being able to reach the customer.

The major problems (described as being a huge hit on profitability if left unresolved) given can be divided into two categories; marketing and production/logistics. Production and logistics issues are related with quality control, ensuring stock and getting production up and running. The marketing issues have to do with expectation management and reaching the customer.

The minor problems described focus on employee issues and internal cooperation. They range from not getting the right employees to keeping employees happy and ensuring good cooperation.

5.3 CONCLUSION

While it is difficult to draw meaningful conclusions from such a small sample, especially when regarding the non significant results, some insights may still be derived. First and foremost is the perceived value of makerspaces in supporting ventures. While not all entrepreneurs found makerspaces useful for their enterprise, not all entrepreneurs participating in the survey had a business where a makerspace *could* be useful. After all, an ICT professional probably has little use for rapid prototyping machinery to support his business. But, even with these entrepreneurs in the sample set the overall perception is that makerspaces do have a positive influence on entrepreneurship. Unfortunately, the mechanisms of why and how this influence exists remains unclear. The perceptions of the entrepreneurs themselves is that makerspaces lower barriers and provide inspiration. Based on this, a weak support for hypothesis 3 is found.

From the actual quantitative part of the survey little information can be gleaned. The barely adequate sample size prevents any meaningful conclusions to be drawn. As such, hypothesis 1 and 2 cannot be confirmed nor denied.

6 DISCUSSION

One of the main shortcomings of this research can be found in the limited quantitative evidence provided to support the findings of the qualitative research. A very low response rate was the direct cause; despite various reminders sent by mail to the participants and contact via phone with the fablabs, the response rate did not increase much. Various fablabs replied that they felt that a lot of accademic research was being done which required their participation, and that their inclination to participate was diminished. Surprisingly enough there seems to be little published

research about fablabs, certainly not enough to warrant such a reserved pose regarding participating in research. Winning the trust of makerspaces should be the first step of future research in this direction, before further quantitative research can be conducted. Considering the main goal of fablabs; the spread of the open source ideology and free access to knowledge, the solution perhaps lies in making the research results freely available and making a stronger case that the knowledge gained from the research can benefit their organization.

Another interesting topic, left untouched by this study, is the nature of the firms that originate from makerspaces. During this research, several atypical yet successful companies were encountered, often employing radically different modes of production who were often without financial backing from formal investors. It is as of yet unclear if these companies are a result of the existence of makerspaces or that such deviant companies tend to gravitate to makerspaces.

Makerspaces can play a role in promoting entrepreneurship. But, the mechanisms by which this effect takes place are much more complex than originally predicted and suggested by existing theories such as the theory of planned behavior. The two proposed mechanisms for this positive effect are providing a creative community which is employed as a knowledge base by entrepreneurs and the access to high tech production machinery. In regard to the theory of planned behavior, which has served as the theoretical framework of this study, these insights add a new level to the theory. Where the theory of planned behavior only looks at certain beliefs, regardless of how they came into existence, our perspective should be broadened to include the origin of such beliefs as well. Especially seeing that entrepreneurs tend to underestimate certain problems. While underestimating such problems is likely to increase the attractiveness of entrepreneurship, it can also be argued that ignoring such problems can lead to serious problems for entrepreneurships. Furthermore, asking the question why certain beliefs are what they are offers new avenues to investigate how they relate to each other. Of course, this approach is not useful if one wishes to only measure intent, for which the original TPB is quite adequate indeed. However, this study has shown that the relationship and origin of beliefs can indeed play an important role in increasing understanding. Take for example the role of technical obstacles, as investigated in the first study. Employing only a belief-intent perspective the belief might very well have been marked as not important, as entrepreneurs underestimated its importance. This is

no way due to a fault of the theory of planned behavior, these beliefs probably don't influence intent, but they can be relevant for the success of a business.

So while this study only provides marginal evidence that makerspaces can increase the number of people wanting to become entrepreneurs, their facilitating role should not be underestimated. At the end of the line it's not the number of nascent entrepreneurs that a community should be interested in, but the number of nascent entrepreneurs multiplied by their chances of success. Based solely on the beliefs-intent structure, making entrepreneurship look like a feasible choice seems like a successful intervention. But without also creating a supportive environment in which these highly motivated would be entrepreneurs can flourish, the net gain is only limited.

The implication for practice is that a holistic approach should be sought. What entrepreneurs think is going to happen isn't always what is going to happen. So an effective intervention not only seeks to positively change perceptions, it should also seek to mitigate problems that the entrepreneurs *haven't* thought about. It can be argued that changing the perceptions of entrepreneurs could also solve this, making them aware of the pitfalls would allow them to take adequate precautions. But there is the rub; the tendency of entrepreneurs to underestimate the difficulty is part of what makes them favor entrepreneurship as a career choice in the first place. It's here that the real use of facilities such as makerspaces become apparent; without scaring would be entrepreneurs away by listing numerous problems it still is possible to help them overcome them when they pop up.

7 BIBLIOGRAPHY

Ajzen, I. (2006). *Behavioral Interventions Based on the Theory of Planned Behavior.* Retrieved november 3, 2013, from Personal webpage of Icek Ajzen: http://people.umass.edu/aizen/pdf/tpb.intervention.pdf

Ajzen, I. (2006). *Constructing a TPB questionaire.* Retrieved febuary 2014, from Personal page of Icek Ajzen: http://people.umass.edu/aizen/tpb.html

Ajzen, I. (2002). Perceived Behavioral Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behavior. *Journal ofApplied Social Psycholog* .

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

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical evidence . *Psychological buletin* , 888-917.

Aldrich, H. E. (1992). Methods in our madness? Trends in entrepreneurship research". *The state of the art of entrepreneurship* , 213.

Amabile, T. (1983). The social psychology of creativity. *Journal of Personality and Social Psychology* , 357-376.

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* , 35-62.

Barbosa, S. D., Gerhardt, M. W., & Kickul, J. R. (2007). The Role of Cognitive Style and Risk Preference on Entrepreneurial Self-Efficacy and Entrepreneurial Intentions. *Journal of Leadership & Organizational Studies* , 86-104.

Barniskis, S. C. (2014). Makerspaces and teaching artists. *Teaching artists journal* , 6-14.

Benton, C., Lori, M., Shelley, K., & Dempsey, T. (2013). *Makerspaces, supporting an entrepreneurial system.* Michigan state: MSU EDA University Center for Regional Economic Innovation.

Boyd, D., & Begley, T. (1986). Psychological Characteristics Associated with Entrepreneurial Performance. *Frontiers of Entrepreneurship Research* , 146-166.

Buttner, H. E., & Gryskiewicz, N. (1993). Entrepreneurs' problem-solving styles: an Empirical study using the kirton adaption/inovation theory. *Journal of small business management* , 22.

Carr, J. C., & Sequira, M. J. (2006). Prior family business exposure as intergenerational influence and entrepreneurial intent: A Theory of Planned Behavior approach. *Journal of business research* , 1090-1098.

Cha, M.-S., & Bae, Z.-T. (2010). The entrepreneurial journey: From entrepreneurial intent to opportunity realization. *Exploring Technological Innovation* , 31-42.

Conger, J. A. (1995). QUALITATIVE RESEARCH AS THE CORNERSTONE OF UNDERSTANDING LEADERSHIP. *The leadership quarterly* , 107-121.

Cooper, A. C., Dunkelberg, W. C., & Woo, C. Y. (1988). Entrepreneurs' perceived chances for succes. *Journal of business venturing* , 97-108.

Coyne, I. T. (2008). Sampling in qualitative research. Purposeful and theoretical sampling; merging or clear boundaries? *Journal of advanced nursing* , 623-630.

Engle, R. L., Dimitriadi, N., Gavidia, J. V., Schlaegel, C., Delanoe, S., Alvarado, I., et al. (2010). A twelve country evaluation of Ajzen's model of planned behavior. *International Journal of Entrepreneurial Behaviour & Research* , 35-57.

Epstein, S. (1980). The stability of behavior: II. Implications for psychological research. *American Psychologist,* , 790-806.

Fayolle, A., & Gailly, B. (2004). Using the Theory of Planned Behaviour to Assess Entrepreneurship Teaching Programs : A First Experimentation. *Annual IntEnt Conference.*

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research.* Addison-Wesley.

Forest, C. R., Moore, R. A., Jariwala, A. S., Fasse, B. B., Linsey, J., Newstetter, W., et al. (2014). The Invention Studio: A University Maker Space. *Advances in Engineering Education* .

Glück, J., Ernst, R., & Unger, F. (2002). How Creatives Define Creativity: Definitions Reflect Different Types of Creativity. *Creativity Research Journal* , 55-67.

Hamidi, D. Y., Wennberg, K., & Berglund, H. (2008). Creativity in entrepreneurship education. *Journal of Small Business and Enterprise Development* , pp. 304-320.

Hart, D. M. (2003). *The Emergence of Entrepreneurship Policy: Governance, Start-Ups, and Growth in the U.S. Knowledge Economy.* Cambridge University Press.

Heppner, P. P., & Petersen, C. H. (1982). The development and Implications of a Personal Problem-solving Inventory. *Journal of counceling Psychology* , 66-75.

Huberty, C. J., & Morris, J. D. (1989). Multivariate Analysis Versus Multiple Univariate Analyses. *Psychological Bulletin* , 302-308.

James, K., & Asmus, C. (2005). Personality, Cognitive Skills, and Creativity in Different Life Domains. *Journal of European Industrial Training* , 102 - 111.

Kim, M.-S., & Hunter, J. E. (1993). Relationship between attitudes, behavioral intentions and behavior. *Communication research* , 331-364.

Krueger, N. F. (1993). The Impact of Prior Entrepreneurial Exposure on Perceptions and New Venture. *Entrepreneurship Theory and Practice* , 5-21.

Krueger, N. F., Reilly, M. D., & Carsud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing , 15* (5-6), 411-432.

Luthje, C., & Franke, N. (2003). The 'making' of an entrepreneur: testing a model of entrepreneurial intent among engineering students at MIT. *R&D management* , 135-147.

Martin-Cruz, N., & Rodriguez-Escudero, A. (2013). New technologies and entrepreneurial intention. *International conference on industrial engineering and industrial management*, (pp. 221-232).

Mike, S., Patrick, M., Martin, W., Ferguson, R., FitzGerald, E., Hirst, T., et al. (2013). *Innovating Pedagogy: Exploring new forms of teaching, learning and assessment, to guide educators and policy makers.* The open university.

Oosterbeek, H., van Praag, M., & IJsselstein, A. (2010). The impact of entrepreneurship education on entrepreneurship skills and motivation. *European Economic Review* , 442-454.

Peterman, N. E., & Kennedy, J. (2003). Enterprise Education: Influencing Students' Perceptions of Entrepreneurship. *Entrepreneurship Theory and Practice* , 129–144.

Rubin, M., Watt, S. E., & Ramelli, M. (2012). Immigrants' social integration as a function of approach-avoidance orientation and problem-solving style. International Journal of Intercultural Relations. *International Journal of Intercultural Relations* , 498–505.

Schwarz, E. J., Wdowiak, M. A., Almer-Jarz, D. A., & Breitenecker, R. J. (2009). The effects of attitudes and perceived environment conditions on students' entrepreneurial intent: An austrain perspective. *Education & training* , 272-291.

Shapero, A. (1975). The displaced, uncomfortable entrepreneur. *Psychology today* , 83-88.

Shook, C. L., & Bratianu, C. (2010). Entrepreneurial intent in a transitional economy: an application of the theory of planned behavior to Romanian students. *Int Entrep Manag J* , 231-247.

Souitaris, V., Zerbinati, S., & Al-Laham, A. (2007). Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources. *Journal of Business Venturing , 22* (4), 566-591.

Sternberg, R. J., Grigorenko, E. J., & Singer, J. L. (2004). *Creativity: From Potential to Realization.* American Psychological Association.

Thomas, D. R. (2006). A General Inductive Approach for Analyzing. *American journal of evaluation* , 237-246.

Thompson, E. R. (2009). Individual Entrepreneurial intent: Construct clarification and development of an internationally reliable metric. *Entrepreneurship theory and practice* , 1042-2587.

Troxler, P., & Schweikert, S. (2012). *Developing a Business Model for Concurrent Enterprising at the Fab Lab.* Retrieved march 2014, from AMI comunities: http://www.ami-communities.eu/pub/bscw.cgi/d573159/Developing%20a%20Business%20Model%20for%20%20Concurrent%20Enterprising%20at%20the%20Fab%20Lab.pdf

Ward, T. B. (2004). Cognition, Creativity and entrepreneurship. *Journal of business venturing* , 173-188.

Wennekers, S., & Thurik, R. (1999). Linking Entrepreneurship and Economic Growth. *Small Business Economics , 13* (1), 27-56.

Willemaerts, C., Dewulf, W., Lambaerts, M., Boeykens, S., vanden Abeele, V., van Aken, J., et al. (2011). Introducing Engineering Students to Manufacturing in a Fabrication Laboratory (Fab Lab). *1st World engineering education flash week*, (pp. 72-79). Lisabon.

Yeung, H. W.-c. (1995). Qualitative personal interviews in international business research: Some lessons from a study of Hong Kong Transnational Corporations. *International business review* , 313-339.

Zampetakis, L. A. (2008). The role of creativity and proactivity on perceived entrepreneurial desirability. *Thinking Skills and Creativity* , 154–162.