

Halbinger, Maria

**Doctoral Thesis**

## Entrepreneurial Individuals: Empirical Investigations into Entrepreneurial Activities of Hackers and Makers

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**Copenhagen  
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Entrepreneurial Individuals

# Entrepreneurial Individuals

Empirical Investigations into Entrepreneurial  
Activities of Hackers and Makers

**Maria Halbinger**

PhD Series 15.2014

The PhD School of Economics and Management

PhD Series 15.2014

# **Entrepreneurial Individuals**

*Empirical Investigations into Entrepreneurial Activities of  
Hackers and Makers*

Maria Halbinger

PhD School in Economics and Management  
Copenhagen Business School

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# ACKNOWLEDGEMENTS

*To my parents*

*Creativity*

*And passion for what you do*

*Make your dreams come true*

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To express my heartfelt gratitude I dedicate this dissertation to my parents.





## **ENGLISH SUMMARY**

New ventures are central to an economy's welfare and substantial promoters of technological change and innovation. Extant research has identified individuals and their role in entrepreneurial processes as the core pillars of entrepreneurship. This PhD dissertation aims to refine our understanding of the fundamental relationship between individuals and their entrepreneurial activities.

In order to empirically test the hypotheses built, the analyses are based on a unique dataset on individuals in hacker- and makerspaces, i.e. open communities with physical workspaces where individuals with a common interest in technology, computing, science, art and hacking culture can meet, socialize and collaborate. Given that hackers and makers engage in various entrepreneurial activities, this empirical setting offers crucial benefits when analyzing entrepreneurial individuals.

The thesis combines the literatures on psychology and entrepreneurship and consists of three essays. The first essay focuses on the early activities in the entrepreneurial process and depicts how the individual's creativity as well as different forms of motivation influence different process activities including the discovery and exploitation of opportunities. The second essay consists of a longitudinal analysis and examines how the identity of the founder relates to firm exit. The third essay applies computational linguistic tools on haiku poems written by hackers to investigate how self-confidence, social awareness and social influence are related with entrepreneurial experience, defined by the number of times the individual has been involved in new firm establishments. Overall, the thesis aims to contribute to the field of entrepreneurship by providing empirical evidence on the individual-level factors that shape entrepreneurial activities.

## DANSK SAMMENDRAG

Iværksættervirksomheder er afgørende for økonomisk vækst og en væsentlig faktor for innovation og udviklingen af nye teknologier. Eksisterende forskning har identificeret individer og deres rolle i entreprenørskabsprocessen som kernen i entreprenørskab. Denne afhandling søger at øge forståelsen af den grundlæggende sammenhæng mellem individer og deres entreprenørielle aktiviteter.

For at kunne foretage empiriske tests af afhandlingens hypoteser er analyserne baseret på et unikt datasæt, som dækker individer i hackermiljøer. Disse åbne miljøer tilbyder fysiske rammer, som giver individer med fælles interesse i teknologi, programmering, videnskab, kunst og hackerkultur mulighed for at mødes, socialisere og samarbejde. Eftersom hackernes aktiviteter i høj grad er entreprenørielle, giver denne empiriske ramme en værdifuld mulighed for at analysere entreprenørskab.

Denne afhandling kombinerer psykologi- og entreprenørskabsliteraturen, og består af tre artikler. Den første artikel fokuserer på aktiviteterne i den tidlige del af entreprenørskabsprocessen og afdækker hvordan individers kreativitet, såvel som andre former for motivation, påvirker forskellige aktiviteter i processen såsom udforskning og udnyttelse af muligheder. Den anden artikel består af en longitudinal analyse og afdækker hvordan iværksætteridentitet påvirker virksomhedsophør. Den tredje artikel anvender computerbaserede lingvistikværktøjer til at analysere haiku digte, skrevet af hackere, for at undersøge hvordan selvtillid, socialbevidsthed og social påvirkning er relateret til entreprenørskab, defineret som det antal gange personen har deltaget i opstarten af en ny virksomhed. Samlet set tilstræber afhandlingen at bidrage til entreprenørskabsfeltet gennem empirisk dokumentation af faktorer på individniveau, der former entreprenørielle aktiviteter.

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# Chapter 1

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## INTRODUCTION

Entrepreneurship appears to have considerable benefits for economies. Research evidence shows that entrepreneurship crucially contributes to regional and industrial development (Feldman, 2001; Feldman et al., 2005), technological change (Schumpeter, 1934), job creation (e.g. Fritsch & Mueller, 2008) and economic growth (van Stel et al., 2005). Consequently, policy makers, practitioners and researchers alike share a strong interest in learning more about these entrepreneurial individuals who start new ventures. Given the impact of entrepreneurs on the economy and society, it is important to understand the individual skills and drivers required to discover opportunities, turn them into successful business ideas and make decisions conducive to running a viable venture. The characteristics of entrepreneurial individuals are decisive and their investigation is important for guiding investment of scarce resources and attention, and providing support in the form of appropriate training, incentive programs and financial support.

From a theoretical point of view, entrepreneurship research at firm level, i.e. taking the venture as the level of analysis, has hugely increased our understanding of how new organizations shape regions, markets and society. At the same time, scholars have drawn attention to the structural conditions that can precipitate entrepreneurship such as particular industry (e.g. Carroll & Swaminathan, 2000), geographical (Sorenson & Audia, 2000) and institutional conditions (e.g. Aldrich & Fiol, 1994). Since the key ingredient in entrepreneurship is human action rather than the environment, macro-level studies have been criticized for their deficiency in attention to individual-level effects (e.g. Thornton, 1999; Shane et al., 2003).

Micro-level studies highlighted that analyzing genetics (Shane et al., 2010), demographics, particularly education and occupation (Bates, 1995; Lazear, 2005) and psychological characteristics (e.g. Zhao & Seibert, 2006), is important to understand the underlying mechanisms related to individuals' entrepreneurial activities. Despite the progress made with respect to entrepreneurship, and micro-level research highlighting the differences between entrepreneurs and non-entrepreneurs, there is little empirical research on individuals in the entrepreneurial process and their performance (Shane, 2012). Seminal contributions in the field are theoretical and provide important insights into why individuals discover and exploit entrepreneurial opportunities (Shane & Venkataraman, 2000; Baron, 2006) as well as how their concept of the self, and the way they interact with others, matter for entrepreneurial activities (Cardon et al., 2009; Fauchart & Gruber, 2011; Baron & Markman, 2000). This is partly because analyzing the micro-foundations of entrepreneurship requires collection of data at different points in the process including activities before and after firm foundation.

### **The Thesis at the Intersection of Psychology and Entrepreneurship**

This thesis aims to contribute to this stream of literature by providing empirical evidence on how individual-level factors influence distinct entrepreneurial activities. It does so by drawing on the psychology and entrepreneurship literatures, a reasonable combination for three reasons. First, psychology includes the study of individuals' minds and thoughts, which relates to the intra-psychic dimensions of humans and takes account of individuals' mental functions including how individuals think and process information, and solve problems (e.g. Bandura, 1986). These aspects are at the core of entrepreneurship, with information processing particularly relevant with respect to entrepreneurial opportunities. Being placed in a rich "information corridor", i.e. in a situation in

which heterogeneous pieces of information exist, and its processing are critical for the discovery of opportunities. Moreover, a psychology lens on entrepreneurship allows investigation of the root causes of activities and provides a valuable perspective on the analysis of entrepreneurial motivation.

Second, psychology is concerned with the analysis of human behavior and is a helpful tool to increase our understanding of entrepreneurial activities. In particular, social psychology looks at how individuals interact with and work with each other (e.g. Allport, 1920; Tajfel, 1972). This is highly relevant for entrepreneurship, given that core entrepreneurial activities such as communication, accessing networks and mobilizing resources (Aldrich & Fiol, 1994, Stuart et al., 1999, Aldrich & Kim, 2007) occur in social interactions. Moreover, introducing a social psychological perspective into entrepreneurship research is interesting since one of the most hampering factors in entrepreneurship, uncertainty, can be reduced by social interaction (Autio et al., 2013).

Third, the social aspect of psychology gives credit to humans' values and feelings related to their actions and how they make sense of what they do (Tajfel & Turner, 1979; Hogg & Terry, 2000). Since this aspect provides insights into the mechanisms underlying individuals' actions and self-perception in social contexts, this lens is beneficial in shedding light on how and why entrepreneurs identify themselves compared to other social groups or individuals. Additionally, this perspective takes into account the meanings behind actions - a crucial aspect of entrepreneurship research because founders imprint their firms through their entrepreneurial behavior (e.g. Fauchart & Gruber, 2011). Given that firms are socially constructed (Whetten & Mackey, 2002), this thesis acknowledges the importance of taking account of the fact that individuals, particularly entrepreneurs, act within a social environment.

In investigating entrepreneurial activities from a psychological perspective, I use the notion of entrepreneurship as a process that is based on two major components, individuals and opportunities. Opportunities generally are situations that indicate the possibility to make profit (Casson 1982, Shane 2012). However, entrepreneurial opportunities are particular in not being merely useful, i.e. optimizing existing goods or increasing efficiency of existing processes, but involving novelty (e.g. Kirzner, 1997; Shane & Venkataraman, 2000).

The thesis adopts the framework in Shane and Venkataraman (2000) which describes entrepreneurship as a process where opportunities exist, and are discovered and exploited. *Discovery* includes a) exposure in the sense of being located in information corridors, i.e. where opportunities in form of complementary information pieces exist, and b) recognition, i.e. making connections between those information pieces to form opportunities with new means-end relationships. *Exploitation* refers to the exploitation of opportunities through firm foundation, i.e. exploitation of an opportunity in the organizational setup of a new firm, or other forms of implementation in markets and hierarchies, for instance in the form of patents and trademarks (see figure 1 for an overview).

In building on this body of entrepreneurship literature, I follow the well-established notion of entrepreneurship defined as a process, and contribute to current discussions on process models (McMullen & Shepherd, 2006; Alvarez & Barney, 2007; Alvarez et al., 2013). This thesis draws on Shane and Venkataraman's (2000) seminal model for four reasons. First, the model is widely accepted and considered to be a core concept in entrepreneurship research (Aldrich & Cliff, 2003). However, while Shane and Venkataraman call the major process components "stages", this thesis refers to them as "activities". This choice acknowledges the recent conception of activities in the process as not necessarily strategic or chronological (Shane, 2012). This thesis treats the activities



within the entrepreneurial process as distinct and independent and as activities that are not mutually exclusive.

This leads to the second reason which concerns the characteristic that the activities can co-occur or be iterative. For instance, it is possible that individuals might pursue several activities simultaneously or exploit opportunities to which they have not been exposed or discovered.

The third reason refers to the fact that since information is unevenly distributed (Hayek 1945), not all opportunities are identified, recognized and exploited (Schumpeter, 1934; Casson, 1982; Kirzner, 1997; Shane & Venkataraman, 2000). Consequently, by treating each activity separately in a standalone way, the thesis takes account of this and acknowledges that individuals can pursue entrepreneurial activities independent of each other, and opt out at different points in the process.

Fourth, entering information corridors in which opportunities arise (as noted earlier), thus also refers to an activity. This thesis deviates from Shane and Venkataraman's model in terming this activity *exposure*. That is, the individual does (or does not) expose him- or herself to situations where opportunity-related information exists. The reason for this adaptation is to allow a coherent view and consistent terminology in relation to entrepreneurial activities and the role of the individual in the process. However, it is important to note that the underlying theoretical principle as proposed by the authors, remains unchanged, and thus, the term *exposure* is in line with Shane and Venkataraman's process model.

With respect to the overall thesis, the investigation does not stop with opportunity implementation or becoming an entrepreneur. Instead, in line with prior work, *exit* is included in the broader conception of the process (e.g. Wennberg, 2009) because, as noted earlier, the technological, regional and economic benefits only occur if newly founded organizations survive

(Bruederl et al., 1992). While there are various definitions and conceptions of exit, in this thesis, firm exit refers to performance, and is defined as firm discontinuance, i.e. the termination of business (Yang & Aldrich, 2012).

Furthermore, since the entrepreneurial process does not have to be rational, strategic or chronological (Shane, 2012), in this thesis it is considered that individuals can pursue parts of the entrepreneurial process repeatedly, thereby increasing the breadth of their experience. Analyzing the factors associated with entrepreneurial experience is important given their associated benefits such as increased firm performance (e.g. Stuart & Abetti, 1990; Delmar & Shane, 2006; Dencker et al., 2009; Eesley & Roberts, 2012) and above-average economic growth (Plehn-Dujowich, 2010; Roberts & Eesley, 2011). In line with prior work, the thesis captures entrepreneurial experience by the number of examples of entrepreneurial activity, i.e. number of firm foundations (Stuart & Abetti 1990; Delmar & Shane, 2006; Hmieleski & Baron, 2009; Eesley & Roberts, 2012).

Combining the psychology and entrepreneurship literatures is advantageous for several reasons. Overall, it facilitates an individual-level perspective on the notion of entrepreneurship as a process and extends work on the micro-foundations of entrepreneurship. More specifically, since the thesis combines three studies each of which independently represents a different part (sub-process) of the entrepreneurial process, the thesis provides detailed insights into the factors that are important for different entrepreneurial activities, i.e. activities before and including the transition to entrepreneurship (chapter 2), firm exit (chapter 3) and the extent of entrepreneurial experience captured by the number of firm foundations (chapter 4).

From a theoretical point of view, this combination advances the knowledge in this field by providing insights into why there are more opportunities than entrepreneurs (chapter 2), why some

individuals repeatedly engage in entrepreneurial activities (chapter 4) and how entrepreneurs influence the rates of exit of their firms (chapter 3). Specifically, I show in chapter 2 that not all opportunities are exploited because there are different individual factors that matter for the early, pre-founding activities of entrepreneurship compared to those that matter for the later exploitation activities. Additionally, I show in chapter 3 that entrepreneurs pursue activities in a way that supports their self-conception thereby influencing their firms' viability, and in chapter 4 I explain how factors that are important in interactions with others relate to the repetition of entrepreneurial activities.

From an empirical point of view this combination is advantageous because first, it extends the literature on entrepreneurial process models by operationalizing distinct entrepreneurial activities as separate dependent variables and empirically testing Shane and Venkataraman's seminal model (chapter 2). Second, chapters 3 and 4 particularly benefit from this combination because it allows the application of well-established constructs in psychology to the field of entrepreneurship, and operationalization of theoretical concepts at the individual-level through the use of novel empirical strategies to generate the explanatory and control variables.

The thesis chapters connect in the sense that all the explanatory variables stem from the field of psychology and all the dependent variables originate from entrepreneurship research. Figure 1 shows that the dependent variables in each chapter represent distinct entrepreneurial activities which link the chapters in this thesis.

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Insert Figure 1 about here  
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## **Thesis Goal and Research Questions**

The overall goal of this thesis research is to substantiate the importance of the individual in entrepreneurship. Specifically, it examines the social psychological factors with respect to entrepreneurial process activities to provide empirical evidence on:

- a) how creativity as well as intrinsic and extrinsic motivation influence opportunity exposure, recognition and exploitation;
- b) how founder identity is linked to firm exit; and
- c) how social skills are associated with entrepreneurial experience.

To address these research questions requires an empirical context of entrepreneurs and comparable non-entrepreneurs, observed before and after the transition to entrepreneurship. This imposed a methodological challenge with respect to finding appropriate data, a challenge acknowledged but not fully addressed in the entrepreneurship literature (Shane & Khurana, 2003).

Figure 2 provides a graphical overview of the thesis chapters and titles, and highlights the research questions, dependent variables investigated, and the data and empirical strategies applied.

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Insert Figure 2 about here  
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## **The Empirical Context: Hacker- and Makerspaces**

I collected data on individuals listed as registered members of hackerspaces and makerspaces. A hackerspace is an open community that provides workspace for like-minded individuals to meet, socialize and work together. Hence, the term hackerspace can refer to the community as well as the physical workspace. Typically, hackerspaces are operated by their

communities, and offer members physical and virtual platforms for problem-solving, ideas exchange and collaboration, in areas such as technology – especially computers - and the sciences and arts. Hackerspaces, sometimes called hackspaces, makerspaces, makerlabs or hacklabs, are financed mainly by membership fees and usually equipped with a broad range of tools, machinery, hardware and materials including PCs, and computer components, hammers, saws, 3D printers and materials such as wood and metal parts, etc. Hence, they require physical spaces or work rooms which typically are located in garages, basements, warehouses, factory buildings, education or social centers.

A typical example is Metalab, a 230 sqm non-profit hackerspace, located in a basement in the first district of Vienna, Austria. Metalab provides physical space to foster open and free information exchange and collaboration between technology-minded individuals, so-called digital artists, hobbyists and entrepreneurs, who share an interest in information technologies, new media, arts and hacking culture generally. The workspace includes a central meeting room equipped with tables, chairs and projectors, to facilitate group working, talks, presentations and workshops. Metalab also has a library, a social space, a kitchen, bathrooms and several small labs, for instance for photography, oscilloscopes, laser cutters and 3D printers - all equipped with high speed internet connection. Metalab was founded in 2006, inspired by German hackerspaces, and has developed to be one of the most influential hackerspaces in Europe, playing a crucial role in establishing other hackerspaces around the globe, for instance the NYC Resistor in New York, USA. Metalab appears to be a hotbed of entrepreneurship and has successful firm foundations including Mjam, Austria's largest internet food delivery company, and YEurope, Europe's first YCombinator inspired startup accelerator. Like many other hackerspaces, Metalab is run by a voluntary organizing team which

meets regularly to discuss hackerspace related issues such as renovation projects and investment. Metalab is financed primarily by membership fees in addition to corporate and government funds.

Members of hackerspaces are known as hackers and makers. The term “hacker” originally had a positive connotation, describing sophisticated computer experts who were able to use and develop computer programs, software and hardware beyond their original purpose. It later was seen as a negative description, through media association with computer breakins for malicious purposes such as exploiting leaks in state government security systems. As a result, debate emerged about the term. The mainstream conception of “hacker” is still associated with a, to some extent negative or even criminal connotation. However, experts in the field and the communities see the term “hacker” as neutral, and refer to individuals who engage in criminal hacking and illegal activities as “crackers”.

The term “maker” refers to individuals who not only alter existing products but generate completely new concepts, designs and projects using hand tools and machinery such as 3D printers or computer numerically controlled (CNC) machines (Lang, 2013; Aldrich et al., 2014).

This thesis adopts the neutral perspective and refers to hackers and makers to describe individuals who use and enhance existing technologies, products, materials or any goods beyond their original purpose, and engage in the development of their own new projects, works, concepts and designs. Hence, *activities* in hacker- and makerspaces go beyond problem-solving, code writing and programming. They include new ideas, and the creation of artifacts, solutions, products and services that are often highly innovative and entrepreneurial. Hacker- and makerspaces usually provide diverse tools including hammers, saws, needles or more expensive, technical equipment including 3D printers and CNC machines to facilitate experimentation and prototyping of ideas. Hacker- and makerspace members can subscribe to distribution and mailing lists that are addressed

to the community allowing them to benefit from the “wisdom of the crowd”. Since free information exchange is one of the most important maxims in hacker and maker communities, the thresholds for entering these communities are low, and by subscribing to the mailing lists, individuals become registered members in the space. In return, they are embedded in a community where problems, needs and ideas can be discussed and probed virtually without physical presence in the workspace, for instance via wikis, blogs, email or RSS feed. Consequently, hacker- and makerspace members can be constantly exposed to the diverse problems, needs and ideas of their peers in the community.

This virtual and physical collaboration, allows the involvement of technologies in the *projects* hackers and makers pursue but is not limited to that. The project nature is extensive and ranges across creative problem-solving by reusing and modifying software and hardware, experimenting with light, sound and text, 3D printing of component parts, tools and equipment, game development and generating new artifacts and inventions for instance robots, machinery and drones. Hackers and makers typically alter existing goods when they experience problems or dissatisfaction with existing market offerings, which may result in the development of completely new market offerings. Consequently, hacker and maker projects vary in terms of degree of usability and innovation.

An example of an innovative hacking project that resulted in firm foundation is the open-source RepRap Project (replicating rapid prototype). The goal of the RepRap Project was to develop a 3D printer able to print its own components, thereby applying a particular manufacturing technique that produces material and components in layers. One of the project’s founders, in 2009 co-founded MakerBot Industries in New York, a firm that produces 3D printers which enable users to produce three-dimensional objects of virtually any shape based on a digital model. In 2011, the firm attracted venture capital investment of US\$ 10 million. In 2013, MakerBot Industries was

acquired in a stock deal worth US\$403 million and currently serves its customers as a distinct brand and subsidiary of Stratasys Incorporated.

The *individuals* in hacker- and makerspaces share a set of common values such as freedom of speech, transparency, independence and learning, to enable creativity and collaboration (Coleman & Golub, 2008). Since these values are central to their selves, hackers tend to be less inclined to take up positions in hierarchically organized firms, even were the latter willing to hire them (Carlson, 2011). The majority of hackers are well-educated either as autodidacts or because they are pursuing studies at a university or college (see also Lakhani & Wolf, 2005). If active in the labor market however, hackers select into occupations such as free-lancers and jobs that offer personal freedom and flexibility, primarily in the information technology (IT) industry, or become entrepreneurs.

In general, the projects hackers pursue are based on personal interest and thus are less formally organized and tend to follow the maxims of the hackerspace of shared resources, ideas and labor. The motives for becoming a hacker vary; some individuals join a hackerspace in order to open a business (profit or non-profit), others do so to create art, or because they enjoy the activity of hacking and being part of a social group (Lakhani & Wolf, 2005; Carlson, 2011). Given the nature of technology, and in particular internet-based projects, collaborations exist within and across spaces since information and knowledge can be shared even with geographically distant communities.

Consequently, hacker- and makerspaces can be incubators of entrepreneurial activity and their members crucial contributors to innovation (von Hippel, 1986; Franke & Shah, 2003) and entrepreneurship (Autio et al., 2013). Hackers and makers engage in diverse entrepreneurial activities by exposing themselves to complementary need-based and solution-based information



(e.g. von Hippel, 1988), solving problems (e.g. Jeppesen & Lakhani, 2010), discovering ideas with business potential (e.g. Lilien et al., 2002), and becoming entrepreneurs (e.g. Shah & Tripsas, 2007).

### **Data Collection and Assembling of Sample**

As insights into a context matter in order to understand the meanings of activities and practices (Brewer 2000, Barley & Kunda, 2001), I gathered in-depth information on the norms and behavior in hacker- and makerspaces before beginning my data collection, which is in line with the approach adopted in previous studies in similar empirical settings (e.g. Jeppesen & Frederiksen, 2006). The field work involved on site visits to hacker- and makerspaces and conferences across Europe, interviews with selected study subjects in all the regions investigated, and screening of relevant online data. Figure 3 shows the iterative process of field work combined with diverse test studies (paper based and online pilots) supplemented by a think aloud systematic (Forsyth & Lessler, 1991) which allowed the extrapolation of a survey format as an appropriate research design.

Thus, the study design, the questions and their sequence were developed in line with the empirical context. The web-based format was chosen because the communication, problem-solving activities and collaboration in hacker- and makerspaces primarily use IT. All responses were anonymous and voluntary since the interviews showed that confidentiality was an important issue for the communities. To ensure reliability and validity, the survey was tested off- and online and piloted within several communities.

Data collection was conducted between May and July 2012 in three steps (for an overview, see figure 3). In a first preparation stage and to ensure trustworthiness of the study within the community, the administrator of a hacker- and makerspaces consortium<sup>1</sup> announced the survey on three particular online platforms where key members and administrators of the target sample are registered members. Second, e-mails were sent to 392 community mailing lists and administrators with requests to forward them to the community in Northern European English- and German-speaking countries, and the United States, Canada, Australia and New Zealand. Among these, 23 spaces were either not active or were not accessible. The third step was sending a reminder after eight to ten working days to the remaining 369 spaces, 143 in Europe, 208 in the United States and Canada, and 18 in Australia and New Zealand.

The sample of hacker- and makerspaces was selected based on (1) community status, (2) community purpose, (3) conditions of membership, and (4) accessibility to the community. More precisely, the study included hacker- and makerspaces defined as “active” on the official hacker consortium website, and excluded those with purposes other than hacking or making such as spaces with exclusively commercial or educational intentions. Also excluded were organizations with employed staff to run the community, and spaces with IT-security arrangements preventing community-external contact or access.

The questionnaire covers various personal occupational-related characteristics of 678 respondents and includes single- and multiple-choice questions. Following a logical sequence of questions including interrelated modules, the questionnaire asks for information at firm- and individual-level. The responses provide data on individuals’ demographic, dispositional, cognitive and motivational aspects as well as information on firms and firm founding events. To meet the

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<sup>1</sup> This consortium was selected because it is the biggest conglomeration of hacker and makerspaces worldwide.

requirement for accurate examination of the influencing factors attributed to the individual, the questions are based on well-established measures used in psychology studies. As indicated in figure 3, the individual- and firm-level information is exploited in all the chapters in this thesis.

I also obtained data on creativity. Following the work of Amabile (e.g. Amabile, 1996), I included a section on verbal creativity in the survey which was adjusted to the empirical setting and research design. Study subjects were asked to write a haiku poem about a situation where they had an idea (thus referring to the discovery of an opportunity). A haiku poem is a Japanese non-rhyming poem which follows a defined systematic of 17 syllables divided into three lines containing 5, 7 and 5 syllables. The following haiku is an example of this particular poetry and was used to instruct the survey respondents:

*Old tomcat sitting  
Watching autumn leaves blow by  
Wishing they were mice*

This generated a text corpus of over 500 haiku poems which were used to facilitate operationalization of the explanatory variables in chapter 4 .

Following the haiku poem, respondents were asked to evaluate three other poems against one another. The poems were randomly assigned which enabled independent and unbiased peer ratings based on six defined criteria drawn from the literature (Amabile, 1996). The criteria are 1) creativity, 2) novelty of word choice, 3) appropriateness of word choice, 4) richness of imagery, 5) liking, and 6) use of the poetic form, which were rated on a Likert scale from 1 (low) to 5 (high).<sup>2</sup>

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<sup>2</sup> This particular part of the dataset is not used in this thesis.

The inclusion of this task was motivated by various aspects but apart from measuring creativity in a well acknowledged way, one of the main reasons for its inclusion is related to heuristics. Heuristics are the combination of strict formal guidelines and relatively open instructions allowing task outcomes to be compared. At the same time, since heuristics matter for entrepreneurship (e.g. Busenitz & Barney, 1997) and particularly with respect to decision-making (Simon, 1997) and opportunity recognition (Baron & Ensley, 2006), applying this approach allowed the possibility to provide valuable insights for entrepreneurship research.

Another benefit is represented by the text corpus based on survey responses. This part of the dataset allows analysis of the language individuals use to describe personal experiences. Given the stable and value-laden characteristics of language (Pennebaker, 2011), analyzing these data should reveal important insights into individuals' identities and be less prone to bias due to indirect measurement.

Finally, from a practical, more context-related perspective, the haiku task was included as an incentive for survey respondents. Hackers and makers are inclined to work creatively. It seemed likely that a creative task would encourage survey responses.

The survey platform registered 2,948 hits from single individuals by July 2012. Among these, a number of respondents were excluded from the final analysis since their response times did not meet the standard answering time measured in the pilot studies. The analysis included only responses submitted between 7.5 and 90 minutes reducing the sample to 678 respondents.<sup>3</sup> The final sample includes individuals aged between 16 and 72 years, 90.37% of whom are aged between 16

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<sup>3</sup> A time of more than 90 minutes indicates the individual took a break during response to the survey which might bias results. A tighter time window was applied for the analysis in chapter 4.

and 48 resulting in a mean age of 32.9 years. Among survey respondents, 76.6% of study subjects are engaged in IT-related developments and 43.8% had founded at least one firm at the time of survey completion. In relation to gender distribution, 57 individuals are reported as female and 498 male (123 missing values), 39.52% of respondents reported their marital status as “single” and only 17.1% indicated that they were parents.

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Insert Figure 3 about here  
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### **Limitations of the Sample**

It should be noted that the sample has some shortcomings. First, due to privacy concerns among several hacker- and makerspace administrators, it was not possible to identify the exact number of members per space, which limits the possibility of calculating response rates and checking the representativeness of the sample. Second, a relatively small number of spaces provided a disproportionate number of responses. The 678 responses in the final sample stem from 244 hackerspaces of which 30 hackerspaces accounted for 5 or more respondents. Hence, the average number of responses per hackerspace is 2.78, with a standard deviation of 2.6. Finally, the sample is unbalanced across regions in the sense that 105 responding spaces are located in Northern Europe, 94 in the United States, 21 in Australia and New Zealand, and 24 from other countries.

To address these issues, I conducted several checks within the limitations of the data collected. First, to check for sample representativeness, I compared respondents’ demographic information in the final sample with field observations and the preliminary online search, and information from entrepreneurship literature and innovation studies in comparable contexts. Overall, it seems that the basic features of the final sample match the data gathered during the field

work and that from the literature. Specifically, the high number of male respondents in my sample (89.72%) corresponds with studies in similar empirical settings, for instance a study on problem-solving activities that includes 90.0% males (Jeppesen & Lakhani, 2010), and work on hacking motivations with 97.5% male participation (Lakhani & Wolf, 2005). The under-representation of females matches the information gathered in the field work (Carlson, 2011) and the respective literature (Coleman, 2010). The high percentage of males in the sample is also in line with evidence in entrepreneurship literature that entrepreneurship is primarily a male dominated area (e.g. Hout & Rosen, 2000), and by a study applying a social cognitive perspective to entrepreneurship which had 81.10% male respondents (Hmieleski & Baron, 2009).

The age range of the final sample (90.37% between 16 and 48) corresponds to the age spectrum when individuals are most likely to engage in the entrepreneurial process (Aldrich & Kim, 2007; Oezcan & Reichstein, 2009). The mean age of 32.9 years is comparable to the age of respondents in studies of hackers aged 29 (Jeppesen & Frederiksen, 2006) and 30 (Lakhani & Wolf, 2005). In the context of entrepreneurship research, the deviation seems to be slightly higher at up to 15% (Sorensen, 2007) suggesting that in terms of age, my final sample is more representative of studies of hackers and makers than the entrepreneurship literature. In addition, the majority of the survey respondents in my sample are active in areas related to IT, programming and applications and game developments which is mostly in line with the prior literature on hacking activities (Lakhani & Wolf, 2005), literature on hacker culture (e.g. Coleman, 2010) and field observations (Carlson, 2011).

Despite the over-representativeness of single hackerspaces, general representativeness within the hacker- and makerscene appears to be relatively high. However, with respect to this

second limitation, I ran all estimations in chapters 2 to 4 with cluster corrected standard errors using hackerspaces as the cluster identifier. The results remained basically unchanged.

Third, with regard to potential bias due to regional effects, I applied the most central measure in the Global Entrepreneurship Monitor (GEM) 2013 global report (Amoros & Bosma, 2014) for comparison with my sample. This measure, the Total early-stage Entrepreneurial Activity (TEA), captures individuals between 18 and 64 in the process of establishing a firm or already running one, across countries. In line with the tendencies reported across regions by GEM, the entrepreneurship rate among survey respondents in the United States and Canada region were higher than in Europe (49.16% vs. 32.32%). Since Australia and New Zealand are not included in the GEM report, no comparison was possible. However, since the response rate and entrepreneurship rate in my final sample are relatively balanced (8.61% and 8.08%) there seems no reason to be overly concerned about overrepresentation in the data.

I also included regional controls in the analyses conducted in chapters 2 to 4. These control variables show some signs of significance, but do not alter the overall results of the analyses. Thus, it can be assumed that potential bias with respect to the geographical dimension of my investigation is relatively small.

Because of these limitations related to the particular context of hacker- and makerspaces, I cannot test, e.g., for response bias. However, comparisons with the field work findings and relevant literature suggest that overall, my final sample corresponds well to the data settings in studies investigating similar research questions.

## **Hacker- and Makerspaces: A beneficial Setting for Entrepreneurship Research**

This context is particularly advantageous for addressing the research questions for various reasons. First, hacker- and makerspaces are an interesting context to apply an individual-level perspective to different entrepreneurial activities because space members are highly entrepreneurial and involved in various aspects of the entrepreneurial process. For instance, members of these communities alter existing market offerings based on their personal needs, develop new solutions, generate business ideas and start new firms. Consequently, it was possible to observe individual characteristics associated with a) the pre-founding stages, i.e. opportunity exposure and recognition, b) different forms of exploitation, i.e. commercialization via patents or firm foundation, and c) firm exit. Hence, the sample contains non-entrepreneurs, entrepreneurs, including those who subsequently exited, and serial entrepreneurs. From a methodological point of view, this is important for operationalizing the dependent variables.

Second, hacker- and makerspaces represent a distinct community whose members pursue the same values and beliefs thereby lowering heterogeneity across participants. With reference to codified hacker ethics (Himanen et al., 2002), individuals are ideologically in line, share knowledge, collaborate and use similar codes and language. This is a major advantage of the setting because it makes study subjects reasonably comparable and reduces potential bias in the results. This enables measurement of the individual determinants of entrepreneurship since relatively similar individuals are observed among whom subsets become entrepreneurs, exit and have varying entrepreneurial experience.

This leads to a third main advantage of the setting. Despite the commonalities within the community, individuals in this setting vary. In other words, the shared norms and language function as a baseline from which it is possible to observe variety and to disentangle the differences



attributed to the individual. This is particularly beneficial when analyzing differences across identities which inevitably are linked to values, beliefs and actions (Hogg & Terry, 2000) and language as a means to express identity (Pennebaker, 2011).

To use individuals in hacker and makerspaces to analyze identities was motivated also by interviews and observations during preparation for the data collection. The findings from the field work indicate the existence of different identities, for instance individuals who modify existing products, software and services and develop new ideas to satisfy their own needs and those of others in the community, in contrast to individuals who become entrepreneurially active to harm competition and possibly crack security systems.

However, the predictions in chapter 3 on founder identities and firm exit were inspired by the theory and tested using data on the existence of relevant identities. Analysis of individual attributes in similar settings has been done in prior research, and in the same vein, this thesis draws also on the context of hacker- and makerspaces to examine diverse forms of motivation and creativity (Roberts et al., 2006; Shah, 2006; Lakhani & Wolf, 2005).

Fourth, hacker- and makerspaces are particularly appropriate to study innovation and entrepreneurship given their organization into virtual as well as physical platforms that enable information exchange, knowledge sharing and collaboration for their members. Innovation, which is often linked with entrepreneurship (Schumpeter, 1934), involves creativity and represents a social process that links individuals with diverse backgrounds, motivations, skills and vocabulary (Feldman, 2002). While the internet represents an important facilitator in this process for accessing and leveraging information, geography is important to overcome the limitations of virtual collaborations such as transfer of tacit knowledge and organizing resources required for the creation of knowledge (Feldman, 2002). Hacker- and makerspaces combine the advantages of both worlds

since projects, in particular technology-related projects, can be developed and discussed online and elaborated in the physical space if necessary. As already noted, the internet is the core communication medium within and across hacker- and makerspaces.

Finally, choosing hacker-and makerspaces as the empirical context to study entrepreneurship is beneficial given the number of implications associated with the context and its description as the 2<sup>nd</sup> industrial revolution: According to Aldrich and colleagues (2014), hacker-and makerspaces are likely potential hotbeds of user innovation since they provide resources, equipment and tools relevant for generating entrepreneurial opportunities and business ideas, and potentially reduce failure rates because developments and prototypes can be tested early on in the process. Given the ideology of sharing and collaboration, the context is interesting to study in terms of the underlying motivations and strategies individuals in this context pursue when founding and managing their firms since this can influence the market dynamics and competition in respective industries.

## **Thesis Chapters**

Chapter 2 provides a deeper understanding about how individuals come across entrepreneurial opportunities, how they recognize them as such, and transform them into business ideas. To depict a broader range of the entrepreneurial exploitation of these ideas, the study is not limited to firm creation and considers further implementation modes in markets and hierarchies which should be of interest to both scholars and practitioners.

Since these issues are linked to both individuals' motivations and cognitive skills, chapter 2 analyzes the influence of different motivations, i.e. intrinsic and extrinsic, as well as creativity. Intrinsic motivation refers to the individual's inherent interest in an activity, while extrinsic

motivation relates to the stimulus associated with outcomes, for instance when individuals pursue an activity because they expect a particular result from it (Ryan & Deci, 2000). For the purposes of this study, creativity refers to a cognitive skill that is purposefully applied by the individual in the sense that the individual decides to deploy his or her creative skill in entrepreneurial activity (Sternberg & Lubart, 1996; Sternberg, 2006).

The study aims to contribute to entrepreneurship research, in particular the literature on entrepreneurial process models, by empirically analyzing Shane and Venkataraman's (2000) seminal process model. Specifically, it provides empirical evidence on the theoretical prediction that intrinsic and extrinsic motivation are important for different entrepreneurial activities (Amabile, 1997). By showing that intrinsic motivation matters more in early process activities and is detrimental at later process points, the findings suggest explanations for why there are fewer entrepreneurs than opportunities. Additionally, the results indicate that creativity plays a beneficial role in all entrepreneurial activities. Thus the study contributes specifically to entrepreneurship research in relation to creativity (e.g. Ward 2004, Audretsch & Belitski, 2013), by using a perspective of creativity that has not been empirically applied to investigate distinct process activities.

Chapter 3 extends analysis of the entrepreneurial process and to my knowledge is the first empirical study to investigate how the identity of founders is linked to firm exit. It contributes to a better understanding of the values and meanings associated with entrepreneurial behavior and should add to the emerging literature that analyses entrepreneurship from a social identity perspective, i.e. how individuals categorize themselves compared to others (Tajfel, 1972; Tajfel & Turner, 1979). Chapter 3 discusses firm exit dependent on founders' identity which is a reasonable

association to investigate since founders pursue firm strategies that inevitably are linked, specific to and aligned with their identities (Fauchart & Gruber, 2011) thereby impacting on the viability of their firms.

Methodologically, I apply principal component factor analysis to generate three founder identity variables based on theories developed in prior work (Ashforth & Mael, 1989). Furthermore, to appropriately model the time perspective of firm exit, the empirical strategy involves thorough consideration of potential censoring issues when creating the required longitudinal dataset. I take account that firm exit is not random but conditioned on the transition to entrepreneurship and apply a two-stage Heckman (1979) specification including an instrument variable.

The key findings of the study reveal that community oriented founders active in problem-solving, i.e. masterminds, are less likely to exit while the opposite applies to founders aiming to contribute to the world, i.e. missionaries. These findings are supported by several supplementary analyses and suggest that limiting the analysis to primarily recent firm foundations, mavericks, means reckless founders inclined to rivalry, are less likely to exit. The study's findings support the prediction that community-oriented and missionary-prone identities are particularly dominant in shaping entrepreneurial action. The study intends to add to prior work on founder identity as grounded in social identity, by providing empirical evidence on how different founder identities have different impact on firm exit.

Also Chapter 4 takes account of the importance of the social perspective associated with the individual. Pursuing entrepreneurship requires particular skills given that entrepreneurial activities and firm foundation are profoundly social activities (Whetten & Mackey, 2002). Thus, how individuals, more precisely potential entrepreneurs, communicate and interact with others, matters.

This is especially important because these activities need to be performed repeatedly in order to achieve entrepreneurial experience. Understanding what underlies entrepreneurial experience in turn is important given the extraordinary benefits that entrepreneurial experience brings in relation to increased firm performance of subsequent firms and disproportionate economic impact.

These considerations motivated the analysis in chapter 4 which aims to provide insights into the relationship between so-called social skills i.e. skills relevant to human interaction, and entrepreneurial experience i.e. the number of firms founded by the entrepreneur.

The study is co-authored with Toke Reichstein and, like the preceding chapters, draws on data obtained from the online survey to operationalize the study's dependent variable. It draws also on the text corpus of haiku poems to generate the study's explanatory variables. Specifically, we apply computational linguistics to identify patterns in the use of personal pronouns, and use them as proxies for different individual social skills. This indirect measure of the skills associated with the individual makes the study less prone to potential bias related to hitherto self-reported measures of social skills in the literature.

This empirical strategy introduces a new methodological approach into the field of entrepreneurship and contributes to individual-level research. Language reveals information about individuals and is, similar to fingerprints, stable over time (Pennebaker & King, 1999). In analyzing personal pronouns, we address the social aspect of the study since pronouns are highly social (Tausczik & Pennebaker, 2010).

The empirical analysis involves zero-inflated negative binomial regression to take account for over-dispersion in the data related to zeros representing individuals who never start a firm and the peculiarity that the individual's decision to start the first firm may be distinctively different from the decision related to subsequent firm founding.

The main findings in this chapter suggest that entrepreneurial experience is greater at high levels of self-confidence and social awareness. Self-confidence refers to the individual's belief in his or her own abilities (Chen et al., 1998; Simon et al., 2000), and social awareness captures the "degree of consciousness of and attention to the other" (McGinn & Croson, 2004, p. 334).

In contrast to our prediction, the findings suggest entrepreneurial experience to be negatively associated with social influence, the extent to which someone is able to alter others' attitudes or behavior in social interactions (Baron & Markman, 2000) proxied by usage of "we". Our post hoc analysis sheds light on the acknowledged ambiguity of "we"-related pronouns, and supports the notion that pronouns are contextual (Pennebaker, 2011). More precisely, it indicates that in the context of hacker- and makerspaces, use of the first person plural pronoun refers to expression of a shared identity rather than the influential "we" used in political speeches.

Given the importance of language in the field of entrepreneurship (Aldrich & Fiol, 1994; Lounsbury & Glynn, 2001), the study's findings contribute to the field by revealing underlying attributes of entrepreneurial individuals through examining pronouns and support the notion of language analysis as a promising research trajectory in social science.

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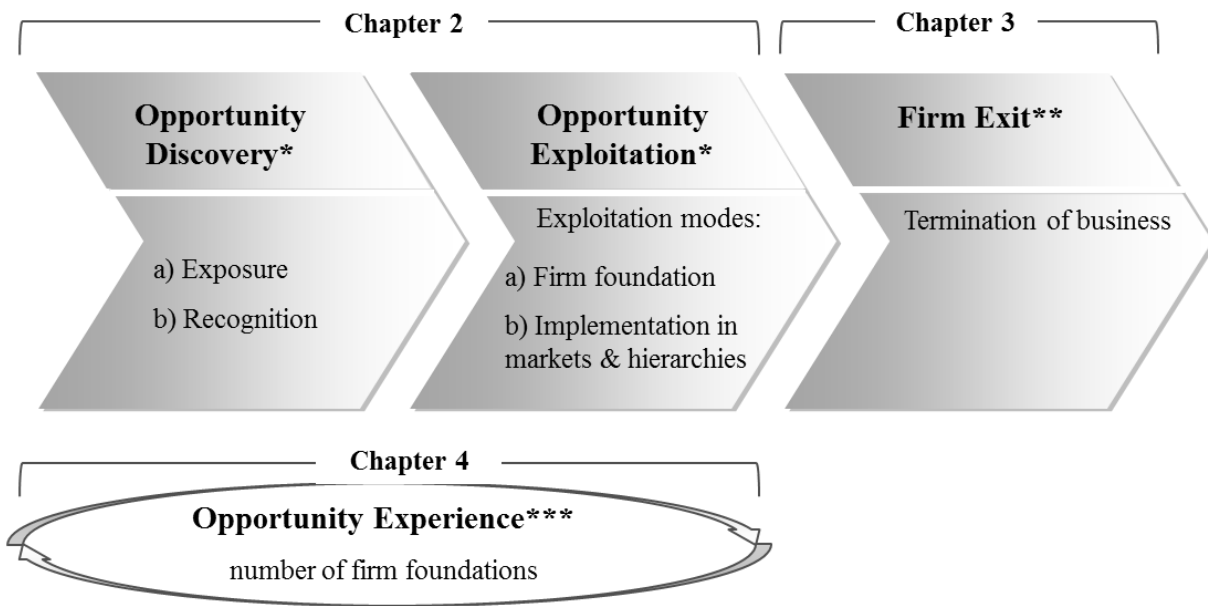
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**FIGURE 1**

**Entrepreneurial Activities and Dependent Variables per Chapter**



References:

\*) Shane & Venkataraman 2000; \*\*) Yang & Aldrich 2012

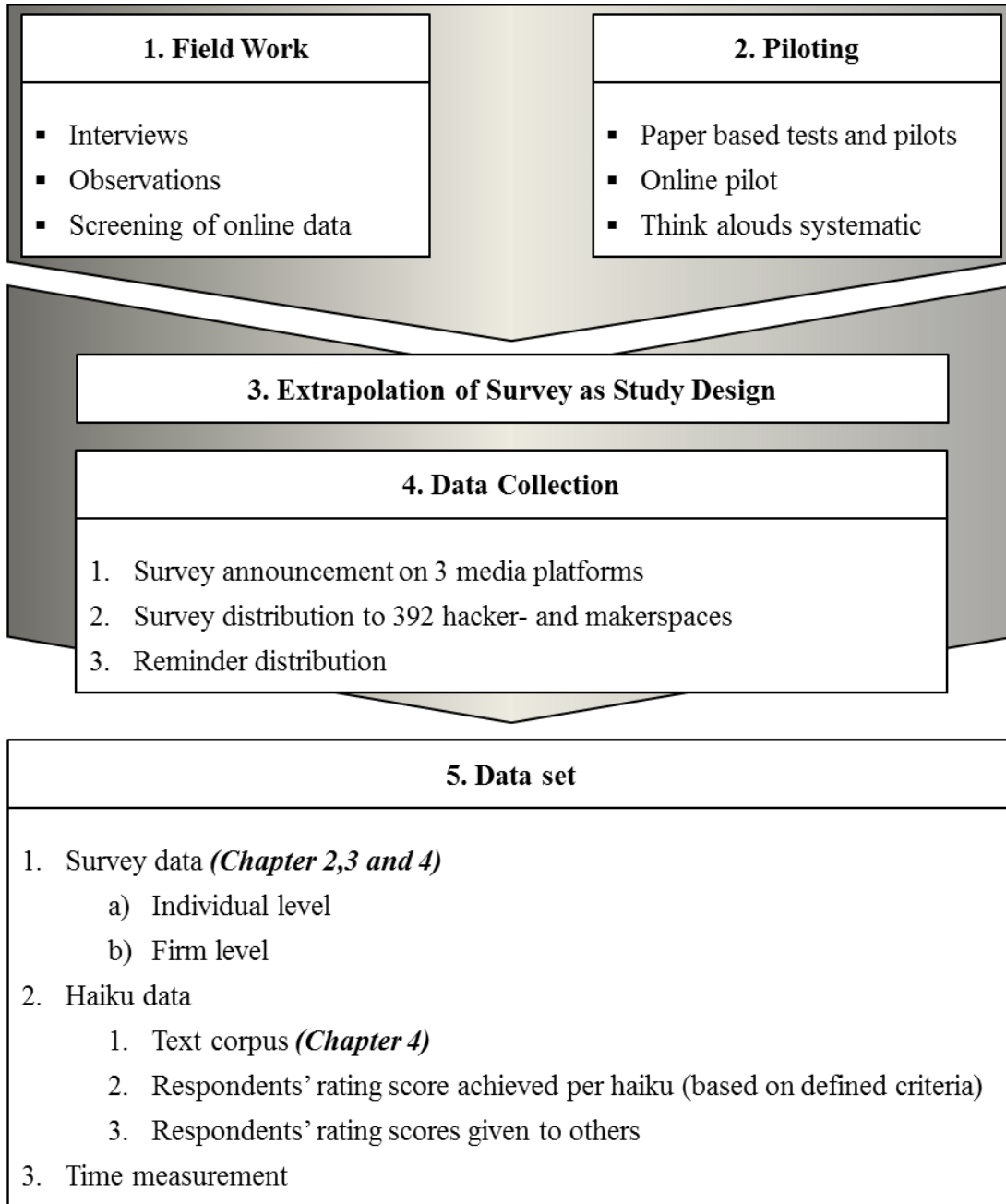
\*\*\*) Stuart & Abetti 1990, Delmar & Shane 2006, Hmieleski & Baron 2009, Eesley & Roberts 2012

**FIGURE 2**  
**Thesis Overview**

Chapter Title	Research Question	Data	Dependent Variable	Empirical Strategy
2 Motivations, Creativity and Entrepreneurial Activities	How does creativity as well as intrinsic and extrinsic motivation influence opportunity exposure, recognition and exploitation?	Survey data on 678 community members in Northern European English- and German-speaking countries, the United States, Canada, Australia and New Zealand	1. Opportunity Exposure 2. Opportunity Recognition 3. a) Firm Foundation 3. b) Opportunity Implementation	Logistic Regressions
3 Mavericks, Missionaries and Masterminds: Founder Identity and Entrepreneurial Exit	How does founder identity affect firm exit?		Firm Exit	Discrete Time Duration Models including Correction for Attrition bias
4 More than Words: Social Skills and Entrepreneurial Experience	How do social skills influence entrepreneurial experience?	Survey data; Text corpus stemming from haiku poems written by hackers	Entrepreneurial Experience	Sentiment Analysis in combination with Zero-inflated Negative Binomial Regressions

**FIGURE 3**

**Data Collection Steps and Overview of Data Set**





## Chapter 2

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# MOTIVATIONS, CREATIVITY AND ENTREPRENEURIAL ACTIVITIES

by Maria Halbinger

### **ABSTRACT**

This study applies a psychology lens on the notion of entrepreneurship as a process in which individuals discover and exploit opportunities, i.e. firm foundation and other implementation forms. It theorizes that the influence of creativity and different forms of motivation vary based on entrepreneurial activity. Drawing on a dataset of entrepreneurially active individuals from hacker- and makerspaces across the globe, the findings show a positive relationship between intrinsic motivation and opportunity exposure and a negative relationship with becoming an entrepreneur; in contrast, extrinsic motivation is positively associated with opportunity exploitation (becoming an entrepreneur and opportunity implementation in other forms). The positive effects of creativity across all entrepreneurial activities provide a more nuanced view of how a creative thinking style relates to entrepreneurship. The study aims to increase our understanding of why there are fewer entrepreneurs than opportunities.

## INTRODUCTION

Entrepreneurship is acknowledged to be a driver of regional development (Feldman, 2001) and economic growth (Sternberg & Wennekers, 2005). It is therefore puzzling that relatively little has been done to map the factors that shape entrepreneurial activities. Researchers, policy makers and practitioners all struggle with the conundrum of why there are fewer entrepreneurs than opportunities (e.g. Roberts, 1991; Shane, 2001). Entrepreneurship research primarily addresses this puzzle by focusing on factors related to the environment (e.g. Audretsch, 1995; Aldrich, 2000) and to technology (e.g. Christensen, 1997; Shane, 2001), and has increased our understanding of the conditions hampering or fostering entrepreneurship. However, relatively less attention has been paid to uncovering individual-level effects (Thornton, 1999; Shane et al., 2003). Person-centered studies have investigated individual characteristics (e.g. Busenitz & Barney, 1997; Zhao & Seibert, 2006; Shane et al., 2010) and demographics (Bates, 1995; Lazear, 2005) but these contributions mainly emphasize differences between entrepreneurs and non-entrepreneurs. Some works do consider entrepreneurship as a process and investigate the transition to entrepreneurship (e.g. Sørensen, 2007; Oezcan & Reichstein, 2009; Elfenbein et al., 2010) but there are no empirical studies that investigate the individual characteristics associated with engagement in different types of entrepreneurial activities. This chapter tries to provide a more detailed understanding of the association between individual characteristics and entrepreneurial venturing.

Prior research shows that entrepreneurship involves multiple activities that are tightly connected from an individual point of view but not mutually dependent. Entrepreneurship involves being exposed to, recognizing and implementing opportunities and establishing a firm (Shane & Venkataraman, 2000). We need to understand how individual factors are related to these different

activities. While researchers have speculated about the cognitive mechanisms important for the discovery of opportunities (e.g. Baron, 2006), and considered whether specific motivations are linked to the exploitation of opportunities (e.g. Shane et al., 2003), empirical work investigating how individuals' creativity and motivations relate to these distinct entrepreneurial activities is scarce. This is partly due to the difficulty of collecting data from comparable individuals engaged in different process activities that include pre-founding activities and different exploitation forms. As a result, empirical work on creativity and motivation is mostly confined to experimental and management research settings where entrepreneurial activities can be observed before their exploitation, and measurement of creativity can be performed by peers or supervisors (e.g. Amabile, 1996; Tierney et al., 1999; Zhou and George, 2001; Grant and Berry, 2012).

The entrepreneurial processes that occur outside such settings are mostly unexplored, and the few studies that discuss creativity and motivation are mainly theoretical (e.g. Amabile, 1997a; Shane et al., 2003) or focus on a single aspect of the entrepreneurial process, i.e. the transition to entrepreneurship and the incentives associated with being an entrepreneur (e.g. Lazear, 2005; Zhao and Seibert, 2006; Taylor, 1996). This strand of research generally ignores the distinct characteristics which cause individuals to opt out at certain points in the process.

The introduction of a psychological perspective into entrepreneurship research is advantageous. It provides a useful framework for the task of identifying the associations between individual factors and single entrepreneurial activities, responding to calls for a more detailed analysis of entrepreneurship that takes account of the various exploitation of opportunities not just the organizational setup related to new venture creation (Shane et al., 2003; Shane, 2012). A psychology lens allows investigation of the intra-psychic dimensions of individuals, i.e. how they think and process information, which is important with respect to accessing and processing

opportunity-related information. It also allows examination of entrepreneurial action by revealing the underlying human behavior motivations.

It is important to know more about these associations. The influence of creativity has been long debated (e.g. Schumpeter, 1934; Ward, 2004) and while researchers have found the creativity embodied in creative classes, to be crucial for regional development and higher economic returns (e.g. Florida, 2005; Lorenzen & Andersen, 2009), little is known about how individual creativity influences activities *ex ante* venturing. Entrepreneurial activity is based on specific motivation (Shane et al., 2003) and it has been theorized that these motivations vary according to the activity (Amabile, 1997a). Hence, entrepreneurship research would benefit from analysis of how creativity and different forms of motivation impact on the single activities of entrepreneurship. Specifically, in this study I examine the influence of creativity, intrinsic motivation, i.e. when an individual expends effort on a task for reasons of pure interest and learning, as opposed to extrinsic motivation, i.e. when individuals expend effort for a particular expected outcome (Ryan & Deci, 2000), on exposure, recognition and successful implementation of opportunities.

The present research investigates whether intrinsic and extrinsic motivations as well as creativity are associated with different activities in the entrepreneurial process. Intrinsically motivated individuals are argued to expose themselves to opportunities through their search for new information inputs which positions them into information corridors that allow access to rich, opportunity-related information. In contrast, intrinsic motivation considers the founding event to be time-consuming, and the associated uncertainty brings feelings of low levels of control and a mismatch between personal skills and the occupation. Creativity facilitates the recombination of complementary pieces of information which trigger opportunity recognition. According to the notion in investment theory of creativity, to “buy low and sell high” (Sternberg, 2006, p. 87;

Sternberg and Lubart, 1996), creative individuals decide to use their creative skills to exploit opportunities and start a firm. Extrinsically motivated individuals tend to be results-directed, pursuing entrepreneurial activities in the expectation of payback or career progression, which makes them more likely to implement opportunities and select into entrepreneurship.

I utilize data on hackers and makers because individuals in hacker- and makerspaces provide a good setting to investigate these issues. Hackers and makers are highly entrepreneurial which allows analysis of all entrepreneurial process activities including those before transition to entrepreneurship. Prior research suggests the presence of diverse forms of motivation and creativity (Lakhani & Wolf, 2005; Roberts et al., 2006; Shah, 2006; Alexy & Leitner, 2011); I combine theories of entrepreneurial activities and psychology and apply them to this context to examine individual-level factors in entrepreneurship. The reasonably closed hacker- and makerspace environment lowers heterogeneity and facilitates investigation of comparable individuals categorized as entrepreneurs and non-entrepreneurs.

The study in this chapter aims to contribute primarily to the literature on entrepreneurial process models through the introduction of well-established psychological constructs into the field of entrepreneurship. The findings suggest that intrinsic motivation is beneficial at the front end of the process but detrimental in the back end, particularly for the chances of becoming an entrepreneur. Extrinsically motivated individuals are more likely to become entrepreneurs and to exploit opportunities in various implementation formats, such as patents and trademarks. Hence, this study increases understanding of the ambiguous nature of intrinsic and extrinsic motivation and proposes explanations for why opportunities may remain unexplored or unexploited. This has some interesting implications for research on team formation and search, since it provides insights into the personal characteristic that matter at different points in the process, and offers guidance for

organization in the search for business opportunities. The insights into the positive effects of creativity across all entrepreneurial activities, provides a more nuanced understanding of how this factor benefits entrepreneurship.

The next section outlines the theoretical framework and hypotheses. The third section discusses specification of the sample and the data collection process, and presents the econometric approach and testing of hypotheses. The final section presents results, and concludes with a discussion of the research contributions, implications, limitations and opportunities for further work.

## **ENTREPRENEURIAL PROCESS AND OPPORTUNITIES**

While entrepreneurship researchers, over the years, have developed different process models (e.g. Ardichvili et al., 2003; Baron, 2007), there is agreement that stimuli vary across activities (Autio et al., 2013), and that intrinsic and extrinsic motivation for instance, matter for different process activities (Amabile, 1997a). This article exploits the idea behind Shane and Venkataraman's model (2000) that individuals pursue opportunities via three main activities: opportunity exposure, recognition and exploitation.

The first activity, opportunity exposure, requires the individual to a) possess prior information that is b) complementary with the new information inputs. The second activity requires the individual to recombine heterogeneous information pieces thereby creating new means-ends relationships. The individual's recognition of an opportunity involves recognizing the entrepreneurial value of the information. These two activities represent discovery of an opportunity (figure 1) but are distinct activities. The existence of opportunity-related information, and exposure to opportunity-related information are distinctively different from the ability to recombine the

information and recognize the value of an opportunity as it takes shape in the entrepreneur's mind (Baron, 2006; Shane, 2012).

The final activity is exploitation of an opportunity through a) new firm foundation or b) via other implementation forms within and outside existing organizations such as new products, services, patents, or trademarks. Firm foundation refers to the "institutional arrangement" of firm creation as one way to exploit an opportunity (Shane, 2012, p.13). In response to criticisms related to limiting entrepreneurship only to firm foundation (Shane & Venkataraman, 2000), this chapter takes account of other arrangements such as the implementation of opportunities within existing organizations or markets.

The analysis applies Shane and Venkataraman's process perspective on entrepreneurship, but highlights four aspects. First, in order to take into account that the process does not necessarily follow a sequential or strategic order (stages), which is an important aspect of the model (Shane, 2012), the present study refers to the process modules as "activities" rather than "stages". This acknowledges the fact that activities can be pursued independently and are not mutually exclusive, and that an individual can exploit an opportunity that someone else has recognized. Second, individuals can perform activities iteratively or simultaneously since exposure and recognition are closely intertwined. Third, this notion allows the possibility that individuals may stop at different points in the process. This is consistent with the statement that information is unevenly distributed (Hayek, 1945) and thus, not all opportunities are recognized and exploited (Schumpeter, 1934; Casson, 1982; Kirzner, 1997; Shane & Venkataraman, 2000). Fourth, in line with Shane and Venkataraman's process model, the process is theoretically initiated by the individual's position in the information corridor. I call this activity "opportunity exposure" since individuals must expose themselves to situations where opportunity-related information exists. Taken together, the

entrepreneurial process provides a blueprint with individuals and opportunities at its core, in which the ideal-typical individual is the agent who progresses through the process activities through the pursuit of an entrepreneurial opportunity.

In line with prior work, I define opportunities as situations where the possibility exists that products, services, models or process are introduced to a market with a potentially positive price-cost relationship (Casson, 1982; Shane, 2012). In previous studies, entrepreneurial opportunities are explicitly associated with new products and services rather than optimization or efficiency-increasing mechanisms applied to existing products, services, models or processes. Although both types of opportunities are appropriate for certain contexts and uses, the entrepreneurial opportunity is inherently novel (e.g. Kirzner, 1997; Shane & Venkataraman, 2000). But due to the imbalance between opportunity-related information and people’s beliefs, not all opportunities that exist are identified, recognized and exploited entrepreneurially (Schumpeter, 1934; Hayek, 1945; Casson, 1982; Kirzner, 1997; Shane & Venkataraman, 2000).

By implication, only some individuals become aware of existing opportunities, and only some individuals recognize their value and exploit these opportunities for entrepreneurial purposes. Hence, entrepreneurial behavior is affected by opportunities but they do not define the whole process (Shane et al., 2003). This chapter examines the individual-related rather than the opportunity-related aspects of the phenomenon, and proposes a distinct view on the key personal attributes related to opportunity discovery and exploitation.

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Insert Figure 1 about here  
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### **Sub-activities of Opportunity Discovery: Opportunity Exposure and Opportunity Recognition**

Opportunity discovery requires individuals a) to be exposed to information that complements their prior information and b) to successfully combine and leverage relevant information inputs necessary to recognize the opportunity's value. The succeeding parts of this chapter discuss how different forms of motivation and creativity determine entrepreneurial activities. Motivation comprises two factors, intrinsic and extrinsic motivation, which are not mutually exclusive because an individual can perform a task that involves both motivation forms simultaneously (Amabile, 1983).

#### ***The role of intrinsic motivation on opportunity exposure and entrepreneurship***

Intrinsic motivation refers to the individual's inherent interest in and appreciation of a task or activity (e.g. Ryan & Deci, 2000; Amabile, 1996). Individuals that are highly intrinsically motivated primarily obtain satisfaction from pursuing particular activities without expectation of outcomes because they support their feelings of competence and self-determination (Deci & Ryan, 1985). For instance, research shows that intrinsic motivation underlies software developments because individuals are willing to dedicate time and effort to problem-solving and development activities for the sheer pleasure of doing so (Lakhani & Wolf, 2005; Roberts et al., 2006). Although not all individuals are merely intrinsically motivated in the moment of performing a particular task (Amabile, 1983), for instance in open software development (Alexy & Leitner, 2011), they can become drawn into the task if there is a perfect match between skills and the task which results in a "flow", a state of mind without a sense of time, place or pressure which induces positive emotions (Csikszentmihalyi, 1996). This attracts individuals into situations where there is a wide range of information which extends their attention scope thereby increasing the possibility to receive new

information inputs (Frederickson, 2001; Estrada et al., 1997). Consequently, when they are highly intrinsically motivated, individuals are more likely to come across new stocks of information.

This can be beneficial for the discovery of opportunities since it requires individuals to expose themselves to information inputs that are complementary to the knowledge they already possess (e.g. Shane, 2000), for instance information about user needs (von Hippel, 1986), market or technology trends, slack resources, and environmental market shifts (Venkataraman, 1997; Shane & Venkataraman, 2000).

Moreover, intrinsically motivated individuals aim to progress in what they do, and in order to increase their competence levels, they are interested in learning and exploration (Amabile, 1997a; Ryan & Deci, 2000). Hence, intrinsic motivation stimulates the search for new information to solve problems, overcome challenges and extend competences. This suggests active search for new information inputs.

It has been argued that individuals' prior knowledge is distinct and determined by experiences in the past (Venkataraman, 1997); therefore intrinsically motivated individuals' stocks of information can be expected to be voluminous based on previous searches for novelty. This indicates that, similar to a reinforcing circle, higher rates of intrinsic motivation broaden the individual's information base and also induce exposure to new information inputs. Hence, intrinsically motivated individuals are likely to be located in corridors of rich information where prior, complementary information meets new information stocks, and consequently they are exposed to entrepreneurial opportunities.

While prior work emphasizes that intrinsic motivation is particularly important in the early activities of entrepreneurship (Amabile, 1997a), investigation of its impact at the back-end is limited. Furthermore, since exposure to and exploitation of opportunities are two separate activities

that depend on individual motivation (Autio et al., 2013), I argue that the effects of intrinsic motivation on the exploitation of opportunities, i.e. firm foundation, are detrimental for various reasons.

Individuals will invest in activities that are of personal importance to them (Amabile, 1997a). They enjoy spending time on these activities and are keen to increase their competence. Research on hacker communities shows that intrinsically motivated individuals are willing to spend extra hours on their projects (Lakhani & Wolf, 2005). However, becoming an entrepreneur would leave less time to devote to interesting activities and require investment of time in organizing the start up. Prospective entrepreneurs need to mobilize resources, a crucial and challenging activity related to starting a firm (Stuart et al., 1999; Aldrich & Kim, 2007). This implies that individuals with intrinsic interest in an activity will be less likely to become entrepreneurs given the lack of added personal value from transitioning to entrepreneurship and the amount of time that would need to be devoted to the founding process.

Moreover, entrepreneurship is a context that inevitably is linked to uncertainty (Aldrich & Fiol, 1994; Autio et al., 2013). Individuals tend to avoid situations over which they have low control (Wood & Bandura, 1989); such situations contrast with the self determination at the core of intrinsic motivation (Deci & Ryan, 1985). At the same time, “person-entrepreneurship fit” theory indicates that individuals select into entrepreneurship if this particular occupational path matches their skills (Markman & Baron, 2003). Consequently, when individuals pursue a task of intrinsic interest in a pre-founding activity, they are less likely to select into an occupation like entrepreneurship which is in stark contrast to their inner motivation and skills. Thus, I hypothesize:

*Hypothesis 1: Intrinsic motivation increases the likelihood of a) opportunity exposure and b) decreases the likelihood of firm foundation.*

### ***The role of creativity on opportunity recognition and entrepreneurship***

Exposure to information is a necessary but not sufficient condition for the discovery of an opportunity. It is also necessary to transform the information into a “business idea” (Shane 2012, p.17). This is an important milestone in the entrepreneurial process since information about an opportunity per se might, objectively, be “useless” if it lacks an entrepreneurial context. Thus, individuals need to accomplish undergo the next mental step and make the appropriate connections within their information stocks (Baron, 2006). This involves linking hitherto unconnected, heterogeneous pieces of information in the individual’s prior and newly absorbed information. The outcome of this process step is recognition of new means-ends relationships required for value recognition (Shane & Venkataraman, 2000; Shane, 2012). However, identification of these relationships is difficult. Researchers argue that not all individuals are equally able to perform this task (Ward et al., 1997), and consider cognitive mechanisms to be at the core of the phenomenon (e.g. Kaish & Gilad, 1991; Busenitz & Barney, 1997; Mitchell et al., 2004).

This study draws on the cognitive science literature which argues that cognitive style plays a major role in how individuals process information, and perform specific tasks (e.g. Sternberg, 1988; Baron & Ensley, 2006). Cognitive or thinking styles demonstrate people’s tendencies to make use of their skills and leverage their strengths (Sternberg, 1985a,b). Accordingly, connecting complementary pieces of information is based on individuals’ preferences related to using their recombination skills. Recombination underpins creativity. Creativity is discussed from different perspectives in the literature, for example as a process or as its outcome (e.g. Amabile, 1983; Weisberg, 1988; Amabile et al., 2005), as skills or as thinking styles (e.g. Sternberg, 1985a).

This study draws on the investment theory of creativity and attributes creativity to people’s decisions about how to deploy their creative abilities (e.g. Sternberg & Lubart, 1996; Sternberg,

2006) to produce both novel and useful outcomes (Amabile, 1996; Sternberg & Lubart, 1996). From this perspective, creativity is more of a decision than mere possession of creative ability. Accordingly, an individual requires creative skills but also must decide to think in novel ways about existing information, to make new, unconventional connections, and to investigate and produce new ideas (Sternberg, 2006).

Thus, an individual's preference for deploying creative skills for recombination purposes, influences whether or not the individual makes the appropriate connections between the information stocks, identifies new means-ends relationships, and recognizes the opportunity as such. In other words, the initially objective, opportunity-related information is shaped in the creative individual's mind into a subjectively perceived opportunity with entrepreneurial value. Consequently, from an investment theory point of view, creativity has a positive impact on opportunity recognition. In line with the notion of "buying low and selling high" (Sternberg, 2006, p. 87), creative people do not only generate creative outcomes such as ideas, or entrepreneurial opportunities, that might initially be misjudged and perceived as low quality. They stand out as creative individuals by "selling high", by making others perceive the outcomes of their (creative) investment as valuable (Sternberg & Lubart, 1996; Sternberg, 2006).

One way to "sell high" in the sense of demonstrating the opportunity's value to others, is to apply it in an organizational setup. Firm foundation functions as a viable option for creative individuals with an opportunity. Thus, individuals with high scores for creativity deploy their creative skills (in the investment theory sense) and "sell the opportunity high" by becoming an entrepreneur. Since creativity is independent of the opportunity's origin, meaning that it can be acquired from someone else (Amabile, 1997a), firm foundation is independent of whether or not the focal individual recognized the opportunity as such. Thus, I hypothesize:

*Hypothesis 2: Creativity increases the likelihood of a) of opportunity recognition and b) firm foundation.*

### ***The Role of Extrinsic Motivation on Opportunity Exploitation***

Although an opportunity holds the prospect of a recombination of resources or information potentially resulting in profit (Shane, 2012) not all discovered opportunities are exploited. (Shane, 2000, 2001). The nature of the opportunity on its own does not explain the entrepreneurial process; it is the motivation to further pursue and exploit the opportunity that is a distinctive factor in entrepreneurship (Shane et al., 2003). In order to understand what drives the exploitation of an opportunity it is necessary to understand the individual motivation to engage in this step in the entrepreneurial process. Motivation influences whether or not individuals embark on an activity, how long they persist with it, and how much effort they invest in it (Campbell & Pritchard, 1976). The entrepreneurship literature identifies pecuniary and non-pecuniary benefits as important motivators. For instance, individuals engage in the exploitation of opportunity in the expectation of a financial reward (e.g. Shepherd & De Tienne, 2005; Dunne et al., 1988; Campbell, 1992; Taylor, 1996), and if the expected associated costs, time and efforts are lower than the expected gains (Kirzner, 1973; Schumpeter, 1934; Venkataraman, 1997). Thus, expectation about the opportunity's outcome can be a decisive factor in the choice to pursue the opportunity.

Research has also identified non-pecuniary motivators such as expectation of autonomy (e.g. Blanchflower & Oswald, 1998; Taylor, 1996), need for achievement through the assumption of high personal responsibility for outcomes (e.g. McClelland, 1961; Collins et al., 2000), and self-efficacy or the confidence that the task will be accomplished successfully (e.g. Bandura, 1997; Chen et al., 1998).

The above suggests that an outcome-driven perspective promotes entrepreneurialism, and the expectation of achieving goals is a core driver of entrepreneurship. Thus, individuals who are driven by the rewards from and outcomes of an activity rather than the activity itself, are more likely to engage in entrepreneurial activities and the exploitation of opportunities to achieve their goals. In social psychology research, this is described as extrinsic motivation. The notion of extrinsic motivation refers to the desire to exert efforts to engage in an activity in order to achieve a goal, not just to enjoy the activity (Deci & Ryan, 1985). In this chapter, I assume that extrinsically motivated individuals will engage in exploitation of an opportunity if they expect pecuniary or non-pecuniary benefits from the activity. As already noted, this study is not limited to exploitation in the form of firm foundation (Amabile, 1997a; Shane, 2012) but applies a broader definition of opportunity exploitation that captures both new firm set up and also opportunity implementation in markets and hierarchies. I hypothesize that extrinsically motivated individuals are more likely to exploit opportunities through firm foundation or other exploitation.

*Hypothesis 3: Extrinsic motivation increases the likelihood of a) firm foundation and b) opportunity implementation.*

## **DATA AND METHOD**

### **Empirical Setting**

The study draws on a survey administered to individuals in hacker- and makerspaces, referred to as hackers and makers. “Makers” refers to individuals who modify existing work created by others, and create new designs and artifacts using diverse tools and machinery. The term hacker has malicious connotations that come from hacking-related break-ins and infringements of computer security systems. In the present study the term “hacker” is neutral and refers to both

hackers and makers as individuals who employ goods and services including technologies, products and materials of any kind, beyond their initial purpose, alter them and generate completely new work and projects including new concepts, designs and artifacts.

Hackers and makers are usually members of hackerspaces, or hackerlabs and makerspaces or makerlabs. The terms hackerspace and makerspace is used to describe both the community of members and the physical workspace that the community provides for individuals with a shared interest in areas such as technology, computing, arts and science, to socialize, exchange ideas and collaborate. Hackerspaces can be located in education or social centers, industrial buildings, warehouses, garages or basements, and comprise labs equipped with a range of tools, materials and machinery including hammers, drilling machines, laser cutters, 3D printers and, sometimes specialized equipment, such as computer numerically controlled (CNC) machines and oscilloscopes. Hackerspaces are usually run by a community-internal organizing team and financed by (voluntary) membership fees, and corporate and public donations.

The activities of hackers and makers involve more than solving problems related to existing products, and include programming and game development, and the creation of completely new works, designs and concepts such as robots, drones and art-related installations in combination with materials, sound, light and fire.

These activities may be collaborative within and across hackerspaces, and hackers and makers collaborate both physically in the workspace, and virtually in the community. Since there is generally no bar to access, individuals can subscribe to hackerspace mailing lists to discuss problems and ideas related to hacking, which gives access to the knowledge and expertise of the community without the need for a physical meeting. Free information exchange, and resource and knowledge sharing represent core values of the hacker community (Coleman & Golub, 2008), and



these mailing lists are used frequently thereby constantly exposing its members to the needs, problems and solutions of its members.

### **Hacker- and Makerspaces as an Appropriate Study Choice**

Studying individuals in hacker- and makerspaces had several motivations. First, studying hackers and makers to analyze the individual-related aspects of the entrepreneurial process is advantageous because their hacking activities refer to entrepreneurial activities. Research shows that these individuals encounter need-based and solution-based information (e.g. von Hippel, 1988), engage in problem-solving (e.g. Jeppesen & Lakhani, 2010), develop ideas with high potential commercial value (e.g. Lilien et al., 2002) and transition to entrepreneurship (e.g. Shah & Tripsas, 2007). Consequently, these individuals are crucial stakeholders in the processes of innovation (von Hippel, 1986; Franke & Shah, 2003) and entrepreneurship (Autio et al., 2013). Hackers and makers are interesting as study subjects to investigate the influencing factors of distinct entrepreneurial activities.

Second, since firm foundation is the result of human action rather than environmental effects, macro level studies analyzing how context effects shape the individual's likelihood to become an entrepreneur (e.g. Aldrich & Zimmer, 1986; Carroll & Swaminathan, 2000; Sorenson & Audia, 2000; Oezcan & Reichstein, 2009) have been criticized as ignoring individual-level effects (e.g. Thornton, 1999; Shane et al., 2003).

To lower heterogeneity and disentangle the effects of individual characteristics, requires a setting with a reasonably homogeneous population. Apart from experimental studies, meeting this requirement is complex, and appropriate settings in natural environments are rare. Hacker- and makerspaces are ideal in this respect; they represent a closed community in which the main values

and ethics are shared (Himanen et al., 2002, Coleman & Golub, 2008). Although communities are open to new membership, typically only like-minded individuals join hacker- and makerspaces in order to collaborate with individuals with whom they have common interests. Prior work shows also that these communities represent contexts within which individuals dedicate enormous time and where members report their greatest creative achievements, e.g. in open software development (Lakhani & Wolf, 2005).

Hence, this setting is appropriate also for analyzing diverse forms of motivation and creativity. The individual members of the community differ in their “mental equipment”, their capabilities, and how they exploit them (e.g. Jeppesen & Frederikson, 2006). Among those that discover an opportunity, only some become entrepreneurs (Shah & Tripsas, 2007; Mollick, 2012) while others prefer to commercialize their ideas (Jeppesen & Lakhani, 2010) or remain at stages prior to exploitation because of the enjoyment derived from entrepreneurial activity (Lakhani & Wolf, 2005).

However, it should be noted, that such a setting could lead to a problematic population of study subjects in the sense that the variation in these individuals might not be reflected in a selected sample of potential respondents. For this reason, we include a control variable for area of development, region and relatedness between the hacking activity and the professional occupation in the empirical analysis.

### **Data Collection and Assembling of Sample**

Data collection included (but were not limited to) preparatory field work and piloting phases which were performed iteratively. The insights into a setting are beneficial for increased understanding of the context’s activities, practices and related meanings (Brewer, 2000; Barley &

Kunda, 2001). I therefore conducted several field studies including web-analyses, and interviews and field observations in hackerspaces and at hacker conventions. The field work combined with several pilot studies including offline and online tests and a think-aloud systematic (Forsyth & Lessler, 1991), informed the research design and format of the online survey and the detailed individual and firm level questions.

The data were collected stepwise, between May and July 2012. After the administrator of the biggest global hacker and maker consortium had promoted the survey online to signal its trustworthiness, the survey was distributed to 392 hacker- and makerspaces in Northern English- and German-speaking Europe<sup>4</sup>, the United States, Canada, Australia and New Zealand. Hackerspaces were selected based on criteria such as activity status (e.g. active versus closed) and purpose (e.g. private versus commercial purpose), membership conditions, and accessibility. I was unable to reach 23 hackerspaces, and 369 hackerspaces were sent reminders after eight to ten working days.

By the end of the survey period, 2948 individuals had visited the survey platform. The final sample was extracted from that number by applying a response time window of 7.5 and 90 minutes, corresponding to the measured response timeframe in the pilot studies, which reduced the final sample to 678 individuals from 244 hackerspaces. While 43.8 percent of survey respondents in the final sample had started at least one venture, 76.6 percent of respondents were engaged in IT-related activities. The age span was 16-72 years with a mean age of 32.9 years old; 39.52 percent self-reported single as their marital status and 17.1 percent reported having children. The gender distribution was 57 female and 498 male individuals (with 123 missing values).

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<sup>4</sup> The European countries include Austria, Denmark, Finland, Germany, Norway, Sweden, Switzerland, U.K. and Ireland

## **Limitations of the Setting**

Despite the advantages of the setting noted earlier, the sample suffers from some shortcomings. First, the concerns over privacy occupying numerous hacker- and makerspace administrators resulted in constraints with respect to report response rates and representativeness checks of the sample<sup>5</sup>. Second, the final sample appears unbalanced with respect to the distribution of respondents across a) regions (105 from Europe, 94 from the United States and Canada, 21 from Australia and New Zealand and 24 from other countries) and b) hackerspaces since 30 out of 244 hackerspaces had five or more respondents.

Although it is not possible to test formally to address these potential issues, several checks were performed to compare the final sample with studies in similar contexts in entrepreneurship and the respective literature, and my field observations. First, with respect to demographics, the sample's over-representativeness of male respondents with 89.72 percent appears to reflect the standard in the field (e.g. Carlson, 2011; Coleman, 2010), and is consistent with the notion in research that entrepreneurship is a male domain (e.g. Hout & Rosen, 2000), e.g. on one study of entrepreneurship that adopts a social cognitive perspective there are 81.10% of male respondents (Hmieleski & Baron, 2009), and is in line with studies conducted in comparable contexts, i.e. problem-solving activities - 90.0% males (Jeppesen & Lakhani, 2010) and hacking - 97.5% males (Lakhani & Wolf, 2005).

A check on age showed that the final sample with a mean age of 32.9 years is in line with other hacking studies that report mean ages of 30 years (Lakhani & Wolf, 2005) and 29 years (Jeppesen & Frederiksen, 2006), and that the age range of 90.37% of the respondents of 16-48 is

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<sup>5</sup> For instance, several hackerspaces did not reveal the number of registered members in the community.

well within the range considered for individuals to be prone to entrepreneurship (Aldrich & Kim, 2007; Oezcan & Reichstein, 2009).

In addition, the high reporting of computing, technology, development of programs, applications and games, as main areas of respondents' activities is consistent with field observations (e.g. Carlson, 2011), research on anthropology (Coleman, 2010) and studies in similar settings (Lakhani & Wolf, 2005).

Second, to check for potential bias related to the regional unbalance I compared entrepreneurial activities across regions based on the Total early-stage Entrepreneurial Activity measure (TEA). This key measure, from the Global Entrepreneurship Monitor 2013 report (Amoros & Bosma, 2014), exhibits trends consistent with the present study's final sample, in the sense that entrepreneurial activity is higher in the United States and Canada compared to Europe.<sup>6</sup> Australia and New Zealand are not included in this report but appear to have similar response and entrepreneurship rates at 8.61% and 8.08% respectively. I also controlled for region in the empirical analyses which indicate significant effects on the activity of firm foundation but do not indicate reasons for concern, since the main results are unchanged with the inclusion of the control.

Third, although the tests on the demographic dimensions mentioned above indicate that the final sample is reasonably representative, I included in the econometrical analyses cluster corrected standard errors based on hackerspaces as the cluster identifier. The results did not change. Overall, the tests indicate that the final sample matches well with observations in the field and studies investigating similar research questions and contexts.

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<sup>6</sup> The TEA measure includes individuals between 16 and 64 who are about to establish or already run a business.

## Measures

### *Dependent variables*

This section discusses operationalization of the dependent variables for the activities involved in the entrepreneurial process, from opportunity exposure, recognition, to exploitation via firm foundation and other implementation formats. All the dependent variables are operationalized as dummy variables taking the value 1 in the case that the respective activity is pursued by the individual and 0 in case it is not pursued. This operationalization is in line with the notion of an entrepreneurial process in which activities can be carried out independently and not necessarily in sequential order.

*Opportunity exposure.* The dependent variable is measured by a proxy capturing two relevant aspects of exposure: a) the individual's prior knowledge that is complementary to b) new information inputs (Kaish & Gilad, 1991; Shane & Venkataraman, 2000). In line with previous research I operationalize the first component, prior knowledge, through the user's information about needs (von Hippel, 1988) or unsolved problems (Venkataraman, 1997) and combine it with the second component, captured by a dummy variable indicating whether or not the individual encounters new pieces of information (Shane & Venkataraman, 2000). In the presence of both types of information available to the individual, heterogeneous pieces of information encounter each other. Thus, the dummy variable indicates whether or not the individual is exposed to an opportunity. The variable is generated stepwise by combining responses to the question "I hack because I have unmet need(s) or unsolved problem(s) I want to solve" with the number of hackerspace visits (online or physically), indicating that the individual has obtained new needs- and solutions-based information from other members.

*Opportunity recognition.* To measure opportunity recognition, I exploited a questionnaire item on the individual's hacking and development history. The question took the style of a question on firms' innovation developments in the U.K. innovation survey which is based on the Eurostat Community Innovation Survey (CIS) (DTI 2003). In contrast to the rather objective phenomenon of being exposed to an opportunity, this dependent variable captures the individual's decision about what action to take upon exposure to opportunity-related information pieces. The combination of resources and information stocks incorporates the prerequisite that the individual must have recognized a new means-ends relationship. Thus, opportunity recognition is rather subjective and related only to the pure existence of an opportunity (Shane, 2012) and exposure to it. Based on this argument, I measure whether the individual has performed this combination task and generated a development based on his/her hacking activities. More precisely, with reference to this CIS survey type question I generated a dummy variable for whether or not the community member had made a significantly new development or significantly<sup>7</sup> improved a new technology, a new combination of existing technologies, or other knowledge, material or information. From this perspective, the information about developments based on novel combinations of heterogeneous information pieces, proxies for whether or not an opportunity has been recognized.

*Firm foundation.* To construct the variable for firm foundation and transition to entrepreneurship, I generated a dummy for whether or not the individual had founded or co-founded a company.

*Opportunity implementation.* In line with prior work, this study applies a less restrictive definition of entrepreneurship where exploitation includes both firm foundation and the implementation of opportunities in markets or hierarchies (e.g. Shane, 2012). For a refined analysis

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<sup>7</sup> "Significantly new" was thereby referring to the peers in the community for a reference point

of the determinants, the different forms of exploitation are measured separately as opportunity implementation and firm foundation. To construct opportunity implementation formats, I created a dummy variable based on survey items about number of new products, services, patents or trademarks realized as individual developments.

***Independent variables***

The independent variables are based on measurement items developed and used in social psychology. Unless otherwise indicated, they are used in the original scale version. Two separate principal component factor analyses were conducted involving the Kaiser criterion (Kaiser, 1960) and varimax rotation for the survey items related to motivation and creativity. The two factors required to operationalize the intrinsic and extrinsic motivation variable result from a factor analysis performed on all motivation-related survey questions. By construction, these two factors are not correlated and thus are not mutually exclusive, which is an important requirement according to the theory. An overview of the survey questions, factor loadings, variances and Cronbach’s alphas are summarized Table 1.

Since the dataset involves categorical variables, alternative factor analyses were conducted. For this purpose, I performed a polychoric correlation matrix and exploratory factor analysis in which the matrix rather than the raw variables function as the input. This alternative technique delivered similar but weaker results which represents additional support for the principal component factor analyses results.

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Insert Table 1 about here  
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*Intrinsic motivation.* Operationalization of intrinsic motivation variable was performed in line with self-determination theory measuring different forms of motivation (Deci & Ryan, 1985; Ryan & Connell, 1989). I conducted a principal component factor analysis with all the survey items related to intrinsic and extrinsic motivation. For the particular context of hacker- and makerspaces, I adapted the items based on prior studies using similar settings where individuals engage in entrepreneurial activities before firm foundation (e.g. Lakhani & Wolf, 2005; Roberts et al., 2006), and also on the insights gathered during familiarization with the empirical context. Hence, the items “I enjoy the activity of hacking itself”, “I enjoy being part of a community”, and “I forget everything around me when I get into the Zone” functioned as proxies for intrinsic motivation. The last item refers particular to “flow”, a state where individuals enjoy an activity to the point that they lose any sense of time due to a perfect match of skills and task (Csikszentmihalyi, 1996; Lakhani & Wolf, 2005). The three items loaded into one factor as expected. Table 1 shows further related statistics.

*Creativity.* Individual level creativity has been defined and measured in multiple ways across experiments and field studies, and rated in various formats involving peers, experts or supervisors (e.g. Amabile, 1979; Shalley & Perry-Smith, 2001; Grant & Berry, 2011). Table 1 shows my operationalization of creativity using an adapted short version of a four-item scale developed by Sternberg (1985a). The self-reported measure is based on a seven-point Likert scale from 1 “strongly disagree” to 7 “strongly agree”. I chose this specific self-reported measure due to the underlying theoretical view of creativity highlighted above. The study considers creativity from the perspective of the individual’s decision about how to deploy the creative skills available to him or her (Sternberg, 2006). Hence, the analysis investigates a psychological process within the individual’s mind, rather one involving individuals or the environment. Since this mental process is

not always reflected in the individual's behavior, and hence not necessarily obvious to others, an external rating of creativity in this context would be questionable. Thus, only the individual is likely to be able to perform the rating. The creativity items loaded into one factor and the Cronbach's alpha of 0.77 indicates good internal consistency.

*Extrinsic motivation.* As noted earlier, all motivation questions are based on items from social psychology (Deci & Ryan, 1985; Gagné & Deci, 2005; Ryan & Connell, 1989) and in line with studies investigating similar empirical settings. Hence, extrinsic motivation is based on items measuring the goal-oriented motivation of individuals when they hack "I want to enhance my career opportunities", "I would like to discover a business opportunity", "I hack because the hacker community gives support to found a company" (Roberts et al., 2006; Ryan & Connell, 1989). After rotation, the extrinsic motivation items yield one factor with good internal consistency (Cronbach's alpha= 0.73).

### ***Control variables***

Since personality traits matter for entrepreneurship, I control for *agreeableness*, *conscientiousness* and *openness to experience* (e.g. Zhao & Seibert, 2006; Shane et al., 2003). In line with prior work in management (e.g. Grant & Berry, 2012), these personality traits are constructed according to the scale developed by Donnellan et al (2006), a consistent and validated short form of the Five-Factor Model of personality. The survey questions are partly reverse-coded and based on a Likert scale from 1 ("strongly disagree") to 5 ("strongly agree"). Table 2 summarizes the questions and the results for the principal component factor analysis conducted to obtain the constructs.

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Insert Table 2 about here  
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Following previous entrepreneurship studies, I control for demographic variables including mean-centered age and its square term for non-linear influence (e.g. Dunn & Holtz-Eakin, 2000) and gender. Moreover, the binary variables *married/relationship* and *children* are used as demographic controls since both factors affect the likelihood of entrepreneurial engagement (e.g. Dunn & Holtz-Eakin, 2000; Sørensen 2007; Oezcan & Reichstein, 2009).

Furthermore, to check whether or not the respondent is an active member of the community, I control for *contribution* as a dummy variable. In addition, I control for whether the person's hacking activity is related to his or her occupational choice (*occupational relatedness*) and for whether or not the person enjoys his or her occupation (*occupation enjoyment*). By including these variables, the analysis takes account of a) whether or not the individual's profession, for instance entrepreneurship, is related to the hacking activity, and b) whether enjoying of the profession matters with respect to the hazard of opportunity exposure, recognition, firm foundation and opportunity implementation.

Additionally, the study employs a categorical variable capturing whether individuals are engaged in the IT industry. Finally, since geographical location matters for entrepreneurship (e.g. Mueller & Thomas, 2001; Thomas & Mueller, 2000) and to control for whether the data stems from hacker- and makerspaces across the globe, I control for whether or not an individual belongs to a hackerspace located in the Anglo-Saxon region.

### ***Model descriptions***

To investigate how motivation and creativity are associated with transition to the different activities of the entrepreneurial process, the study uses separate regressions to disentangle the effects. Hence, the analysis operates with four dummy dependent variables for different entrepreneurship related activities. These are opportunity exposure, opportunity recognition,

opportunity implementation and firm foundation. As noted earlier, although these activities are all part of one process, each activity is independent of the other activity and is distinct. Individuals that engage in one activity may not necessarily engage in the others. The activities are considered as unrelated and modeled separately. I conduct a series of logistic regressions in which the respective dependent variables represent the activity in the entrepreneurial process. This allows separate analysis of the influence of individual attributes on the likelihood of opportunity exposure, recognition, as well as implementation and likelihood of becoming an entrepreneur.

The regressions are corrected for potential bias in the standard errors caused by heteroskedasticity, using the Huber-White sandwich estimation method. I also performed a goodness-of-fit test based on Hosmer and Lemeshow (2000) to assess the match between predicted and observed frequency. The test results indicate good specification of all the models. Finally, I analyze the variance inflation factor and supplement it with an assessment of the correlation matrix of the respective regression analysis. For all models, variance inflation factors are below 3 and hence do not indicate any cause for concern over multicollinearity. Table 3 summarizes the descriptive statistics and the correlation coefficients for the dependent, explanatory and control variables

## **RESULTS**

Table 4 presents the results of the five logistic regressions. It presents the effects in a staged approach following the entrepreneurial process model. This allows analysis of the variables' influence on the respective process activity. The dependent variables in models 1 to 3 represent the activities of opportunity exposure, recognition and implementation. Model 4 exhibits the effects of the control variables on firm foundation (log likelihood -420.85667). Adding the explanatory variables creativity, intrinsic and extrinsic motivation in the less restrictive Model 5 increases

explanatory power compared to Model 4. A log likelihood ratio test shows a statistically significant improvement in model fit (log likelihood -412.42098) with a p-value for a chi-squared of 16.87 with 3 degrees of freedom.

Overall, there is strong support for hypothesis 1a, that intrinsic motivation is positively associated with opportunity exposure ( $p < 0.001$ ). Moreover, Model 5 provides evidence that intrinsic motivation is negatively linked to firm foundation. The estimate in Model 5 is significant and supports hypothesis 1 b ( $p < 0.01$ ). Model 1 also exhibits further factors influencing opportunity exposure. The analysis demonstrates positive and significant effects of creativity ( $p < 0.1$ ), openness to experience ( $p < 0.05$ ), agreeableness ( $p < 0.01$ ), contribution ( $p < 0.05$ ), and IT industry ( $p < 0.1$ ), revealing that creativity, and specific predispositions, contributing to the hacker community, in particular in IT related areas, increase the likelihood of opportunity exposure.

The logistic regression models 2 and 5 strongly confirm hypotheses 2a and 2b, that creativity is a significant determinant of opportunity recognition and firm foundation ( $p < 0.001$ ;  $p < 0.05$ ). Mean centered age, contribution, and occupational relatedness indicating that the individual's hacking activity is related to his or her occupation, show additional significant positive effects in model 2.

As predicted in hypotheses 3a and 3b, individuals scoring high for extrinsic motivation are more likely to exploit an opportunity for firm foundation and implement an opportunity in other formats. The estimates are positive and significant. Furthermore, models 3 and 5 show that both forms of opportunity exploitation are positively linked to creativity ( $p < 0.01$ ;  $p < 0.05$ ), occupational relatedness ( $p < 0.001$ ;  $p < 0.05$ ) and mean centered age ( $p < 0.05$ ;  $p < 0.001$ ). Implementation is also positively associated with contribution, and negatively associated with agreeableness. Additionally, model 3 shows that intrinsic motivation decreases the likelihood of further forms of opportunity

implementation thereby indicating a detrimental effect on exploitation of opportunities in hierarchies and markets.

Finally, in Model 5, age exhibits a non-linear relationship with regard to firm foundation, and while the Anglo-Saxon region increases the likelihood of becoming an entrepreneur, the variable IT industry has the opposite effect.

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Insert Table 4 about here  
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## **DISCUSSION**

The key findings of this study indicate that the effects of motivations and creativity change along different entrepreneurial activities and that while intrinsic and extrinsic motivation exhibit partly contrasting effects, creativity is consistently positive. In combining the literatures on psychology and entrepreneurship, this study appears to be the first to empirically test Shane and Venkataraman's process model (2000). Specifically, the analysis provides evidence that while intrinsic motivation is conducive to the early activities of entrepreneurship, there is a negative relationship between intrinsic motivation and the later activities of exploitation. In contrast, extrinsic motivation is positively associated with forms of opportunity exploitation. At the same time, creative individuals are more inclined to both recognize opportunities and start firms.

Overall, the results add to individual-level studies in entrepreneurship which suggest that theoretically not all individuals are equally likely to discover and exploit opportunities (e.g. Shane & Venkataraman, 2000; Baron, 2006), and to work analyzing the differences between entrepreneurs and non-entrepreneurs with respect to psychological dimensions (e.g. Busenitz & Barney, 1997; Zhao & Seibert, 2006). Through a fine-grained view of the activities before and including the

transition to entrepreneurship independently, this study's findings enhance research on entrepreneurship process models in various ways. First, drawing on the psychology literature to analyze entrepreneurial activities allows me to account for the intra-psychic aspects of individuals including mental functions and human behavior (e.g. Bandura, 1986). By applying the notion of creativity in association with implicit theories on thinking styles, the study considers individuals' inherent preferences and decisions to think in new ways, beyond the pure ability to think creatively (Sternberg, 2012). From an investment theory perspective, the notion of creativity includes a) considering problems from a new angle, and thinking "outside of the box", b) recognizing and deciding about worthwhile ideas, and c) persuading others about the value of these ideas (Zhang & Sternberg, 2011). Since the notion of creativity corresponds to the distinct entrepreneurial activities, the finding that creativity is consistently positive in the process is particularly interesting, and the study context of hacker- and makerspaces appears highly appropriate since individuals in these settings are exposed to and solve problems, generate ideas, and start firms.

Using a psychology lens increases our understanding of the motivations for individuals to pursue distinct entrepreneurial activities. The results of this study indicate that it is the pleasure obtained and the personal interest of the individual that fosters exposure to opportunities, but that it requires extrinsic motivation to exploit opportunities in an entrepreneurial fashion. Intrinsic motivation appears to hamper exploitation of opportunities. Since individuals vary in their scores for intrinsic and extrinsic motivation and creativity, this study's findings add a person-centered answer to the puzzling question of why not all opportunities that individuals come across and recognize are exploited, and suggests that individuals opt out at different points in the process. Furthermore, the study addresses calls for a better understanding of the determinants of other organizational setups apart from firm foundation (Davidsson, 2004; Alvarez & Parker, 2009), and

disentangles exploitation related to the notion of firm foundation from exploitation for other purposes such as new products, services, patents and trademarks.

Second, the findings also add to research on motivation. Prior work in this research stream has debated whether the relationship between intrinsic and extrinsic motivation is antagonistic or synergetic. While the former associates an increase in extrinsic motivation for an activity with a decrease in intrinsic motivation, the latter refers to a relationship in which intrinsic and extrinsic motivation are self supporting, or at least do not negatively affect one another (see e.g. Deci and colleagues (1999) for a meta-analytical review). Research has increased our knowledge about the nature of this relationship in experimental settings and work environments in established organizations (e.g. Amabile, 1993, 1997b) and highlighted that the relationship is particularly complex in distributed models of innovation such as open software development (Alexy & Leitner, 2011). The present study does not measure the mutual effects of these motivations but is nevertheless interesting since the findings suggest that, investigating the whole entrepreneurial process, it appears that intrinsic motivation is required to initiate the process and extrinsic motivation is required to complete it. However, this study treats these activities separately and the results indicate that intrinsic and extrinsic motivation have significant, but opposite effects on the likelihood of starting a firm or of exploitation in other formats. Thus, this study contributes by empirically confirming a hitherto theorized variation across the entrepreneurial process (Amabile, 1997a).

On the other hand, in providing empirical evidence that intrinsic motivation exhibits opposite effects in the early versus late process activities, the results are consistent with one of the few empirical studies on intrinsic motivation in entrepreneurship (Gimeno et al., 1997), which suggests that when individuals are intrinsically motivated they benefit from psychic incomes and



less from (financial) payback thereby decreasing the survival chances of their firms. The present study complements this work by examining the transition to entrepreneurship and providing potential explanations for this phenomenon related to time-constraints, uncertainty and person-job mismatch.

Third, the connection between creativity and entrepreneurship appears to be intuitive and has been thoroughly discussed in the literature (e.g. Schumpeter, 1934; Amabile, 1997a; Ward, 2004). Empirical evidence on this relationship however, is scarce, in particular with respect to single entrepreneurial activities. This may be due in part to lack of appropriate settings to measure creativity based on activities before the transition to entrepreneurship. The findings in this chapter on the significant impact of creativity on single activities contributes to work in cognitive science and pattern recognition in entrepreneurial and invention processes (e.g. Amabile, 1997; Baron, 2006; Baron & Ensley, 2006; Maggitti et al., 2012). The use of data on individuals that engage in diverse entrepreneurial activities introduced a new empirical setting to research on creativity, in particular investment theory of creativity (Sternberg & Lubart, 1996). In line with this notion, the results suggest that individuals who intentionally deploy their skills for creative purposes, connect complementary pieces of information required to see new means-ends relationships and recognize opportunities. Moreover, the findings indicate that these individuals do not stop at this stage but are more likely to go on to exploit the recognized opportunities via firm foundation or other activities. Apparently, once individuals have been exposed and made the decision to invest their skills, time and efforts to transform information pieces into business ideas, they desire a “payback”. Based on the principle “buy low and sell high” (Sternberg, 2006, p.87), they implement the recognized opportunity in the form of firm creation or other exploitation forms.

Fourth, the study offers a complementary perspective on the literature on founding teams. Studies in this research stream debate whether diversity in team formation is preferable to homogeneity (e.g., Pelled et al., 1999; Ruef et al., 2003). This study's findings extend this notion and indicate that even before firm foundation, diverse individual-level factors are important. Specifically, separating entrepreneurial activities from one another and analyzing them independently, gives an idea of the individual attributes that matter in the single activities of the entrepreneurial process. In other words, this chapter should provide guidance with respect to the search for individuals supporting prospective entrepreneurs, in case they are not "fully equipped" with the relevant motivations and creativity to successfully perform different entrepreneurial activities, and the roles required.

Finally, the findings have implications for the search literature, particularly distributed sources of innovation, which is a recent link in the literature (Alvarez et al., 2013). Studies in this stream argue that companies increasingly aim to innovate by boundary-spanning search for innovation inputs, stemming from distributed sources of innovation and their positive impact on innovation processes (e.g. Katila & Ahuja, 2002; Laursen & Salter, 2006). This study's results complement this research by providing insights into the distribution of potential sources of innovation and the underlying mechanisms with respect to the availability of opportunities in the market. The findings suggest that if individuals are not equipped with relevant motivations and creativity, opportunities that are discovered might remain unexploited despite their commercial value and their potential value as inputs to the organization's innovation processes. This is consistent with the statement that sophisticated users become entrepreneurs by chance, if no existing organization can be found to exploit the opportunity (Shah & Tripsas, 2007). These individuals' ideas represent interesting potential sources of innovation and are of high economic

interest to organizations due to their significantly higher potential for innovation and market success (Lilien et al., 2002). The study's findings contribute to the literature on idea management (e.g. Alexy et al., 2012 ) by shedding light on where and why business opportunities emerge – which might be beneficial for a further investigation of measures, tools and management processes in order to translate external ideas into company internal innovation.

### **Implications for Practitioners and Educators**

This research should be useful to venture capitalists and innovation managers. When founding or innovation teams are formed, the combination of the “right” people, or more specifically the “right” motivations and creative skills, has been shown to be crucial. Individuals intrinsically motivated in a particular activity can be beneficial to start the process. But their impact can be counterproductive in later stages. The research in this chapter provides evidence about the determinants of entrepreneurial and innovation processes, and moreover, suggests ideas on when and how different team members should be composed.

Furthermore, since organizations typically search for new ideas to fuel their innovation processes, managers could benefit from knowing more about when and why entrepreneurial opportunities are available in the market. This should be of particular interest to high-tech industries where innovation cycles are short, competition is high, and many products are standardized; opportunities that are already in the discovery stage represent highly valuable inputs to entrepreneurial or innovation pipelines.

Finally, the study should be of interest to educators in suggesting creativity training for nascent entrepreneurs and prospective founding teams. One approach might be proactive training of individuals in how to use creativity tools and methods to stimulate a creative thinking style, and

abandonment of conventional paths in the search for new ideas and ways to solve problems. An appropriate teaching approach might include awakening individual awareness in the various effects of motivation.

### **Limitations and Future Research**

The particular context of hacker and makerspaces offers advantages for an analysis of the impact of motivation and creativity on the entrepreneurial process, including pre-founding. However, it reduces generalizability of the findings. The individual's affiliation with a hackerspace might be a product of predisposition. Hence, the occurrence of entrepreneurs in our sample might be attributable to self-selection mechanisms, first to the hackerspace in general, and also to responding to the survey. The specifics of the data collection design did not allow me to check the representativeness of the final sample or response bias. However, I conducted several checks associated with respondents' gender, age, hackerspace affiliation and geographic location. Comparisons with the fieldwork as well as studies analyzing comparable research questions in entrepreneurship and context-related studies suggest good correspondence between the final sample and this work. Future work could extend the investigation to other areas, such as processes in R&D labs, to study the determinants of invention or organizational innovation processes. With respect to the significance of the region control on firm foundation, future work could investigate how hackers' proclivity for firm foundation varies across regions.

The respondents in our sample ranked their skills and preferences for ideas and combinatorial tasks; thus measurement of the creativity variable could be criticized. However, as an individual's tendency for deploying of his or her creative skills underlies intra-psychic mechanisms,

a self-reported measure is an appropriate way to measure creativity under the premise of the investment theory of creativity (e.g. Sternberg, 2006).

Future research opportunities could include indirect analysis of individuals' characteristics and skills. It could adopt a more holistic approach to analyzing individuals' entrepreneurial endeavors. Prior work suggests that intrinsically motivated individuals not only experience an interest and enjoyment in the task but do so through an act of self-expression (Amabile, 1997a). Future work could take account of this view and analyze how entrepreneurship relates to individuals' self-conceptions and how they are associated with firm performance.

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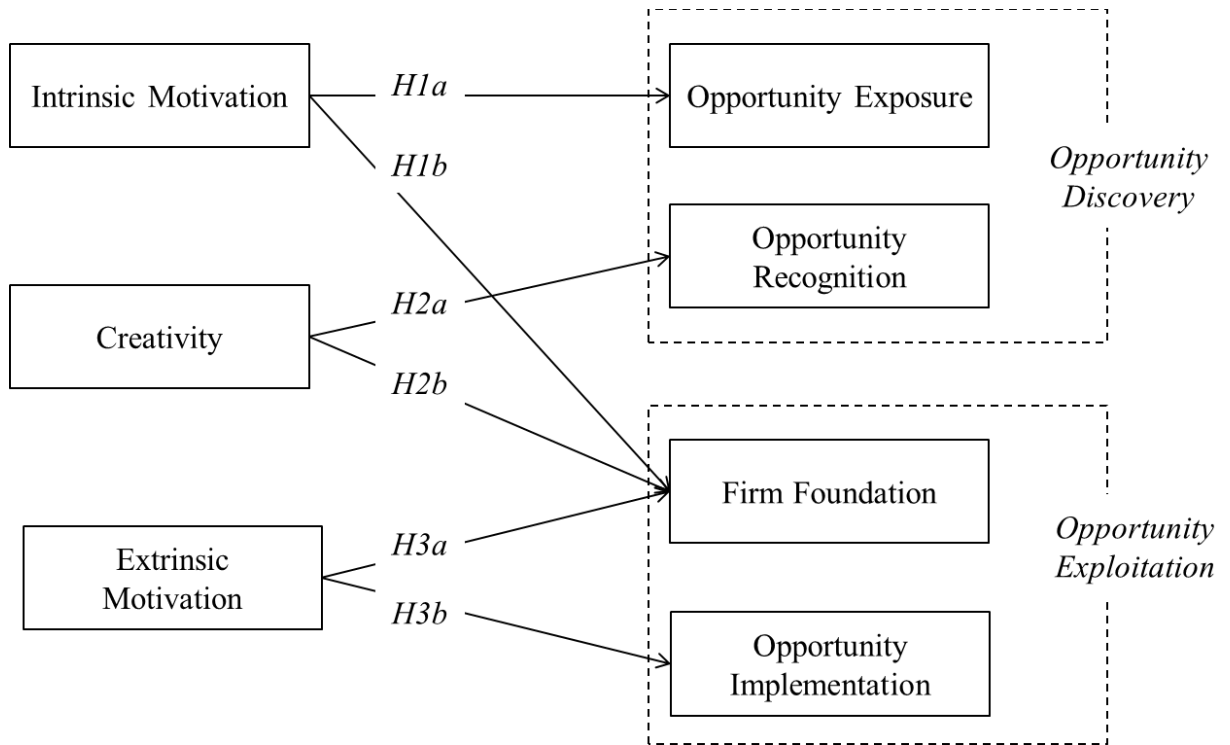
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**FIGURE 1**

**Conceptual Model and Hypotheses**



**TABLE 1**

**Motivation and Creativity: Survey Questions, Factor Loadings, Variances and Cronbach's Alphas**

Motivation Factor Analysis		
Questions	Intrinsic	Extrinsic
I hack because...		
...I enjoy the activity of hacking itself	0.812	
...I enjoy being part of a community	0.664	
...I forget everything around me when I get into <i>the Zone</i>	0.635	
...I would like to discover a business opportunity		0.849
...I want to enhance my career opportunities		0.801
...the hacker community gives support to found a company		0.758
Variance	1.515	1.959
Proportion	0.253	0.327
Cumulative	0.579	0.327
Cronbach's Alpha	0.478	0.730
Creativity Factor Analysis		
Questions	Creativity	
I am someone who...		
...makes connections & distinctions between ideas & things	0.773	
...is able to grasp abstract ideas & focus my attention on those ideas	0.805	
...is able to put old information, theories, & so forth together in a new way	0.801	
...uses the materials around me & makes something unique out of them	0.704	
Variance	2.381	
Proportion	0.595	
Cumulative	0.595	
Cronbach's Alpha	0.771	



**TABLE 2****Personality Traits: Survey Questions, Factor Loadings, Variances and Cronbach's Alphas**

Personality Traits Factor Analysis			
Questions	Agreeable- ness	Conscien- tiousness	Openness to Experience
I sympathize with others' feelings	0.856		
I am not interested in other people's problems. (reverse coded)	0.715		
I feel others' emotions.	0.784		
I am not really interested in others. (reverse coded)	0.738		
I get chores done right away.		0.615	
I often forget to put things back in their proper place. (reverse coded)		0.786	
I like order.		0.555	
I make a mess of things. (reverse coded)		0.753	
I am not interested in abstract ideas. (reverse coded)			0.839
I have difficulty understanding abstract ideas. (reverse coded)			0.784
I do not have a good imagination. (reverse coded)			0.640
Variance	2.440	1.883	1.852
Proportion	0.222	0.171	0.168
Cumulative	0.222	0.393	0.561
Cronbach's Alpha	0.785	0.620	0.647

**TABLE 3**

**Descriptive Statistics and Correlation Coefficients (N=678)**

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
1 Opportunity Exposure	0.776	0.417										
2 Opportunity Recognition	0.528	0.500	0.1506									
3 Opportunity Implementation	0.319	0.466	0.0943	0.6465								
4 Firm Foundation	0.438	0.497	-0.0030	0.2333	0.2640							
5 Intrinsic Motivation	-2.39e-09	1	0.3163	0.1137	0.0128	-0.0316						
6 Creativity	3.69e-09	1	0.2459	0.2061	0.1426	0.1805	0.3530					
7 Extrinsic Motivation	-2.13e-10	1	0.0551	0.0208	0.1194	0.1036	-0.0000	0.1322				
8 Openness to experience	4.14e-09	1	0.2103	0.0833	0.0769	0.1462	0.2477	0.5034	-0.0430			
9 Agreeableness	-2.35e-09	1	0.1630	0.0065	-0.0635	-0.0161	0.1737	0.2078	0.0737	-0.0000		
10 Conscientiousness	8.98e-10	1	-0.0370	0.0505	0.0610	0.0095	-0.0622	0.0261	0.0405	0.0000	-0.0000	
11 Occupational Relatedness	2.994	1.424	0.1370	0.1643	0.1987	0.1144	0.2374	0.1095	0.1093	0.0705	0.0448	0.0276
12 Contribution	0.906	0.293	0.1893	0.1697	0.0692	0.0410	0.2455	0.1072	0.0028	0.1140	0.0736	-0.0338
13 Mean centered age	-0.398	9.327	-0.0153	0.1108	0.1114	0.2395	-0.0062	0.1507	0.0178	0.1350	-0.0928	0.0027
14 (Mean centered age)2	87.023	164.412	-0.0196	0.0570	0.0454	0.0785	0.0386	0.1157	0.0490	0.0496	-0.0543	-0.0123
15 Occupation enjoyment	0.621	0.486	0.0976	0.0774	0.1232	0.0893	0.1973	0.0954	0.0202	0.0286	0.1066	0.0489
16 Female	0.265	0.442	-0.1253	-0.1207	0.0047	-0.0326	-0.1536	-0.2251	0.0156	-0.2151	-0.0205	-0.0384
17 Married/relationship	0.419	0.494	0.0908	0.0841	0.0483	0.1120	0.1156	0.1844	-0.0520	0.1400	0.0333	0.0018
18 Children	0.171	0.377	0.0470	0.0686	0.0760	0.1357	0.0832	0.1574	0.0127	0.1230	-0.0527	-0.0518
19 Region	0.562	0.497	0.0885	0.1300	0.0997	0.1983	0.1771	0.3097	0.1706	0.1759	0.0184	0.0163
20 IT Industry	0.739	0.440	0.1072	-0.0104	-0.0332	-0.1047	0.1744	-0.0822	-0.0249	0.0207	-0.0708	-0.0199
			11	12	13	14	15	16	17	18	19	20
11 Occupational Relatedness												
12 Contribution			0.0767									
13 Mean centered age			-0.0695	-0.0610								
14 (Mean centered age)2			-0.0322	-0.0213	0.6038							
15 Occupation enjoyment			0.5674	0.0389	-0.0052	0.0156						
16 Female			-0.0938	-0.1600	-0.0716	-0.1477	-0.1223					
17 Married/relationship			0.0582	0.0185	0.2797	0.1352	0.1026	-0.2193				
18 Children			0.0101	0.0395	0.4944	0.2973	0.0563	-0.1933	0.4319			
19 Region			-0.0455	0.1725	0.2131	0.0819	0.0148	-0.0953	0.1230	0.1880		
20 IT Industry			0.1911	0.1067	-0.0573	-0.0102	0.0893	-0.1598	-0.0671	-0.0153	-0.1728	

**TABLE 4**

**Determinants of Opportunity Exposure, Recognition, Implementation and Firm Foundation**

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
	Opportunity Exposure	Opportunity Recognition	Opportunity Implementation	Firm Foundation	Firm Foundation
Intrinsic Motivation	0.439*** (4.04)	0.013 (0.13)	-0.184+ (-1.78)		-0.319** (-3.14)
Creativity	0.208+ (1.65)	0.395*** (3.71)	0.307** (2.61)		0.229* (1.98)
Extrinsic Motivation	0.120 (1.07)	-0.064 (-0.76)	0.197* (2.07)		0.153+ (1.67)
Openness to experience	0.264* (2.21)	-0.157 (-1.63)	-0.004 (-0.03)	0.191* (2.16)	0.166 (1.57)
Agreeableness	0.273** (2.61)	-0.090 (-1.05)	-0.223* (-2.43)	-0.044 (-0.53)	-0.050 (-0.58)
Conscientiousness	-0.080 (-0.75)	0.101 (1.24)	0.108 (1.25)	-0.001 (-0.01)	-0.036 (-0.42)
Occupational Relatedness	0.089 (0.97)	0.283*** (3.96)	0.326*** (4.18)	0.226** (3.06)	0.232** (3.00)
Contribution	0.688* (2.14)	1.171*** (3.76)	0.713* (2.20)	0.239 (0.83)	0.415 (1.41)
Mean centered age	-0.002 (-0.16)	0.0324* (2.51)	0.031* (2.18)	0.067*** (4.74)	0.066*** (4.50)
(Mean centered age) <sup>2</sup>	-0.001 (-0.88)	-0.000 (-0.67)	-0.001 (-1.01)	-0.001* (-2.13)	-0.002* (-2.16)
Occupation enjoyment	-0.043 (-0.17)	-0.204 (-1.01)	0.168 (0.74)	0.101 (0.49)	0.176 (0.83)
Female	-0.118 (-0.51)	-0.306 (-1.54)	0.314 (1.48)	0.047 (0.23)	0.099 (0.48)
Married/relationship	0.190 (0.76)	0.070 (0.37)	-0.021 (-0.10)	0.058 (0.31)	0.104 (0.54)
Children	0.004 (0.01)	-0.231 (-0.83)	0.067 (0.23)	-0.098 (-0.36)	-0.092 (-0.34)
Region	-0.031 (-0.13)	0.191 (1.04)	0.142 (0.70)	0.542** (3.05)	0.503** (2.71)
IT Industry	0.391+ (1.66)	-0.191 (-0.95)	-0.226 (-1.05)	-0.532** (-2.67)	-0.392+ (-1.96)
Constant	0.315 (0.72)	-1.491*** (-3.76)	-2.510*** (-5.89)	-1.027** (-2.76)	-1.370*** (-3.50)
Number of observations	678	678	678	678	678
Log-likelihood	-308.6647	-430.0815	-388.4086	-420.8567	-412.4210
Wald chi2	98.94	68.24	71.78	71.91	76.05
Pseudo R2	0.1445	0.0828	0.0846	0.0944	0.1126

+ p<0.1, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001; t-statistics in parentheses

# Chapter 3

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## MAVERICKS, MISSIONARIES, MASTERMINDS:

### FOUNDER IDENTITY AND ENTREPRENEURIAL EXIT

by Maria Halbinger

#### ABSTRACT

Previous research suggests that founders associate meanings with entrepreneurial activities and pursue firm strategies which are consistent with their identities. This study links the characteristics underlying founder identity with key strategic decisions in entrepreneurship and proposes that exit rates are based on founders' concept of self. The study draws on a unique dataset of 678 individuals entrepreneurially active in hacker- and makerspaces. The findings suggest that founders who are more curious, community oriented and active problem-solvers (i.e. mastermind identity) experience lower exit rates, while founders who are more eager to contribute to the world (i.e. missionary identity) experience higher exit rates. Founders who are more reckless and rivalrous (i.e. maverick identity) are less likely to exit only when firm foundations are recent. By applying a social identity perspective, this study aims to contribute to an understanding of how exit rates of firms vary based on different founder identities.

## INTRODUCTION

Firm exit is a fundamental phenomenon of entrepreneurship that is particularly widespread among young firms (e.g. Brush et al., 2008; Wennberg et al. 2010; DeTienne & Cardon, 2012). Around 60 percent of new firms exit within the first five years (Kirchhoff, 1994; Levie et al., 2011). Since the substantial economic benefits related to economic growth (Sternberg & Wennekers, 2005) and innovation (Schumpeter, 1934) are only realized if new organizations survive (Bruederl et al., 1992; Yang & Aldrich, 2012), it is essential to understand what influences firm exit.

This topic has received substantial attention from various research fields. While economics related research focuses largely on the role of the environmental factors on firm exit (e.g. Audretsch, 1995; Klepper, 1996; Geroski et al., 2010), organization scholars engage in a valuable debate over whether survival is determined by market selection mechanisms (Hannan & Freeman, 1989) or adaptation processes (Meyer & Rowan, 1977). Micro level studies emphasize the importance of founders' human capital, such as prior work experience and demographic characteristics, as crucial aspects of firm performance including firm survival (e.g. Bruederl et al., 1992; Cooper et al., 1994). However, despite their important contributions, these research streams do not take into account that entrepreneurship is not just an occupation. Founders may associate values with their firms and pursue entrepreneurial activities for a personal reason and as a way to convey their identity (Meyer & Zucker, 1989).

As a consequence, several studies apply an identity perspective to explain the transition to entrepreneurship (e.g. Dobrev & Barnett, 2005) and provide important insights into how identities relate to entrepreneurial activity thereby shaping the structure of markets and society (Carroll & Swaminathan, 2000; Greve et al., 2006; Sine & Lee, 2009). However, most research in this vein

takes a sociological perspective and focuses more on the roles of individuals related to occupation and entrepreneurship (e.g. Ibarra, 1999; Cardon et al., 2009; Sheperd & Haynie, 2009; Hoang & Gimeno, 2010) which puts less emphasis on the social aspect of identity stemming from the field of psychology. Moreover, despite the substantial theoretical investigation, the empirical evidence around the impact of social identity is limited.

This chapter adopts the perspective of social identity, i.e. how individuals identify themselves with reference to others or social categories (Tajfel & Turner, 1979; Turner, 1985; Gioia, 1998). This is a useful lens for the investigation of firm exit because founders shape their firms with their identities, and develop firm strategies that are in line with their concept of self (Fauchart & Gruber, 2011). In turn, firm initial strategies have an imprinting effect on firm success (Kimberly, 1979) and firm survival (Delmar & Shane, 2004). Adopting a *social* identity perspective is particularly advantageous because it allows taking into account founders' behaviors towards others, which is a crucial aspect since entrepreneurship involves social interaction, and firms are socially constructed (Whetten & Mackey, 2002). Specifically, the present study examines empirically how different founder identities influence firm exit, defined as business termination (Yang & Aldrich, 2012).

Different identity dimensions are thus at the heart of this study. I introduce three notions of identity; maverick, missionary and mastermind. Mavericks are founders who are more reckless and inclined to rivalry. Missionaries are founders who are more eager to make a contribution to society and masterminds are founders who are more curious, community oriented and active in problem-solving. It is important to note that identities are not mutually exclusive and individuals may identify equally with each category (Ashforth and Mael 1989). I hypothesize that these three founder identities have different impacts on firm exit, and develop the underlying mechanisms

based on the influence that identity has on three core strategic entrepreneurial decisions, i.e. customer needs addressed, targeted markets and resources allocated (Abell, 1980).

The present study draws on survey data from 678 individuals in hacker and maker communities in the United States, Canada, Australia, New Zealand, and Northern and English and German speaking Europe. The data were collected through an online questionnaire administered between May and July 2012, and provide individual- and firm-related information, allowing me to distinguish between effects operating at the two levels of aggregation. This context is advantageous because since the sample is based on individuals who are active at different points in the entrepreneurial process, I can analyze exit rates conditioned on the transition to entrepreneurship. Moreover, the setting of a distinct community reduces unobserved heterogeneity and potential bias allowing me to disentangle the effects of different founder identities.

By taking advantage of a longitudinal dataset, I find that exit rates are higher for founders who feel more obligated to contribute to the world (i.e. missionaries) and lower for more curious, community-oriented founders (i.e. masterminds). Additionally, when focusing on recent firm foundations only founders who are more reckless and inclined to rivalry, i.e. mavericks, exhibit lower exit rates. These findings contribute to the emerging research that adopts a theoretical perspective on social identity to entrepreneurial phenomena. The findings suggest that founders who identify strongly with their group, i.e. masterminds, can achieve mutual benefits that strengthen the chances of survival of their firms. This supports the notion that users are interesting sources of innovations that can result in firm foundation (Shah and Tripsas 2007; Autio et al. 2013). It shows also that the prototypical individual who subscribes to the cooperative norms, values, and beliefs underlying the maker movement, co-creates products and services of high market potential

(Von Hippel 1986; Lilien et al. 2002) and can mobilize important resources relevant for firm survival.

The following section introduces the notion of firm exit and founder identity. Section three presents the hypotheses. Section four informs about data and method and Section five presents the results. The chapter concludes with a discussion of the findings and the implications for future research.

## **FIRM EXIT AND FOUNDER IDENTITY**

The analysis of firm exit has been approached from different perspectives, and scholars have used various terms including survival, failure rate or death. This study applies the notion of firm exit as a measure of performance in that it captures the discontinuation of the firm, and the termination of the business (Yang & Aldrich, 2012). Firm exit is particularly common within the first three years of a venture's life (Bruederl et al., 1992). However, research on the event of exit events is not fully explored (DeTienne, 2010; Wennberg et al., 2010; DeTienne & Cardon, 2012).

Consequently, it is important to investigate the determinants of firm exit, in particular because the benefits such as innovation and technological change (Schumpeter, 1934; Audretsch, 1995), regional development (Feldman, 2001), and economic growth (Sternberg & Wennekers, 2005; van Stel et al., 2005) can only be realized if the firm persists (Bruederl et al., 1992; Yang & Aldrich, 2012).

Firm exit has been investigated in various studies related to economics and organization research. The economics literature associates firm exit rates with industry specifics including industry lifecycle and innovation rates (e.g. Audretsch, 1995; Klepper, 1996) as well as human capital related factors (Bruederl et al., 1992; Cooper et al., 1994; Dahl & Reichstein, 2007).



Organization research investigates firm exit from two different perspectives. One research stream highlights the role of learning and adaptation as important factors in survival (e.g. Meyer & Rowan, 1977); the other, which is related to organizational ecology, studies the birth and mortality rate of organizations and attributes exit or failure rates to market selection mechanisms rather than (the lack of) adaptation by the focal organization (Hannan & Freeman, 1989; Carroll & Hannan, 2000). These research strands have significantly increased our understanding of the dynamics of exit at firm level but focus less on the role of the individual entrepreneur, particularly with respect to the meanings and values that founders associate with their firms.

Given that most organizations in any industry sector are rather small (Carroll & Hannan, 2000), researchers have emphasized the need to take account of the role of the individual founder when analyzing firm exit (Bruederl et al. 1992). The founder may represent a critical source of variation (Wennberg, 2009) and ignoring factors related to firm founders could result in inaccurate inferences (Pennings et al., 1998). Hence, analyzing the role of founder identity could provide valuable insights into the event of firm exit since scholars emphasize the close link between the founder and the firm, considering the firm as the embodiment of the founder's identity (Meyer & Zucker, 1989).

Specifically, founders systematically apply firm strategies that are aligned with their self-concept and imprint their firms with their identities (Fauchart & Gruber, 2011). At the same time, firm strategy is strongly related to firm outcome including survival (Kimberly, 1979; Delmar & Shane, 2004). Hence, given that an individual behaves in a way that is consistent with his or her identity (Stets & Burke, 2000), one could imagine that, through imprinting, founder identity would also influence firm exit. This suggests that research on exit would benefit from closer attention to founders' identity.

In investigating the importance of founder identity, I adopt the concept of social identity understood in the context of psychology. Accordingly, identity captures an individual's definition of self, based on social categories. More precisely, individuals develop a feeling of belonging to groups or categories depending on the values they represent (Tajfel & Turner, 1979; Hogg et al., 1995; Gioia, 1998). Thus, identity reveals how individuals categorize themselves compared to others, and reflects the individual's "place in society" (Tajfel, 1972, p. 293).

Identity is generated over time, and its formation starts in young adulthood (Turner, 1968). Thus, scholars assume that individuals follow an identity trajectory throughout their lives in the sense that identity shapes the education and career tracks they select. Therefore, it is most likely that the founder's concept of self influences his or her entrepreneurial action and behavior, and not vice versa (Fauchart & Gruber, 2011). This suggests that identity is rather stable considering the long term process through which it develops and because individuals aim for a more consistent "sense of self in society" (Hogg, 2000, p. 231).

Introducing social identity to the study of entrepreneurship is advantageous for various reasons. First, social identity puts the focus on the founder in social interaction with others. Individuals define themselves compared to others in their environment (Tajfel & Turner, 1979), and hence, when founders interact, this self-definition matters for both the process of interaction and its outcomes. Consequently, this is a useful lens to apply to entrepreneurship research since founding and managing a firm do not occur in isolation but within a social context, and also since firms are socially constructed (Whetten & Mackey, 2002). How founders interact with others is important since social interactions matter with respect to crucial entrepreneurial activities such as accessing and leveraging information, networks, and resources (Aldrich & Fiol, 1994; Stuart et al., 1999; Aldrich & Kim, 2007). Moreover, social interaction can precipitate entrepreneurial action since it

helps overcoming a major obstacle in entrepreneurship, uncertainty (Autio et al., 2013). A social identity lens shows that identity is not just a product of genetics and personality traits but that it also involves the social environment (e.g. Weber et al., 2011).

Second, this perspective allows analyzing the founder and his or her influence on the firm from a more holistic angle. Prior work on individual-level determinants of entrepreneurship such as demographic factors (e.g. Bates, 1995), personality traits (e.g. Zhao & Seibert, 2006), genetics (Shane et al., 2010), or attributes such as overconfidence (Busenitz, 1999), need for achievement (McClelland, 1961), and motivation (Shane et al., 2003), has significantly increased our understanding of the effects of single, distinct aspects of the founder. However, it has been stressed that the study of firm exit would benefit from considering not only the founder's characteristics and skills but also the entrepreneur's aspirations and objectives (Shane & Khurana, 2003; Gimeno et al., 1997; Wennberg, 2009). This study responds to this call by applying a founder identity lens which takes account of meanings behind founders' actions. This is important since entrepreneurial actions have been shown to reflect personal values and goals of founders (Cardon et al.; 2009; Shepherd & Haynie, 2009; Hoang & Gimeno, 2010).

Third, given that individuals' behaviors reflect their identities (Hogg & Terry, 2000; Tajfel & Turner, 1979), social identity is an important research tool to explain the differences across entrepreneurial strategies. There is a strong link between firm and founder, and founders systematically apply entrepreneurial strategies that are in line with and confirm their identities including key decisions such as how customers are served, how markets addressed, and how resources are allocated and combined to generate market offerings (Abell, 1980; Fauchart & Gruber, 2011). Hence, identity serves as a cognitive scheme for entrepreneurial action, and consequently, founders pursue strategies that are distinctively different according to their identity.

As noted earlier, particularly with regard to firm exit, the strategies of the newly created venture are of significance (Bruederl et al., 1992; Delmar & Shane, 2004).

This study introduces three notions of identity: maverick, missionary, and mastermind. Accordingly, mavericks are founders who are more reckless and inclined to rivalry. Missionaries are characterized as founders who are more eager to contribute to the world and masterminds are founders who are more curious, community oriented and active in problem-solving.

In introducing these three notions, I draw on the work of Fauchart and Gruber (2011) which includes the development of a typology of founder identities and explores their distinct impacts on strategic core aspects of firm creation. Instead, I adopt the notion of founder identity for an empirical investigation into firm exit. Since individuals identify to some extent with identity categories (Ashforth & Mael, 1989), the present study considers the identity notions not as mutually exclusive. This chapter regards the founder identity notions as a continuum with each identity representing a scale along which individuals can vary. This idea of identity is methodologically reflected in the operationalization of the identity variables allowing the variety that is required to reflect a potentially blended nature of founder identity. Hence, the present study deviates from Fauchart and Gruber's typology conceptually and methodologically, and thus, uses new terms for the identity notions.

## **HYPOTHESES DEVELOPMENT**

In the following, the influence of founder identity on firm exit is hypothesized to arise from the firm strategy that founders adopt. Specifically, I link the three identity sub-dimensions used in prior work, frame of reference, basic social motivation, and self-evaluation (Brewer & Gardner, 1996), and interweave them with the well-established strategic core decisions of entrepreneurship, the target market to address, the customer problems to solve, and the resources to generate a market

offering (Abell, 1980). These decision aspects are used in the present study as they operated as basis to establish the immediate bond between founder identity and his or her strategic actions (Fauchart & Gruber, 2011).

### **Mavericks**

This study hypothesizes that firms established by founders who are inclined to a maverick identity are less likely to exit for three reasons. First, maverick-like founders are focused particularly on competition (Fauchart & Gruber, 2011). They regard competitors as the frame of reference, and in order to differentiate from rivals, they align their strategic actions to securing firm success and displacing competing firms. Since defeating rivals is a core aspect of the firm's strategy, business opportunities are developed and selected accordingly, even when competition is fierce. For example, although in the information technology (IT) industry, incumbents' proprietary market offerings restrict the development activities of new entrants and limit customer benefits, entrepreneurial activities dominate (Graham & Mowery, 2003, Ziedonis, 2004). Consequently, as competition is a strong reference point, mavericks develop a culture aimed at generating a market offering that differentiates them from the competition. This created uniqueness provides their firms with competitive advantage (Barney, 1986; 1991). As a side effect of creating this viable product or service, mavericks' actions are streamlined early on in the process and facilitate effective decision making, thereby increasing the firm's survival chances in the market.

Second, founders who are highly socially motivated by self-interest, pursue goals such as firm success and profit (Fauchart & Gruber, 2011). These founders can be expected to be adept at mobilizing resources and allocating them carefully based on their goals. Skillful resource allocation is argued to have beneficial effects for entrepreneurial endeavors, especially in the early stages of a venture (e.g. Aldrich & Fiol, 1994; Lounsbury & Glynn, 2001).

Third, with regard to the sub-dimension of identity, self-evaluation, maverick-prone founders tend to be less concerned about accepted norms and practices. They abandon the standardized ways of doing things and adopt new ways of thinking (Sternberg, 1985; Ward, 2004) thereby enhancing the creative space (Amabile, 1996) and opening up new possibilities for entrepreneurial action. This is especially important when entrepreneurship is linked to the promotion of technological change and innovation since entrepreneurs have to overcome (social) boundaries and act in ways that disrupt the market (Schumpeter, 1934). Nonconformity and refusal of accepted practices have been found to have positive influence on organizational innovation (e.g. Shane & Venkataraman, 1996) and firm foundation (e.g. Powell & Sandholtz, 2012; Zhang & Arvey, 2009). A tendency to bend or change the rules of the game can lower exit rates because overcoming entrepreneurial challenges requires new, unconventional ways of thinking and actions beyond what is morally acceptable (Schumpeter, 1975; Brenkert, 2009).

Thus, taken together, I hypothesize that

*Hypothesis 1: Founders with a stronger maverick identity exhibit lower exit rates.*

## **Missionaries**

Missionary-prone founders can be expected to have higher exit rates. Given that society functions as their frame of reference, they aim to develop a market offering with a social impact. However, this can be problematic for various reasons. Past research shows that missionaries tend to target markets that lack business potential since they aim to serve needs for public goods (Weisbrod, 2000) or commercially unattractive customer needs (Nelson & Krashinsky, 1973). Moreover, they pursue missions where public benefit is more important than monetary payback (Austin et al., 2006; Fottler, 1981; Paton, 2003).

Hence, despite the challenges related to creating competitively attractive market offerings, missionaries still pursue their development because these founders are less concerned with the development of a business idea that makes their firm a viable organization, and more interested in generating a market offering that benefits society as a whole.

Second, missionaries' social motivation to improve the world puts them in tension with respect to resource procurement. Since their mission of world salvation is emphasized over profit, resource providers such as potential investors and employees but also customers are hesitant to become involved in missionaries' ventures since the financial returns are in doubt (Herman et al., 1993). This amplifies the liability of newness effects from which young firms typically suffer (Stinchcombe, 1965). For instance, not having affiliates in the early stages is detrimental to the firm's viability because it hampers access to further financial and social capital (Stuart et al., 1999). Consequently, the liability of newness effects are stronger for firms founded by missionaries (Desa & Basu, 2013). Additionally, accessing financial resources can be problematic for missionaries if receiving external funding is contingent on eligibility requirements or external decision makers adjusting the mission (Korosec & Berman, 2006; Brown & Moore, 2001). As noted earlier, strategically accessing and mobilizing resources is a key activity in firm survival, for instance winning key affiliates and securing investment capital (Bruederl et al., 1992, Stuart et al., 1999). However, missionaries are at risk of lacking the tangible and intangible resources to pursue their mission (Desa & Basu, 2013). Moreover, the vision of working towards the greater good can lead to overshoot expectations. Equivalent to the hubris effect (Hayward & Hambrick, 1997), missionaries are prone to misinterpret or unrealistically assess the entrepreneurial situation by ignoring the downsides of their entrepreneurial endeavors such as unattractive target market and lack of opportunities.

Finally, for missionaries' self-evaluation, acting socially responsibly is crucial. Their intention is to make the world a better place, and hence, breaking with rules and norms is against their maxims. Missionaries' moral standards require them to act accordingly even if this limits the scope of their entrepreneurial action. This is because rules cannot comprise all contingencies, and particularly in dynamic, competitive environments such as entrepreneurship, acting outside of the accepted norms, and breaking with the rules are inevitably linked to creativity and are required to generate change and innovation (Brenkert, 2009). However, creativity is strongly associated with opportunity discovery (Baron, 2006) and entrepreneurial action (Amabile, 1997; Ward, 2004), particularly as firm founders typically face unforeseen situations and challenges. Based on these three rationales I posit that:

*Hypothesis 2: Founders with a stronger missionary identity exhibit higher exit rates.*

### **Masterminds**

Founders inclined towards a mastermind identity show lower exit rates for three reasons. First, masterminds' frame of reference is a community to which they feel a belonging. Consequently, market offerings that are created in mastermind firms are targeted at satisfying the needs of the community. Since beliefs and values are shared within a community (Tajfel & Turner, 1979), masterminds are aware of members' requirements and likely have similar demands, and similar problems with existing market offerings like products or services. As a result, when masterminds develop their business ideas, they respond to the community members' needs and problems. Users are an important source of innovation for firms, particularly in relation to the identification of sophisticated needs ahead of a trend, and the development of potential solutions to address those needs (e.g. von Hippel, 1986). Their solutions and entrepreneurial opportunities are



new compared to existing products and services, and exhibit market potential (Lilien et al., 2002). Both aspects can contribute crucially to the firm's viability since they represent important features of sustainable, competitive advantage (Barney, 1986; 1991). The developments generated by individuals associated with communities tend to be innovative, a phenomenon that is evident across several industries and professions including librarians (Morrison et al., 2004), sports equipment industry (e.g. Franke & Shah, 2003), and open software development (e.g. von Hippel & von Krogh, 2003; Alexy & Leitner, 2011). Prior work has shown that their entrepreneurial activities resemble a trial and error process (e.g. Lee & Cole, 2003) that they have potential for firm creation (Shah & Tripsas, 2007). Knowing about user needs and potential technological solutions introduces business-relevant effectiveness into the entrepreneurial process. Masterminds are able at an early stage to develop market offerings that are clearly targeted to a particular group and which can be beneficial to stay in the market.

Second, as masterminds strongly identify with the group and its members' values, supporting and being supported by the community is core to their social motivation. Since they are able to support their fellows in their entrepreneurial activities, masterminds receive reciprocal help from the community. Thus, peers represent a highly valuable network, and the resources of the community are an important source of innovation and prototyping activities (e.g. Franke & Shah, 2003; Lee & Cole, 2003). Since community members can be mobilized to support the development of new market offerings and serve as pilot customers to test products or service features before market launch, masterminds reap substantial benefits for entrepreneurship which increase their efficiency and the firm's viability.

Third, mastermind-prone founders' self-evaluation depends on the extent to which they are able to contribute to their community. Being an asset to the group matters, particularly as being

valued is important for these individuals' self-worth and feeling of belonging (Hogg & Terry, 2000). Hence, masterminds aim consistently to provide their peers with beneficial market offerings in order to win their appreciation; hence, maintaining their business is important for their identity. To achieve this, masterminds thrive to improve their skills and capabilities through learning. In turn, learning, for instance in the form of probing, provides masterminds with important information advantages in relation to technological developments and their viability (Autio et al., 2013). In other words, masterminds learn earlier about the existence and quality of a business opportunity which decreases their exit rates.

*Hypothesis 3: Founders with a strong mastermind identity exhibit lower exit rates.*

## **DATA AND METHOD**

This section describes the empirical setting and the dataset used to test the hypotheses, and introduces dependent and independent variables and methods.

### **Empirical Setting**

Survey data were collected through an online questionnaire administered between May and July 2012 to members of so-called hacker- and makerspaces. Hacker- and makerspaces are communities of individuals who share an interest in technology, computing, science, art and the hacking culture in general, and where free flow of information, transparency, and learning represent core values (Coleman & Golub, 2008). An initial subscription and voluntary fee payments allows access to these communities which typically offer physical workspaces equipped with machinery such as 3D printers, laser cutters, computer numerically controlled machines, and tools such as hammers and saws, for shared use. While these workspaces can be physically located in warehouses, basements, or community centers and facilitate cooperation, socializing, sharing of

ideas and resources, most hackerspaces are represented by virtual collaboration. On joining a hacker- and makerspace, an individual is included in an email distribution list which allows exchange of various information on needs or problems, solutions and ideas related to hacking projects.

Hackers and makers are individuals who engage in development and problem-solving activities, thereby not only modifying the work of others but also creating new solutions, products, services or artifacts (Lang, 2013; Aldrich et al., 2014). These activities are pursued individually, within and across hackerspaces, and typically motivated by curiosity and personal interest, and range from writing code and programming to the development of products, drones, robots, and public performances in association with light installations, music, or fire. Hackers typically are well-educated or are pursuing a degree or higher degree course (Lakhani & Wolf, 2005), and rather than working in organizational hierarchies prefer occupations that allow personal freedom including entrepreneurship (Carlson, 2011).

The context was chosen to investigate the research question because it represents a setting where all the required variables coexist thereby constituting three major benefits. First, hackers and makers engage in diverse kinds of entrepreneurial activities, including but not limited to opportunity discovery and exploitation. This is especially beneficial for an analysis of exit rates, because not all discovered opportunities result in the creation of firms; thus, it is possible to study firm exit conditioned on the transition from opportunity discovery to entrepreneurship.

Second, hacker- and makerspaces are beneficial for investigating identity because their members represent a reasonably homogeneous population that can be observed within a community with distinct boundaries. This allows the collection of data on fairly comparable individuals, whose main values and ideologies are shared and the community norms are institutionalized. A more

diverse community would likely introduce a higher degree of heterogeneity across participants and potentially produce more biased results. This setting offers major advantages to this respect and responds to calls in entrepreneurship research for settings that include entrepreneurs and non-entrepreneurs who are fairly comparable individuals (Shane & Khurana, 2003).

Third, although hackers and makers share some basic features, there is substantial heterogeneity with respect to founder identities. Since the setting represents a particular community of hackers and makers, it is possible to single out differences across identities within the overall community. This allows observation of key aspects of identity that lead to individual differences on different identity dimensions, such as the social motivation underlying their entrepreneurial activity.

### **Data Collection and Final Sample**

An iterative process, and a combination of field observations, interviews and test studies was used to achieve *ex ante* insights into the setting (Brewer, 2000; Barley & Kunda, 2001) and facilitated derivation of an appropriate research design. The survey was designed based on single- and multiple-choice questions, and divided into firm-level and individual-level information including demographics, motivations for hacking, and entrepreneurial engagement. The questionnaire was tested in several offline and online pilots.

The data were collected in three steps. First, the administrator of a worldwide hacker and maker consortium<sup>8</sup> marketed the survey on three social media platforms to gain reliability within the hacker community because the field observations showed that trustworthiness would be a crucial condition for participation in the survey. In the second phase, emails were sent to hacker and makerspaces in the United States, Canada, Australia, New Zealand, and Northern and English and

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<sup>8</sup> This consortium is the biggest conglomerate of hacker and makerspaces worldwide and was thus, selected for this study

German speaking Europe. The spaces were selected based on a) their registered status (active or non-active), b) their accessibility, c) their website claims about their purpose and intentions, d) their conditions of membership. Emails were sent to 392 communities and community organizers asking for the survey to be distributed across the spaces. Among these communities, 5.86% could not be reached, leaving 369 hacker and maker spaces; reminders were sent after 10 days.

Imposition of a response time window of 7.5 to 90 minutes on the 2948 clicks of individuals registered on the survey platforms, produced a final sample of 678 respondents. This time window was chosen based on response time measured in the pilot surveys. Respondents not meeting these requirements were assumed to have visited the platform out of curiosity and were excluded from the analyses.<sup>9</sup>

For the investigation of entrepreneurial identities, the final data set includes individual- and firm-level information including firms' market entry and exit dates. In the final sample, 76.6 percent of individuals work on developments related to information technologies, and 43.8 percent of individuals have firm founding experience. In terms of demographics, the sample is characterized by a mean age of 32.9 years, and an overrepresentation of males (498 male versus 57 female respondents) and singles with a 39.52 percent rate.

To check the representativeness of the final sample, various tests were conducted with respect to the demographic dimensions of age and gender as well as the distribution of respondents across hackerspaces and regions. The final sample appears to correspond to the characteristics of the overall community and with research in similar settings (e.g. Lakhani & Wolf, 2005; Jeppesen & Lakhani, 2010). Although, the distribution of the entrepreneurship rate across regions is in line

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<sup>9</sup>This choice was investigated by relaxing the minimum time threshold to 8.5 minutes and 10 minutes but keeping 90 minutes as the maximum time. An individual taking more than 90 minutes would seem to indicate gaps in responding which could bias results. With both alternative specifications, the main results hold.

with the Global Entrepreneurship Monitor (GEM) 2013 report (Amoros & Bosma, 2014), there is indication that hackers and makers have a higher proclivity for entrepreneurship than the general population, which suggests that the findings may not reflect a representative individual. The results did not change for the checks for potential bias based on hackerspace affiliation or region.

## **Measures**

### ***Dependent variable***

The dependent variable exit, is a dummy variable that takes the value 0 if the firm did not exit the market within 3 years and 1 otherwise. In this study, exit relates to closure of the business (Yang & Aldrich, 2012). The exit variable was generated based on the questions “When did you (co-) found your most recent company?” and “When did you close down your most recent company?”. Consequently, there is no strong reason to believe that the variable would capture an exit route other than business termination, for instance exit through buyout.

### ***Explanatory variables***

To generate the explanatory variables, I follow prior work in entrepreneurship research and use previous studies as conceptual guidelines to create and mark the domain of these variables (e.g. Brown et al., 2001). Founder identity is based on three sub-dimensions (Brewer & Gardner, 1996) which provided guidelines to generate the scales of the founder identity variables. I conducted principal component factor analyses to operationalize the variables based on the underlying three-dimensional structure of: a) basic social motivation, b) self-evaluation, and c) frame of reference. Hence, each factor analysis was based on three survey items, one item for each aspect of identity. In this way, overall nine questions, which were measured on a Likert scale from 1 (“Strongly disagree”) to 7 (“Strongly agree”), were used for the factor analyses supplemented by the application of the Kaiser (1960) criterion and varimax rotation.

Each factor represents a founder identity variable, 1) maverick identity, for rather reckless founders with an affinity for competitive behavior, 2) missionary identity, for founders engaging in entrepreneurship primarily in order to make a contribution to society, and 3) mastermind identity, for more curious, community-oriented founders active in problem-solving. Importantly, these are not mutually exclusive categories. In this respect, the operationalization of identities departs from Fauchart and Gruber’s original founder identity typology (2011) and refers specifically to their additional finding that beyond pure types, identities can blend in the sense that so-called hybrid identities can occur. To explore this remarkable finding, allowing more degrees of freedom is crucial and therefore, in the present study scales representing a continuum along which individuals can vary, are applied. Using factor analysis to create the variables is particularly beneficial because it increases our understanding of the cross-correlations with multiple variables in the data set. An overview of the items used per identity dimension is presented in Table 1, descriptive statistics and factor loadings are presented in Table 2.

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Insert Tables 1 and 2 about here  
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***Control variables***

The control variables are basically categorized as individual or firm and industry-related.

***Individual level controls***

Identity is associated with actions, beliefs, and motivation (Hogg & Terry, 2000). Thus, individuals’ particular goals and the motivations that drive their entrepreneurial actions might be relevant for an analysis of different types of identity. The dummy control variable *goal orientation* is generated based on the question “I am someone who is motivated by goals” taking the value 1 for

“Strongly agree”, “Agree” “Weakly agree” and 0 for “Strongly disagree”, “Disagree” and “Weakly disagree” and “Neither nor”.

The controls for extrinsic motivation and intrinsic motivation were created based on factor analysis capturing whether the individual engages in entrepreneurial-related activities based on an inherent interest in the activity itself, or based on external, outcome driven expectations. Internal consistency measured by Cronbach’s alpha is high for extrinsic motivation (alpha= 0.729) and poor for intrinsic motivation (alpha= 0.478).

With regard to the particular context, individuals’ participation and interest in gaining reputation matter (e.g. Roberts et al., 2006). Thus, the dummy variable, contribution, measures whether or not the individual actively participated in the community, and *reputation* is operationalized based on the question “I hack because I want to enhance my reputation/status in the community” (taking the value of 1 for “Weakly agree”, “Agree”, “Strongly agree” and 0 for “Strongly disagree”, “Disagree”, “Weakly disagree”, “Neither nor”).

Furthermore, innate personality traits can play a role in individuals’ identity with respect to the groups to which they feel a belonging (Weber et al., 2011; Sibley & Duckitt, 2008). Thus, the analysis also includes dimensions of the five-factor model of personality (Costa & McCrae, 1992). This study applies a short scale to measure dispositions (Donnellan et al., 2006), which is in line with prior work in management, (e.g. Grant & Berry, 2012). Since conscientiousness, agreeableness, and openness to experience are relevant in entrepreneurship studies (e.g. Zhao & Seibert, 2006), these three dimensions are included in the analysis. Principal component factor analysis allows exploration of the questions’ factor loadings into the distinct dispositions, supplemented by application of the Kaiser (1960) criterion and varimax rotation. The Cronbach’s alphas for the personality traits - agreeableness (alpha= 0.785), conscientiousness (alpha= 0.620)



and openness to experience ( $\alpha=0.647$ ) - suggest acceptable to good levels of internal consistency.

With respect to the ongoing debate over whether disposition and identity are stable over time, the analysis includes the control *growth mind*. This variable captures whether individuals have a fixed mindset reflecting their belief in stable, innate abilities (taking the value 0) or a growth mindset represented by their belief that they can change in the sense that abilities and characteristics can be developed (taking the value 1) (Dweck 1999; 2006; Grant & Dweck, 2003). To construct this variable, survey items from social psychology were adapted. The variable is based on factor analysis of the following three, relative measurements “If I knew I wasn’t going to do well at a task, I probably would not do it even if I might learn a lot from it.”, “I sometimes would rather do well than learn a lot” and “It is much more important for me to be challenged than it is to demonstrate my intellectual ability” ( $\alpha=0.50$ ).

Since creativity can influence occupational performance, particularly in entrepreneurial settings (Amabile, 1997; Amabile et al., 2005), the factor is included as a control variable, and generated based on factor analysis with Cronbach’s alpha of 0.77 indicating a good level of internal consistency.

Age affects entrepreneurship, both in its linear and curvilinear forms (e.g. Dunn & Holtz-Eakin, 2000, Oezcan & Reichstein, 2009) and is included in the present analysis as mean *centered age* and [*mean centered age*]<sup>2</sup>.

In line with prior work, demographic dummy variables such as gender (with 1 indicating *female*), being in a relationship (*married/relationship*) and *children* are also included (e.g. Dunn & Holtz-Eakin, 2000; Sørensen 2007). Moreover, the binary variable *occupation enjoyment* which

captures whether the sample individuals enjoy their occupation has been included due to potential effects of the variable on firm exit rates.

#### *Firm and industry level controls*

With respect to the firm- and industry-related factors, the variables *disrupt* and *IT industry* are used to investigate whether the entrepreneurial activity is in the IT area, and whether founders were faced with disruption (technical and commercial). In particular, the years of the dot.com boom that began in 1997 and burst in 2000 and 2001, were challenging for new ventures. Adapted from prior work, the variable *disrupt* is included; it takes the value 1 for firms founded after 1997 (Eesley & Roberts, 2012) and 0 if the firm was founded before 1997 or after 1999.

Since firm size, in particular the size of human capital matter with regards to firm survival (Bruederl et al., 1992; Geroski et al., 2010), the variables *firm size* (measured as number of employees) and *team size* (measured as number of cofounders) are part of the analysis.

In order to single out regional effects, the regression includes a control *region* for whether or not entrepreneurial activities take place within or outside the Anglo-Saxon regions.

Finally, the *inverse mills ratio* is included in the main equation to account for potential selection as explained in the following section.

## **Method**

Investigating entrepreneurial exit given a specific time period involves two major econometric considerations. First, it requires a methodological approach that models appropriately the time perspective of the analysis based on the specifics of the data used. Second, with regard to entrepreneurial exit which is conditioned on transition to entrepreneurship, the analysis needs to account for potential attrition bias.

#### *Discrete time duration model*

Since the first three years are crucial in a venture's life, and interesting when examining exit rates (e.g. Bruederl et al., 1992), this time span was chosen for the analysis. Consequently, I used the dependent variable to expand the data based on a three-year window thereby creating a longitudinal dataset. In line with prior work it was possible to reshape the data in a way that each firm gets as many data points assigned as there are time intervals at risk of the event (exit) occurring for each firm (Jenkins, 2005). As a result, the data available are grouped into discrete time periods (per year), with a maximum of three years observation span. In other words, entrepreneurial exit is observed based on discrete time spells with differing start and end dates. This allows application of discrete time duration models to analyze firms' hazard of entrepreneurial exit based on a three-year observation time span. As a standard feature, I included time fixed effects for the years of analysis to allow an investigation independent of time effects.

It is important to note that the survey was accomplished in 2012. Hence, no accurate information is available on the actual survival time of those firms that were still in operation at the end of this survey period. Thus, potential right censoring may occur because although a firm might appear active in the dataset, it is unclear whether it survived or entrepreneurial exit was not observed. This issue has been accounted for by disregarding all observations for firms that have a founding date later than 2009.

#### *Correction for attrition bias*

The second main challenge of this study is that the investigation of survival might suffer from attrition bias. Becoming an entrepreneur is an active choice and not randomly assigned. Hence, survival may ultimately be rooted in the propensity to establish the firm. As a consequence, the econometric approach needs to consider that there might be potentially bias related to this selection effect. To account for this effect, the conducted analysis is organized in two steps

following the directions prescribed for a Heckman selection specification. This approach dictates the inclusion of the inverse mills ratio which is designed to account for the potential selection bias in the sample (Heckman 1979). The study therefore first examines the individual's decision to transition to entrepreneurship and second, investigate exit conditional on the decision to enter. The first stage uses a probit model to explain the likelihood of becoming an entrepreneur represented by the following equation:

$$\begin{aligned}
 &\text{Prob}(\textit{transition to entrepreneurship} = 1) \\
 &= \Phi(\beta_0 \textit{ constant} \\
 &+ \beta_z \textit{ opportunity implementation} \\
 &+ \beta_1 \textit{ maverick identity} \\
 &+ \beta_2 \textit{ missionary identity} \\
 &+ \beta_3 \textit{ mastermind identity} \\
 &+ \beta_{4-22} \textit{ individual related control variables}) .
 \end{aligned}$$

This regression includes an instrument ( $\beta_z$ ) as well as the explanatory variables from the main equation ( $\beta_{1-3}$ ) and finally the individual-related control variables ( $\beta_{4-22}$ ). To construct the individual's decision to become an entrepreneur the question "How many companies have you founded or co-founded over the course of your lifetime?" was used to create a dummy variable indicating firm foundation with the value 1 (and 0 otherwise).

#### *Instrumentation and main equation*

The Heckman specification dictates the use of an instrument that explains the transition to entrepreneurship, but which is not correlated with the error term of the main equation. This study uses *opportunity implementation* as an instrument. The variable is based on respondents' self-

reported numbers of new products, services, trademarks, patents (or applications), publicly performed plays, exhibitions, music compositions or novels that have been implemented based on developed opportunities, or “hacks” to use context-related terminology. The variable is operationalized by a dummy variable that takes the value 1 if opportunities have been implemented and 0 if not. The reasons to apply opportunity implementation as an instrument for the present research are threefold.

First, entrepreneurship in the sense of business formation is acknowledged to be inevitably linked to opportunities (e.g. Shane & Venkataraman, 2000; Shane, 2001; Sørensen & Sorenson, 2003; Baron, 2006).

Second, the instrument captures three opportunity forms because this corresponds to the opportunity types described in the entrepreneurship literature as “problem solving”, “technology transfers”, and “dreams”, and which are separate from “business formation” (Ardichvili et al., 2003, p.117). Accordingly, these opportunity forms are independent of whether they reflect an identified market need or incorporate a solution to address that need, thereby suggesting that they may be associated with entrepreneurship but do not tell anything about the firm’s performance. Hence, since they are independent of value creation capability, it is reasonable to assume that they may be associated with firm foundation but do not by default indicate the viability of the business and hence that this instrument is uncorrelated with the error term of the main equation of the investigation.

Third, these implementation forms correspond with both the empirical context and the founder identities considered, since the opportunities share basic characteristics with the factors attributed to these identities. For instance, research states that opportunity development with respect to “problem solving” aims to create new products or services that satisfy a market need, while

“dreams” is associated with advancing a cause such as pushing “proprietary knowledge in a new direction” whereby the value of opportunities is unknown (Ardichvili et al., 2003, p.117). Given the conceptual and contextual match, opportunity implementation appears to be a reasonable instrument as it suggests to be linked to firm foundation but not to firm survival.

The cumulative density probabilities as well as the normal density probabilities are extracted from the first stage regression and are used as inputs in the calculation of the inverse mills ratio which is plugged into the second stage regression. The second stage is a standard discrete duration model using a logit specification. It may be represented by the following equation:

$$\begin{aligned}
 & \text{Log}(\text{Exit} = 1) \\
 & = \Phi(\beta_0 \text{ constant} \\
 & + \beta_1 \text{ maverick identity} \\
 & + \beta_2 \text{ missionary identity} \\
 & + \beta_3 \text{ mastermind identity} \\
 & + \beta_{4-28} \text{ individual-, firm/industry- and time related control variables} \\
 & + \lambda_1 \text{ Inverse Mills Ratio}).
 \end{aligned}$$

### ***Robustness checks and model fit***

Several tests were conducted to test for potential biases and model validity. First, collinearity diagnostics were conducted including the investigation of the variance inflation factor and tolerance. The analysis does not exhibit any indication of multicollinearity, with variance inflation factors below 5.

Second, since heteroskedasticity can cause potential bias in the standard errors, the Huber-White sandwich technique was applied in both stages to correct the regressions. Third, to test the

appropriateness of the econometric model specification selected in the second stage, a Hosmer and Lemeshow's (2000) goodness-of-fit test was conducted. The resulting high p-value and relatively small chi-square values (Prob > chi2: 0.149 and Hosmer-Lemeshow chi2: 12.04) indicate that the predicted and observed frequency match closely, suggesting that the model applied fits the data well. Performing the Hosmer and Lemeshow's goodness-of-fit test in the first stage indicates that also the Heckman model is appropriate for the data (Prob > chi2: 0.612 ; Hosmer-Lemeshow chi2: 6.32).

Fourth, to check for the strength of the instrument, the first stage of the Heckman specification is used for investigation. The high significance suggests that the instrument is not weak and hence is appropriate for its purpose.

Overall, none of the tests indicates problems with regard to multicollinearity, robustness, or appropriateness of the model specifications. Tables 3 and 4 summarize the descriptive statistics and correlation coefficients for all the variables in both stages.

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Insert Table 3 and 4 about here  
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**RESULTS**

Table 5 presents the results of the four models testing the hypotheses in a stepwise approach. Model 1 exhibits the first stage, the Heckman selection specification including the instrument, explanatory and a subset of the control variables. Models 2 to 4 introduce sequentially the results of the discrete time duration models for a three year time period specified in logit regressions. Model 2 shows the effects of the individual related control variables including the inverse mills ratio on the hazard of entrepreneurial exit after three years. Model 3 includes in

addition the firm and industry related control variables. Model 4 introduces the explanatory variables maverick, missionary and mastermind identity and contains all the effects that are hypothesized in this chapter.

The Heckman specification in Model 1, performed by probit regression, shows that opportunity implementation is highly associated with the transition to entrepreneurship. This suggests that individuals who have already implemented an opportunity (“hacks”) in the form for instance a product or service, are more likely to become entrepreneurs.

Hypothesis 1 stating that individuals with a stronger maverick identity exhibit lower exit rates is not confirmed. As shown in Model 4, maverick identity and entrepreneurial exit are negatively associated but not significantly.

Hypothesis 2 states that founders with a stronger missionary identity demonstrate higher hazards of entrepreneurial exit. In support of the hypothesis, Model 4 presents the positive significant effect of the missionary variable on entrepreneurial exit indicating that ventures founded by missionaries have higher propensities to exit the market.

The analysis also supports Hypothesis 3, that a stronger mastermind identity is negatively associated with the hazard of entrepreneurial exit. The mastermind identity variable exhibits significantly negative association with entrepreneurial exit.

The significant negative mastermind variable in the Heckman regression in Model 1 also suggests that individuals’ propensity for mastermind identity inhibits transition to entrepreneurship. This suggests that individuals with high scores on mastermind identity are less likely to become entrepreneurs but if they do so, they are more likely to survive (the analysis shows lower hazards of exit). These findings highlight the importance of modeling entrepreneurial exit conditioned on the



transition to entrepreneurship since the effect of the mastermind variable might otherwise suffer from bias.

Model 1 also shows that creative individuals are more likely to become entrepreneurs; individuals with a growth mindset seem to be predisposed to transition to entrepreneurship. Being an entrepreneur and the enjoyment of occupation also show a positive association. While being extrinsically motivated has a positive effect on the transition to entrepreneurship, being intrinsically motivated seems to inhibit the transition.

Model 4 highlights other determinants of entrepreneurial exit. While both location in the Anglo-Saxon region and firm foundation during the years of disruption increase the hazard of entrepreneurial exit, being a parent seems to have the opposite effect.

#### *Supplementary Analyses*

Several supplementary analyses were conducted to test the robustness of the results (see Table 6). First, I ran the analysis on a sub-sample of recent entrepreneurs with firm foundations in 2005 and later. After applying the same procedure of the two-stage Heckman specification to measure firm exit at the three year threshold, Model 5 shows that the results are even stronger than expected and that I underestimated the effects of identity in the main analysis. All the hypotheses are supported since both masterminds and mavericks have a negative and highly significant association with firm exit ( $p < 0.01$ ) while the missionary variable is positively linked to firm exit ( $p < 0.05$ ).

Additionally, Model 5 shows that the variables creativity and intrinsic motivation are positively and significantly linked to firm exit. In contrast, the personality trait agreeableness and having children are negatively related to firm exit.

Second, to rule out the possibility that the results are a by-product of model choice, I consider time to be continuous, and apply a Cox (1972) proportional hazard model (Jenkins 2005). As shown in Model 6, the results are similar to the findings from the main analysis (Model 4 Table 5). This suggests that the results are robust independent of model selection.

The final supplementary analysis aims to take into account of whether the identity effect is rather short than long term by examining firm exit at a five year threshold, as shown in Model 7. Since over a half of new ventures exit the market by the fifth year after foundation, as for example reported by Levie and colleagues (2011), this time span was chosen to test the hypotheses further. The supplementary investigation was conducted following the procedure described in the main analysis including data expansion based on a five year period and the two stages, a Heckman specification and a discrete time duration model. With respect to the five year threshold, all observations for firms founded later than 2007 were disregarded to avoid censoring issues. Model 7 shows that all the explanatory variables point in the direction as hypothesized but only the association with the mastermind variable holds significantly as predicted. One explanation for these findings might be that identity effects are stronger in the upper tail of the hazard ratio distribution (higher rates of exit) and that identity matters less on lower rates of exit. In other words, those study subjects that are left in the distribution exhibit less variation, and consequently, identity becomes less important. More detailed explanation of these findings is provided below.

Further results in Model 7 show that openness to experience, reputation, gender, being in a relationship, disruption, and Anglo-Saxon region, increase the likelihood of exit, while having children decreases the likelihood of exit.

Finally, all models show significant results for age, either mean-centered or the squared term. The significance of the inverse mills ratio variable across all models suggests that the

Heckman specification is the appropriate methodological procedure for all three supplementary analyses.<sup>10</sup>

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Insert Tables 5 and 6 about here  
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## DISCUSSION

The findings of this study indicate that founder identities affect firm exit in different ways. Specifically, founders that are more community oriented, active in problem-solving and learning (i.e. mastermind identity) are negatively associated with firm exit while the opposite effect is found for founders that are more eager to contribute to the world (i.e. missionary identity). In particular, the supplementary analysis on a sub-sample of recent firm foundations supports all the hypotheses suggesting that both maverick and mastermind identities are highly significantly and negatively associated with firm exit, and that missionary identities show the opposite effects.

The results support research on firm exit by investigating business termination from a founder identity perspective as grounded in social psychology. This research line suggests that firms are an expression of the founders' identities, and since values, beliefs, and actions are consistent and confirm identity, the firm's strategic actions are inevitably linked to the founder (Hogg & Terry, 2000; Fauchart & Gruber, 2011). The present study extends this view by theoretically intertwining aspects of identity and core decisions in entrepreneurship to theorize how

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<sup>10</sup> In a fourth, altered model I included a control for revenues accumulated in the first 2 years after foundation to analyze firm exit based on the three year window. The effects are significant and as hypothesized for mavericks and masterminds indicating that these founder identities are negatively associated with firm exit independent of firm revenue. The missionary identity variable shows a negative significant association with exit and is hence in full contrast to the hypothesis. This indicates that if revenues are held constant, also missionaries are less likely to exit. However, due to data restrictions, this analysis is based on only 29 observations which can be problematic in terms of the stability of the findings.

exit rates, like firm strategy, vary based on identity. Moreover, by conceptually and methodologically applying the notion of founder identity as a dimension along which individuals can vary, the study acknowledges that in most industry settings, hybrids rather than pure identity types prevail and are likely to increase in the future (Fauchart & Gruber, 2011).

In addition, the supplementary analyses contribute to the ongoing debate on whether identity is stable over time. While the maverick variable loses significance in the full sample, all the hypotheses are strongly supported by using a sub-sample of recent firm foundations. The consistent findings for missionaries and masterminds confirm previous research by implying that these two founder identities are particularly well developed and that actions are tightly intertwined with identity (Fauchart & Gruber, 2011).

Moreover, the negative association between mastermind identity and the transition to entrepreneurship in the first stage of the empirical analysis, complements work on social identity and user entrepreneurship. Research on user entrepreneurship suggests that users become entrepreneurs by accident, in the sense that venture creation is often not the intention when they alter existing market offerings or generate new products. Instead it is the exposure of the innovation to the public that may initiate the idea of commercializing the innovation by starting a firm (Shah & Tripsas, 2007). For community-oriented individuals such as masterminds however, it appears to be particularly important to be in line with community values which typically incorporate free information exchange and free usage of the innovation developed, as in communities related to sports equipment (e.g. Shah, 2000) and open software developments (von Hippel & von Krogh, 2003; O'Mahony, 2003). In these communities, public exposure is also used, but on purpose in the sense that innovation-related information is publicly revealed in order to prevent third parties from appropriating the innovation. This corresponds to prior work showing that in order to guarantee

benefit from the innovation for everyone outside the typical corporate appropriation regimes, other forms than firm foundation are typically used to protect the works of community members, for instance transfer of knowledge into non-profit foundations (O'Mahony, 2003). Moreover, it is consistent with the notion that large corporations and communities may have contrasting rationales for their existence thereby putting their interactions in tension, and rendering some relationships parasitic (Dahlander & Magnusson, 2005).

This would suggest that exploiting a development generated within a community in the form of firm foundation rather contrasts with community values. Hence, firm foundation may be depreciated and even stigmatized, and considered as "joining the other side". Accordingly, from a social identity point of view, a community member's transition to entrepreneurship represents atypical behavior and deviance from the group. Along these lines, past research implies that in becoming an entrepreneur, founders lose their feeling of belonging to the group, which is a drawback – the so-called "dark side of entrepreneurship" (Sheperd & Haynie, 2009).

However, the finding related to the negative link between a mastermind identity and firm exit once the transition to entrepreneurship has been made, extends this view and is consistent with the "overachiever" argument (Marques, 1990; Wann et al., 1995). In line with this argument, individuals deviate in a positive way as they become "highflyers" in the group (Hogg & Terry, 2000). Since masterminds serve the community with useful market offerings, they turn into highly valued, and therefore appreciated members of the group which feeds their feeling of belonging. Hence, masterminds who become entrepreneurs face a rather "bright side of entrepreneurship" which strengthens their community-oriented identity.

Furthermore, the findings of the supplementary analysis to check short versus long term effects of identity suggest several possible explanations. First, the significant negative association

of the mastermind variable with firm exit given a five year window, provides strong grounds for the assumption that the mastermind identity is stable within a long term perspective. This suggests that user-innovators may create firms indeed “accidentally” (Shah & Tripsas, 2007) but that these firms have higher survival chances within a long term perspective.

Second, the loss of significance for maverick and missionary might indicate that these identities are more inclined to take professional teams on board within the first few years of firm foundation. While masterminds draw on their community to access resources, i.e. development support or management advice, mavericks and missionaries may need to involve external professionals to mobilize relevant human or financial capital, for instance technical experts and managers. At the same time, professionals are likely to act in ways that are consistent with the norms and routines of their professional field (e.g. DiMaggio & Powell, 1983; Colyvas & Powell, 2006). Hence, if a professional team takes over, the firm will pursue actions and strategies in line with the team and it can be assumed that the original founder’s identity and his or her actions will matter less over time.

Finally, these findings contribute to the literature on opportunity identification and development (Shane & Venkataraman, 2000; Baron, 2006). As noted earlier, it might be that some identities matter primarily in the upper tail of the distribution when exit rates are high. Once the identities with high likelihoods of exit are “removed”, there might be a substitution effect between the identity and the quality of the opportunity. In other words, over time, only high-quality opportunities will be left in the market. These opportunities may have been high quality from the start (and not influenced by a less survival-likely identity) or may have been successfully transformed so that their quality has improved over time. These effects seem to apply particularly to

for the mastermind identity since the negative association with firm exit is significant and stable in all the analyses.

### **Implications for research**

Users have been considered important sources of innovation (e.g. von Hippel, 1986; 2005), and examples of innovative developments span industries including sports equipment (e.g. Baldwin et al., 2006), juvenile products (Shah & Tripsas, 2007), and medical devices (Lettl et al., 2008). At the same time, we know that innovation and entrepreneurial action are strengthened through community interaction (Franke & Shah, 2003; Autio et al., 2013). The present study is in line with the notion that hacker- and makerspaces may represent potential infrastructures for users and thereby decrease the barriers to innovation and entrepreneurship (Aldrich et al., 2014). By providing online and physical spaces - often equipped with tools and machinery - hacker- and makerspaces enable opportunity development and facilitate entrepreneurship. Moreover, the study implies that particular identities with close links to these communities can benefit greatly in relation to the various activities involved in the entrepreneurial process including firm survival. The prevailing values of sharing and collaboration are highly beneficial for entrepreneurship because they promote development of business ideas, prototyping, and access to first customers. This phenomenon is interesting from a technological and an institutional perspective, and has interesting implications for research on entrepreneurship and innovation and resource dependency.

### **Implications for practitioners and society**

This study is relevant to practitioners because it shows that masterminds in particular, develop valuable business opportunities that are not always commercially exploited. Venture

capitalists and managers can benefit from this insight as these business ideas can be skimmed from the market to become the foundation for new ventures and to foster inorganic growth and innovation in corporations. Also, awareness of the positive relationship between a missionary identity and firm exit is helpful for practitioners deselecting among ideas for entrepreneurship. Moreover, this study can help to use identity as an instrument to apply a particular strategy. For instance, being aware that founders apply identity distinct strategies, and knowing that for instance a founder has a proclivity for the missionary identity may be helpful alter the strategic directions accordingly.

Finally, the study increases our understanding of the different identities and social motivations behind hacking. The term “hacker” suffers from negative connotations with criminal attacks and encroachments. This study, and especially the field work in preparation for the study design, suggests that this notion of the hacker as an individual that illegally breaks into security systems may be one aspect of term. The notion of hacker also includes individuals that legally alter existing products and services and develop new ideas with innovation potential. The present study appears to be the first attempt to empirically analyze these identities and highlight their importance for entrepreneurship, innovation, and society.

### **Limitations and Future Research**

A natural concern in terms of limitations refers to the generalizability of the study’s findings. The particular context of hackers and makers raises questions about the extent to which the results can be generalized to other groups, entrepreneurs, or individuals. This setting is specific in the sense that collaboration is the baseline, and hence, the results might be less informative in contexts where interaction and collaboration are less important. However, researchers from various



disciplines have analyzed individuals' identities and the impact on firm characteristics (e.g. Hambrick & Mason, 1984; Whetten & Mackey, 2002), as well as the influence on market structure and economic development, based on other specific contexts, such as microbreweries (Carroll & Swaminathan, 2000), windmills (Sine & Lee, 2009), and radio stations (Greve et al., 2006). It should be noted that similarities across fields are evident, and research confirms the influence of missionary identities (e.g. Whetten & Mackey, 2002) or individuals with a more community oriented identity (e.g. Sine & Lee, 2009, Fauchart & Gruber, 2011). The field of entrepreneurship has benefitted crucially from these studies as they have increased our understanding of why and how different identities pursue entrepreneurial activities. Hence, there is no strong reason to believe that the present results would not hold in different settings, in particular in settings where innovation and entrepreneurial activities are in place, for instance think tanks or corporate R&D labs. Previous research has highlighted the importance of using appropriate settings that include non-entrepreneurs comparable to entrepreneurs in order to analyze entrepreneurship on the individual level (Shane & Khurana, 2003). The specific setting of hackers and makers includes entrepreneurs and non-entrepreneurs and thus is beneficial since it allows us to observe and disentangle the effects of different identities in a closed context with comparable individuals to reduce unobserved heterogeneity.

Furthermore, previous research on entrepreneurial survival points out that founders have different performance thresholds that can alter exit rates independent of economic reasons (Gimeno et al., 1997). The present study takes this consideration into account and disentangles the identity effects by keeping several survival-related factors constant including industry and firm variables such as firm and team size, as well as time fixed effects. In a supplementary analysis I controlled

for performance, i.e. revenue, and found support for the maverick and mastermind effects. However, the findings suggesting that all three identities increase the likelihood of firm survival has limitations since the analysis is based on only 29 observations. Future research could address this by analyzing in more detail the revenues or profits of firms, over a longer period of time, based on a larger sample size.

There are opportunities for future research with respect to the cross-sectional set up of the current study's data. It would be useful to examine more closely firm performance measures and how they relate to different community networks and the quality of their support.

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**TABLE 1 Dimensions of Identity and Variance in Meanings for Mavericks, Missionaries and Masterminds**

Identity dimension	Maverick		Missionary		Mastermind
	Self-interest and risk		Promote ideas and pursue visions	Variance in meanings	
Survey item	I am someone who takes chances		I am someone who builds castles in the sky		I hack because I think it is important to solve problems/bugs or add new features
Basis of self-evaluation	Refusing to be bound by, accepted beliefs, customs, or practices.		Concern to responsibly act upon social wrongs		Learning to be able to bring benefits to the community
Survey item	I am someone who is a nonconformist		I am someone who questions social norms, truisms, assumptions		I hack because I want to learn new things
Frame of reference	Competition		Society		Community
Survey item	I hack because I dislike proprietary products and I want to defeat them		I hack because I feel a personal obligation to contribute to the world		I hack because I feel a personal obligation to contribute to my hacker community

**TABLE 2 Descriptives and Factor Loadings for Mavericks, Missionaries and Masterminds**

	Questions	Mean	STD	Rotated factor loadings				Cronbach's alpha
				Factor	Uniqueness	Variance	Proportion	
Maverick	I am someone who takes chances	5.27	1.22	0.61	0.63			
	I am someone who is a nonconformist	5.12	1.38	0.81	0.34	1.41	0.47	0.41
	I hack because I dislike proprietary products and I want to defeat them	4.64	1.80	0.62	0.62			
Missionary	I am someone who builds castles in the sky	4.76	1.53	0.66	0.56			
	I am someone who questions social norms, truisms, assumptions	5.8	1.24	0.75	0.44	1.44	0.48	0.45
	I hack because I feel a personal obligation to contribute to the world	5.35	1.44	0.66	0.56			
Mastermind	I hack because I think it is important to solve problems/bugs or add new features	5.68	1.24	0.76	0.42			
	I hack because I want to learn new things	6.55	0.80	0.68	0.54	1.59	0.53	0.54
	I hack because I feel a personal obligation to contribute to my hacker community	5.02	1.47	0.74	0.45			

**TABLE 3 Descriptive Statistics and Correlation Coefficients for Variables in First Stage, Probit Regression (N=646)**

Variables	Mean	STD	1	2	3	4	5	6	7	8	9	10	11
1 Entrepreneur	0.433	0.496											
2 Opportunity Implementation	0.313	0.464	0.246										
3 Maverick	0.0430	0.997	0.129	0.132									
4 Missionary	0.0542	0.980	0.146	0.161	0.514								
5 Mastermind	0.091	0.904	-0.038	0.057	0.164	0.362							
6 Creativity	0.084	0.933	0.221	0.188	0.353	0.413	0.212						
7 Extrinsic Motivation	-0.001	1.018	0.107	0.115	0.053	0.179	0.283	0.147					
8 Intrinsic Motivation	0.097	0.894	-0.029	0.030	0.180	0.223	0.339	0.220	-0.010				
9 Openness to experience	0.067	0.972	0.165	0.103	0.182	0.233	0.069	0.443	-0.043	0.123			
10 Agreeableness	0.040	1.002	-0.006	-0.055	0.038	0.175	0.222	0.140	0.076	0.107	-0.059		
11 Conscientious-ness	0.001	1.024	0.008	0.065	-0.042	-0.085	0.002	0.028	0.042	-0.075	-0.003	0.001	
12 Growth mind	0.000	1	0.139	0.039	0.209	0.218	0.172	0.204	-0.040	0.203	0.236	0.145	0.017
13 Goal oriented	0.759	0.428	0.034	0.014	0.083	0.173	0.174	0.168	0.182	0.108	0.087	0.101	0.144
14 Reputation	0.560	0.497	0.007	0.079	0.053	0.153	0.282	0.065	0.427	0.133	-0.064	-0.001	-0.015
15 Contribution	0.920	0.272	0.052	0.077	0.042	0.041	0.086	0.050	-0.001	0.189	0.059	0.047	-0.039
16 Mean centered age	-0.346	9.414	0.260	0.120	0.008	0.011	-0.051	0.134	0.017	-0.016	0.141	-0.117	0.005
17 (Mean centered age)2	8.861	1.600	0.098	0.066	-0.022	-0.015	0.017	0.070	0.054	0.028	0.044	-0.093	-0.013
18 Occupation enjoyment	0.639	0.481	0.091	0.117	-0.014	-0.005	0.055	0.036	0.023	0.128	-0.029	0.082	0.049
19 Female	0.230	0.422	-0.049	-0.021	0.020	0.033	0.003	-0.102	0.012	0.016	-0.115	0.049	-0.038
20 Married/ Relationship	0.437	0.496	0.118	0.059	0.018	0.032	-0.021	0.127	-0.052	0.034	0.088	0.001	0.000
21 Children	0.180	0.384	0.144	0.085	0.014	-0.009	-0.013	0.131	0.013	0.045	0.098	-0.073	-0.052
22 Region	0.574	0.495	0.203	0.095	0.058	0.118	0.008	0.300	0.172	0.147	0.153	-0.003	0.018
			12	13	14	15	16	17	18	19	20	21	22
12 Growth mind													
13 Goal oriented	0.059												
14 Reputation	-0.088	0.142											
15 Contribution	0.023	0.006	-0.010										
16 Mean centered age	0.011	0.015	-0.054	-0.0600									
17 (Mean centered age)2	-0.044	0.069	-0.019	-0.003	0.594								
18 Occupation enjoyment	0.083	0.096	0.023	-0.009	-0.006	0.016							
19 Female	-0.050	-0.052	0.063	-0.095	-0.071	-0.149	-0.063						
20 Married/ Relationship	0.047	0.081	-0.038	-0.015	0.286	0.138	0.076	-0.171					
21 Children	0.028	0.076	0.024	0.020	0.502	0.310	0.041	-0.170	0.426				
22 Region	0.137	0.107	0.089	0.137	0.220	0.093	-0.008	-0.064	0.108	0.183			

**TABLE 4 Descriptive Statistics and Correlation Coefficients for Variables in Second Stage, Logistic Regression (N=547)**

Variables	Mean	STD	1	2	3	4	5	6	7	8	9	10	11	12		
1 Exit	0.080	0.272														
2 Maverick	0.181	0.920	-0.047													
3 Missionary	0.100	0.932	-0.018	0.588												
4 Mastermind	-0.007	0.910	-0.075	0.195	0.205											
5 Creativity	0.298	0.922	-0.063	0.363	0.394	0.342										
6 Extrinsic Motivation	0.046	0.950	-0.050	0.024	0.165	0.227	0.060									
7 Intrinsic Motivation	0.066	0.944	-0.011	0.047	0.217	0.417	0.278	0.012								
8 Openness to experience	0.290	0.845	-0.013	0.252	0.328	0.150	0.412	0.025	0.179							
9 Agreeableness	-0.027	0.993	-0.060	0.105	0.225	0.151	0.209	0.095	0.228	0.035						
10 Conscientiousness	0.092	1.009	-0.064	-0.042	-0.131	-0.060	0.016	0.003	-0.089	0.001	-0.029					
11 Growth mind	0.135	0.979	-0.021	0.089	0.065	0.176	0.151	-0.053	0.275	0.242	0.213	0.072				
12 Goal oriented	0.722	0.448	-0.012	0.129	0.161	0.153	0.183	0.184	0.119	0.168	0.099	0.198	0.094			
13 Reputation	0.492	0.500	-0.022	-0.043	0.037	0.252	0.035	0.370	0.226	-0.089	0.132	-0.043	-0.028	0.014		
14 Contribution	0.940	0.238	-0.010	0.003	-0.014	0.070	0.077	-0.132	0.206	0.055	0.032	-0.001	0.103	0.066		
15 Mean centered age	5.166	1.027	-0.056	-0.019	-0.009	0.075	0.162	-0.064	0.091	0.165	-0.099	-0.063	0.010	0.016		
16 (Mean centered age)2	1.320	2.360	-0.079	-0.061	-0.021	0.041	0.105	-0.034	0.102	0.120	-0.156	-0.053	-0.092	0.012		
17 Occupation enjoyment	0.700	0.459	-0.056	-0.076	0.100	0.148	0.073	0.067	0.149	0.044	0.233	0.019	0.102	0.102		
18 Female	0.203	0.403	0.001	-0.038	-0.0830	-0.010	-0.055	0.092	-0.011	-0.155	0.027	0.017	-0.102	-0.012		
19 Married/Relationship	0.537	0.499	0.018	-0.098	-0.034	-0.001	0.107	0.095	0.080	0.082	-0.045	-0.003	-0.005	0.1450		
20 Children	0.293	0.455	-0.028	-0.077	-0.028	0.004	0.048	0.002	0.064	0.070	-0.056	-0.191	-0.110	0.040		
21 Region	0.678	0.468	0.017	0.017	0.134	0.113	0.348	0.207	0.136	0.117	0.160	0.049	0.183	0.228		
22 Disrupt	0.064	0.244	0.115	0.145	0.045	0.029	-0.048	-0.088	-0.072	-0.083	-0.081	-0.031	0.050	0.112		
23 IT industry	0.665	0.472	0.053	-0.174	-0.237	0.032	-0.189	-0.163	0.113	-0.006	-0.205	0.029	0.072	-0.059		
24 Firm size	1.470	2.743	-0.024	-0.029	0.010	0.010	0.033	-0.057	-0.135	-0.145	-0.135	0.168	-0.213	0.097		
25 Team size	1.408	2.419	-0.019	0.005	0.103	0.062	0.077	-0.079	-0.023	-0.057	-0.090	0.080	-0.100	0.091		
26 Invmills	0.720	0.336	0.094	-0.245	-0.379	-0.003	-0.4893	-0.218	0.026	-0.440	-0.180	-0.021	-0.303	-0.095		
			13	14	15	16	17	18	19	20	21	22	23	24	25	26
13 Reputation																
14 Contribution		-0.027														
15 Mean centered age		-0.104	-0.009													
16 (Mean centered age)2		-0.070	0.028	0.836												
17 Occupation enjoyment		0.237	-0.116	-0.066	-0.005											
18 Female		0.104	-0.101	-0.127	-0.130	-0.027										
19 Married/Relationship		0.018	-0.0350	0.268	0.196	0.081	-0.270									
20 Children		0.0830	-0.040	0.550	0.407	0.035	-0.205	0.403								
21 Region		-0.004	0.072	0.139	0.064	-0.024	-0.032	0.177	0.133							
22 Disrupt		-0.018	-0.060	-0.007	-0.087	0.041	-0.132	0.153	0.128	0.004						
23 IT industry		0.031	0.195	-0.101	-0.025	0.094	-0.008	-0.013	-0.047	-0.289	-0.052					
24 Firm size		-0.023	0.029	0.029	0.020	-0.040	0.016	0.132	0.051	0.082	0.277	0.009				
25 Team size		0.013	0.046	-0.090	-0.060	0.016	-0.025	0.049	-0.045	0.087	0.194	0.060	0.645			
26 Invmills		-0.006	-0.044	-0.499	-0.313	-0.173	0.103	-0.214	-0.232	-0.476	0.039	0.259	0.104	0.091		



**TABLE 5 Determinants of hazards of transition to entrepreneurship and firm exit**

Variables	Model 1	Model 2	Model 3	Model 4
	Probit - Entrepreneur	Logit - Exit	Logit - Exit	Logit - Exit (3years)
Opportunity Implementation	0.488*** (4.18)			
Maverick	0.052 (0.82)			-0.392 (-1.05)
Missionary	0.092 (1.29)			0.801* (2.46)
Mastermind	-0.173* (-2.32)			-0.896** (-3.01)
Creativity	0.137+ (1.79)	-0.0659 (-0.35)	-0.0708 (-0.32)	0.377 (1.36)
Extrinsic Motivation	0.124+ (1.92)	-0.140 (-0.65)	-0.204 (-0.79)	0.0740 (0.31)
Intrinsic Motivation	-0.150* (-2.19)	0.0129 (0.06)	-0.0825 (-0.34)	-0.327 (-1.10)
Openness to experience	0.067 (0.98)	0.205 (0.89)	0.295 (1.26)	0.379+ (1.65)
Agreeableness	0.009 (0.17)	-0.207 (-1.08)	-0.155 (-0.79)	-0.140 (-0.75)
Conscientiousness	-0.020 (-0.36)	-0.359+ (-1.84)	-0.316 (-1.62)	-0.374+ (-1.69)
Growth mind	0.144* (2.33)	0.00573 (0.03)	-0.182 (-0.85)	0.0885 (0.37)
Goal oriented	-0.035 (-0.26)	0.156 (0.38)	-0.0781 (-0.17)	-0.246 (-0.52)
Reputation	-0.014 (-0.11)	0.174 (0.46)	0.300 (0.73)	0.617 (1.38)
Contribution	0.330+ (1.69)	-0.124 (-0.18)	-0.333 (-0.42)	0.0392 (0.05)
Mean centered age	0.037*** (4.33)	0.0728 (1.41)	0.0852 (1.53)	0.195** (3.13)
(Mean centered age)2	-0.001 (-1.41)	-0.00561* (-2.16)	-0.00532* (-2.04)	-0.00815** (-2.77)
Occupation enjoyment	0.261* (2.24)	-0.316 (-0.80)	-0.240 (-0.55)	-0.0556 (-0.12)
Female	-0.012 (-0.09)	-0.0689 (-0.16)	0.0289 (0.07)	0.0417 (0.09)
Married/relationship	0.081 (0.67)	0.408 (1.13)	0.277 (0.70)	0.411 (0.91)
Children	-0.076 (-0.44)	-0.487 (-0.87)	-0.759 (-1.45)	-1.372* (-2.40)
Region	0.249* (2.10)		1.236* (2.08)	1.659* (2.45)
year 2		2.107** (2.73)	2.199** (2.83)	2.294** (2.86)
year 3		2.399** (3.10)	2.579*** (3.31)	2.789*** (3.45)
year 4		2.403** (3.06)	2.622*** (3.31)	2.927*** (3.49)
Disrupt			1.510* (2.44)	1.815** (2.85)
IT Industry			0.638 (1.30)	0.862+ (1.81)
Firm size			-0.144 (-1.33)	-0.121 (-1.26)
Team size			-0.0174 (-0.19)	-0.0702 (-0.78)
inv mills		1.143 (1.39)	1.965+ (1.84)	5.053** (3.03)
Constant	-0.878*** (-3.63)	-5.089*** (-3.86)	-6.800*** (-3.89)	-10.66*** (-4.15)
Number of observations	646	547	547	547
Log-likelihood	-374.640	-134.414	-127.414	-119.805
Wald chi2	116.05	33.08	52.52	57.04
Pseudo R2	0.153	0.1219	0.1676	0.217

+ p&lt;0.1, \* p&lt;0.05, \*\* p&lt;0.01, \*\*\* p&lt;0.001; t-statistics in parentheses

**TABLE 6 Supplementary Analyses**

Variables	Model 5	Model 6	Model 7
	Logit, sub-sample young firms - Exit (3 years)	Continuous time specification - Exit	Logit, full sample - Exit (5 years)
Maverick	-1.545** (-2.68)	-0.195 (-0.69)	-0.430 (-1.18)
Missionary	2.292* (1.99)	0.704** (2.71)	0.653 (1.40)
Mastermind	-5.166** (-2.88)	-0.744** (-2.93)	-0.665+ (-1.95)
Creativity	1.784+ (1.73)	0.329 (1.42)	0.244 (0.84)
Extrinsic Motivation	1.321 (1.57)	0.0709 (0.34)	0.0735 (0.29)
Intrinsic Motivation	0.962* (2.39)	-0.343 (-1.41)	-0.481 (-1.29)
Openness to experience	1.510 (1.45)	0.255 (1.24)	0.752* (2.56)
Agreeableness	-2.428*** (-3.56)	-0.169 (-1.03)	0.205 (1.05)
Conscientiousness	-0.735 (-1.16)	-0.380* (-2.33)	-0.0853 (-0.38)
Growth mind	-0.321 (-0.67)	0.198 (1.00)	0.112 (0.35)
Goal oriented	-1.651 (-0.81)	-0.165 (-0.43)	-0.622 (-0.92)
Reputation	0.413 (0.31)	0.465 (1.30)	0.900+ (1.87)
Contribution	3.349 (0.63)	0.0786 (0.12)	-0.507 (-0.60)
Mean centered age	0.573* (2.26)	0.179*** (3.47)	0.200** (2.62)
(Mean centered age)2	-0.0435** (-2.59)	-0.00818*** (-3.29)	-0.00809** (-2.65)
Occupation enjoyment	4.146* (2.16)	0.0361 (0.10)	-0.353 (-0.65)
Female	-4.480 (-1.39)	-0.0530 (-0.13)	0.920+ (1.77)
Married/relationship	-0.799 (-1.40)	0.465 (1.21)	1.061* (2.25)
Children	-5.205* (-2.36)	-0.989* (-2.20)	-1.407* (-2.52)
Region	0.222 (0.10)	1.381** (2.58)	1.650+ (1.95)
disrupt			2.062** (3.05)
IT Industry	-1.141 (-0.48)	0.692+ (1.95)	1.029+ (1.87)
Firm size	-0.0495 (-0.11)	-0.0507 (-0.58)	-0.118 (-0.90)
Team size	-0.420 (-0.79)	-0.0649 (-0.77)	-0.0453 (-0.33)
inv mills	16.14** (2.63)	4.457** (2.98)	4.770* (2.27)
Year fixed effects	Yes	No	Yes
Constant	-31.47* (-2.53)		-10.89*** (-4.43)
Number of observations	191	547	584
Log-likelihood	-36.572	-196.655	-118.459
Wald chi2	67.99	51.60	76.17
Pseudo R2	0.4089		0.2155

+ p<0.1, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001; t-statistics in parentheses

# Chapter 4

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## MORE THAN WORDS:

### SOCIAL SKILLS and ENTREPRENEURIAL EXPERIENCE

by Maria Halbinger and Toke Reichstein

#### ABSTRACT

Utilizing computational linguistics on written haiku poems to identify social skills among more than 450 hackers and makers, we build a theory of self-confidence, social awareness and social influence and their association with entrepreneurial experience defined by number of times the individual has been involved in new firm establishment. We tie these individual qualities to the individual's entrepreneurial tendencies by considering three core activities of entrepreneurship: information gathering, translation of information into business opportunities, and securing resources. We distinguish theoretically between establishment of the first start-up (entrepreneurship) and the repeated transitioning into entrepreneurship (entrepreneurial experience). Our findings suggest that entrepreneurial experience is positively associated with self-confidence and social awareness. Surprisingly, empirical evidence indicates entrepreneurial experience to be negatively associated with social influence. Ex post reasoning based on qualitative scrutiny of haiku Poems suggest this unexpected finding to emerge due to alternative use of words in the hacker and maker context. Our results are robust to generic personality traits.

## INTRODUCTION

Is entrepreneurial experience associated with an individual's social skills? This is an important question because entrepreneurial experience, defined as the number of different entrepreneurial ventures undertaken, provides substantial benefits with respect to managerial, technological and market know-how, relevant for the creation of new business opportunities (Baron & Ensley, 2006, Gruber et al., 2008), firm performance (e.g. Stuart & Abetti, 1990, Delmar & Shane, 2006, Dencker et al., 2009, Eesley & Roberts, 2012) and extraordinarily high levels of stimulation of economic growth (Plehn-Dujowich 2010, Roberts & Eesley, 2011). Compared to number of years of experience in an individual startup, number of different entrepreneurial ventures encompasses exposure to larger diversity and variation of experience, and thus a more varied set of skills and practices. Investigating whether entrepreneurial experience is correlated with social skills could provide a deeper understanding of the mechanisms generating these benefits, and suggest the training that is needed to unlock them.

Social skills may be key to understanding entrepreneurial experience since firm founding is a social process (Whetten & Mackey, 2002), and social interaction can reduce uncertainty and lower the barriers to entrepreneurship (Autio et al., 2013). Investigation of this issue should extend existing research that identifies social skills as one of the mechanisms driving entrepreneurship (see e.g. Hmieleski & Baron, 2009, Baron & Ensley, 2006, Baron & Tang, 2009, Forbes, 2005). Social skills are essential for interacting with others (Baron & Markman, 2000) and matter in terms for mobilizing and processing information and resources that apply to business opportunities and firm creation (e.g. Lounsbury & Glynn, 2001, Baron & Markman, 2003, Baron, 2007). By identifying the degree to which social skills are associated with entrepreneurial experience, this chapter could

potentially reveal some of the dynamics that trigger individuals to engage in repeated entrepreneurial venturing.

Theoretically and empirically we identify three sets of social skills: a) self-confidence, or belief in one's abilities (Chen et al., 1998; Simon et al., 2000), b) social awareness, or the "degree of consciousness of and attention to the other" (McGinn & Croson, 2004, p. 334), and c) social influence, defined as the extent to which someone is able to alter others' attitudes or behaviors in social interactions (Baron & Markman, 2000). We link each of these sets of social skills to entrepreneurial experience, through mechanisms pertaining to core elements of entrepreneurial activity. First, we argue theoretically that these social skills are predominant among individuals that position themselves in information corridors, or in opportunity related information corridors, and with the ability to govern the information accessible via these information corridors. Second, self-confidence, social awareness, and social influence are linked theoretically to decision making processes in entrepreneurial settings, to translating information into opportunities, and to implementing opportunities efficiently. Finally, we propose theoretical arguments suggesting that the three social skills are associated with the ability to mobilize resources and recognize already owned resources. By examining different sets of entrepreneurial activities, we provide a more fine-grained and comprehensive understanding of how each social skill might be associated with entrepreneurial experience. We enhance this fine-grained understanding by distinguishing between the association with the likelihood of being an entrepreneur, and the association with entrepreneurial experience.

There is almost no previous research that tries to disentangle these relations. Measuring social skills, and specifically the different sets of social skills considered in this paper, is not straightforward. Prior work has provided leaps in our understanding of social skills and social

interaction in the context of entrepreneurship (see e.g. Baron & Markman, 2003, Baron & Tang, 2009, Hmieleski & Baron, 2009). However, earlier studies rely on self-reported measures and hence may be biased since individuals may be less than honest in relation to revealing their social identities. We apply an indirect measure of social skills by investigating language patterns in a heuristic, verbal creativity task. We focus on pronouns since they are valuable, socially revealing cues about individual differences and social relationships (Tausczik & Pennebaker, 2010). Specifically, we use the personal pronouns “I”, “You”, and “We” respectively to operationalize self-confidence, social awareness and social influence.

The source of the data used for investigation is an online survey carried out among hackers and makers from a number of countries from the Western world including Australia. Hacker and maker spaces are open communities with a social content which aim to create new things in a physical workspace. Hacker and maker spaces are formed with the intent to create a hotbed of information that can be exchanged. They have many characteristics that make them cradles of entrepreneurial activities. The survey asked about respondents’ private and professional lives as well as their hacker and maker activities. It asked for data on the firm(s) established by the hacker and maker respondents. For the heuristic verbal creativity task respondents, were asked to write a haiku poem - a format of non-rhyming Japanese poetry typically consisting of 17 syllables and 3 lines with the syllables distributed 5, 7, 5 across lines. Respondents were asked to write a poem reflecting an event in their personal or social environment which triggered a flash of genius or the generation of an idea. The following example is taken from the dataset.

*Genius is random*

*Never when you try to be*

*Always a surprise*

The haiku poems provided the data needed to create measures for the three sets of social skills using computational linguistics.

The empirical analysis indicates that high levels of self-confidence and social awareness are associated with entrepreneurial experience. Moreover, we found that socially aware individuals have a lower tendency to become entrepreneurs. In contrast to our expectations, we found evidence that social influence is associated with lower levels of entrepreneurial experience. We investigated this surprising result *ex post* by considering the specific poems using the pronouns “we”. We found that it might be attributable to a particular use of these pronouns by individuals contextually attached to tight communities such as hacker and maker spaces. This is different to the more common interpretations.

This study is the first in entrepreneurship research to empirically apply computational linguistics of language patterns in a heuristic, verbal creativity task. Previous work has been confined to psychology and related fields (e.g. Mairesse et al., 2007; Kao & Jurafsky, 2012; Mehl et al., 2006, Tausczik & Pennebaker, 2010, Ranganath et al., 2013), political science (e.g. Monroe et al., 2008), and management (e.g. Brett et al., 2007, Pfarrer et al., 2010, Bednar, 2012, Helms et al., 2012, Zavyalova et al., 2012, Kern et al, 2012). By investigating three social skills attributions and associating each of them theoretically and empirically, this chapter adds to our understanding of why a predominance of particular social skills is observed among entrepreneurs and especially individuals with more extensive entrepreneurial experience. This study suggests the particular skills needed for engaging in entrepreneurial activity, and offers some guidelines in relation to entrepreneurship education. Finally, the study extends research on sentiment analysis. By investigating the words used in a heuristic task with given guidelines and restrictions, we propose a tool which makes the results more comparable than language used in conversations for instance

(e.g. Ranganath et al., 2013, Kern et al., 2012) or written text of undefined length (e.g. Kao & Jurafsky, 2012).

The rest of the paper is organized as follows. The next section introduces the concepts of entrepreneurial experience and social skills, and presents our theoretical framework hypothesizing their relationship. The following section introduces the data and methods, and presents our results. The paper concludes with a discussion of our findings, followed by some implications and limitations of our study.

## **ENTREPRENEURIAL EXPERIENCE AND SOCIAL SKILLS**

Entrepreneurial experience, captured by the number of firms the entrepreneur has founded (Stuart & Abetti, 1990, Delmar & Shane, 2006, Hmieleski & Baron, 2009, Eesley & Roberts, 2012), is associated with considerable benefits. Experience of establishing and running a firm provides firm founders with learning based advantages (e.g. Delmar & Shane, 2006; Bruederl et al., 1992). This learned knowledge is a crucial asset since experience matters with respect to the tendency to discover high quality opportunities (Baron & Ensley, 2006), and for initial public offer (IPO) purposes (Shane & Stuart, 2002). Moreover, firms founded by experienced entrepreneurs experience higher sales (Delmar & Shane, 2006) and lower failure rates (Bruederl et al., 1992). Experience provides entrepreneurs with a better understanding of the activities necessary for the entrepreneurial process, and the associated roles and responsibilities (Delmar & Shane, 2006) including hiring and distribution of labor (e.g. Bruederl et al., 1992). Experience also is advantageous with regard to the implementation of business processes including product development and sales (Bingham & Eisenhardt, 2011). Like experts, experienced entrepreneurs



develop schemata or routines that they apply to subsequent venture creation, thereby increasing their efficiency (Hayes, 1989). Furthermore, experienced entrepreneurs will likely have useful networks established during prior founding events; the founder's network can be a significant asset in terms of the tangible and intangible benefits related to the identification and evaluation of opportunities (e.g. Aldrich & Zimmer, 1986, Autio et al., 2013) and resource mobilization (Stuart et al., 1999, Aldrich & Kim, 2007). Thus, experienced founders account for a relatively larger share of jobs and economic growth (e.g. Plehn-Dujowich, 2010, Roberts & Eesley, 2011, Eesley & Roberts, 2012). Investigating the factors associated with entrepreneurial experience is both interesting for entrepreneurship research and relevant for practitioners. The switch from novice to expert has major implications with regard to the individual's cognitive capabilities (e.g. Busenitz & Barney, 1997, Forbes, 2005, Baron & Ensley, 2006).

Little has nevertheless been done to understand how entrepreneurial experience is associated with social skills. Drawing on Walker, Colvin & Ramsey (1995), here we define social skills as qualities that allow individuals to establish and maintain positive social relations, contribute to acceptance among and from peers, and function socially to a satisfactory degree in the wider social environment. Previous work has investigated the impact of social skills on firm performance (Hmieleski & Baron, 2009, Baron & Markman, 2003, Baron & Tang, 2009) but ignores the association between these skills and the experience of entrepreneurs. This is surprising since research has already theoretically established that social skills play an important role in the key activities of entrepreneurship including the creation of ideas, the recognition of business opportunities, and the acquisition of resources (Baron, 2007). Furthermore, it has been shown that people equipped with skills obtained from working in small firms are "better" entrepreneurs (Elfenbein et al., 2010). This implies that social skills matter if we want to understand

entrepreneurial experience. Social skills have been argued to be imperative for entrepreneurship since they fuel the crucial dimensions of social capital, i.e. networks, reputation, and trust (Baron & Markman, 2003). As such, they are the skills required for people to interact with each other (Baron & Markman, 2000, 2003, Baron & Tang, 2009). We consider in particular, three distinct skills relevant to the context of entrepreneurship: a) self-confidence, b) social awareness, and c) social influence.

## **HYPOTHESES DEVELOPMENT**

In the following we propose a theoretical framework hypothesizing the association between three particular social skills (*self-confidence, social awareness, and social influence*) and entrepreneurial experience. The related arguments will be rooted in the decision to become an entrepreneur in the first place, and we develop formal hypotheses with regard to the likelihood of becoming an entrepreneur. For each hypothesis, we rely on arguments relating to three key entrepreneurial activities; a) how people come across idea-related information, b) how they proceed with this information and c) how they obtain resources (Shane & Venkataraman, 2000, Baron, 2007).

### **Self-confidence**

Theoretically we propose three mechanisms pertaining to self-confidence. First, the initiation of opportunity identification relies on the encounter with complementary pieces of knowledge that later can be transformed into a business opportunity (Shane & Venkataraman, 2000, Shane, 2012). Low self-confidence will deter the individual from exposing himself to unknown situations that entail new, relevant inputs, e.g. potential user needs (e.g. von Hippel, 1986, Autio et

al., 2013). These individuals tend to avoid situations where they expect to have low levels of control (Wood & Bandura, 1989). As a consequence, unconfident individuals lack access to pieces of knowledge that complement their prior knowledge. Furthermore, low self-confidence has been associated with inward looking attention (e.g. Davis & Brock, 1975, Ickes et al., 1986, Stirman & Pennebaker, 2001), which makes the individual less attentive to the surrounding environment and accordingly less receptive to new inputs. It also imposes restrictions on the individual's proclivity to consider his or her own knowledge as a valuable basis for a potential business opportunity. Hence, low self-confidence induces unwillingness to be exposed to situations where opportunity-related knowledge exists, and lower inclination to appreciate one's own information as representing a business opportunity. In contrast, individuals who have self-selected into entrepreneurship are found to be highly confident (Busenitz & Barney, 1997, Forbes, 2005). Self-confidence implies a strong belief in one's abilities (Chen et al., 1998; Simon et al., 2000); entrepreneurs are convinced about their abilities to discover and select the right opportunities.

Second, diffident individuals need to compensate for their lack of confidence by gaining approval and encouragement from others (Wood & Bandura, 1989). However, potential entrepreneurs are faced with newness and uncertainty and are required to make independent decisions (Busenitz & Barney, 1997), i.e. evaluate the potential of a business opportunity. Thus low scores for self-confidence can hamper the individual's likelihood of becoming an entrepreneur due to uncertainty about his or her skills (Chen et al., 1998). For this reasons, unconfident individuals may not think they have the ability to make the right decisions, which ultimately may lead to their making no decision, or delaying decision making and missing a window of opportunity. This applies in the case when uncertainty postpones decisions (Simon, 1997). Fast decision making is crucial for catching windows of opportunity (Perlow et al., 2002) and achieving competitive

advantage (for a review see Kessler & Chakrabarti, 1996). Self-confidence means individuals are able to rely on and even over-estimate their abilities and knowledge (Busenitz & Barney, 1997). The overly optimistic behavior of self-confident individuals may cause them to consider potential opportunities as being less risky than they are (Simon et al., 2000). In addition, self-confident individuals tend to have selective memory - remembering only the successful decisions. Unsuccessful or wrong decisions are forgotten or attributed not to being a mistake but rather an outcome due to exogenous factors beyond the control of the self-confident individual. This bias allows them to continue to pursue a given professional profile when faced with adversity. It provides valuable inputs and experience for their entrepreneurial endeavors. Expertise gained through previous experience increases the speed and precision of individuals' decisions (Simon, 1997). This efficiency in decision-making allows the self-confident entrepreneur to extent his entrepreneurial experience in a shorter time.

Third, self-confidence is reflected in the way individuals act, and hence, how others perceive them. Being self-confident entails the ability to mobilize and obtain resources, to shape events in their environment and the goals they set (Wood & Bandura, 1989). Self-doubt motivates others to question the individual's abilities. Thus, diffidence diminishes their access to crucial resources and stakeholders. Indeed, low self-confidence can hamper the individual's ability to secure core professional relationships such as potential founding partners, key employees, and customers. As a consequence, low self-confidence decreases the individual's belief in the entrepreneurial endeavor, and therefore the likelihood of embarking on a founding event. Self-confidence may be contextual in the sense that individuals feel very confident in settings in which they have experience (Chen et al, 1998). For this reason, we see individuals being entrepreneurial in known territories, and individuals who have selected into entrepreneurship likely to do so again due

to the person-entrepreneurship fit (Markman & Baron, 2003). Thus, self-confidence may increase the extent of entrepreneurial experience. We hypothesize that:

*Hypothesis 1a. The greater an individual's self-confidence, the greater the likelihood he is an entrepreneur.*

*Hypothesis 1b. The greater an individual's self-confidence, the greater his entrepreneurial experience.*

### **Social Awareness**

Being socially aware refers to the extent to which someone is conscious of and attentive to others (McGinn & Croson 2004). There are three rationales for why social awareness may be associated with an individual's tendency to select into entrepreneurship and extend entrepreneurial experience. First, socially aware individuals are more receptive to information in their surroundings (Kirzner, 1997, Kaish & Gilad, 1991). Their attention to others provides insights into information, in various contexts, that could be relevant for entrepreneurship (Endsley, 1995). Moreover, socially aware individuals are inclined to bridge social distance (McGinn & Croson, 2004; Kern et al., 2012), which is relevant for information exchange (Adair & Brett, 2005). Consequently, social awareness may increase the individual's acquisition of information that is both advantageous and disadvantageous with respect to potential entrepreneurial opportunities. Being socially aware may allow the individual to position himself favorably to secure information needed to discover or recognize an opportunity, information that signals the potential of the opportunity, and information about the uncertainties and risks associated with pursuing the business opportunity (Ardichvili et al., 2003). Social awareness changes the cognitive processing related to entrepreneurship. It induces a more rational decision making process and consideration of a greater amount of data compared to

a more heuristic and biased approach. These individuals who are well informed about the downsides to entrepreneurship, tend to form more realistic expectations, which are likely to decrease their likelihood of becoming an entrepreneur in the first place.

After selecting into entrepreneurship, the individual's cognitive frame changes, and entrepreneurs formulate templates that support the identification of and connections in opportunity-relevant information (Baron & Ensley, 2006). The cognitive framework streamlines the information perceived, because like experts, entrepreneurs have learned through experience where to focus their attention (Choo & Trotman, 1991). This entrepreneurial "filter" is of particular interest with regard to socially aware individuals because it can increase the focus on information related to customer needs, and upcoming market and technology trends which are important for the recognition and evaluation of opportunities (Autio et al., 2013). Social awareness for this reason may extend the existing entrepreneurial experience.

Second, non-entrepreneurs lack the pattern recognition beneficial for firm foundation, which provides a cognitive framework to "connect the dots" relevant for identification of opportunities (Baron, 2006). Novices find it difficult to make the right connections across information inputs in order to discover opportunities and select "good" ones (Baron & Ensley, 2006). This is because they lack prior experience that would provide mental cues about what is feasible. Entrepreneurs on the other hand are trained in combining previously unrelated pieces of knowledge due to entrepreneurially-biased cognitive processing. At the same time, they generate more valuable business ideas that can be exploited for firm foundation (Baron & Ensley, 2006). Moreover, socially aware entrepreneurs benefit due to their better ability to retrieve and decipher market and technology information with respect to timing of entry. Social awareness helps the entrepreneur to

better embed the new venture in the “wider socio-systemic context”, and increase the extent of entrepreneurial experience.

Third, based on studies related to labor market matching theory, individuals self-select into occupational contexts that fit their skills (Markman & Baron, 2003, Ozcan & Reichstein, 2009). Socially aware individuals may chose occupations that are aligned to their abilities. i.e. related to bridging social distances between parties (Kern et al, 2012). They are often successful employees in organizational occupations such as law or sales (Wayne et al, 1997), obtain higher outcomes with respect to their jobs (Hochwarter et al., 2006, 2007), achieve higher salaries (e.g. Belliveau et al., 1995), and are good negotiators (e.g., Lewicki et al., 2005). Socially aware individuals are less likely to make the transition into entrepreneurship given their good match and evident success in the labor market which result in high opportunity costs for a first time transition to entrepreneurship. However, socially aware entrepreneurs enjoy several advantages. Having made the transition to entrepreneurship, socially aware entrepreneurs may be more cognizant of what is required for subsequent firm founding events. This includes an awareness of the importance of appropriate types of resources at the right stages in the process. Their skill is advantageous for negotiations (e.g. Thompson, 1991) with potential suppliers, customers, and employees. In particular this skill provides a better understanding of whether the information being provided is unbiased (Baron & Markman, 2000, 2003). Overall, social awareness may be a crucial asset for mobilizing high quality resources and allocating them efficiently, increasing the scope for further firm foundation. We hypothesize that:

*Hypothesis 2a. The greater an individual’s social awareness, the lower the likelihood he is an entrepreneur*

*Hypothesis 2b. The greater the social awareness of an individual, the greater his entrepreneurial experience.*

## **Social Influence**

Individuals with social influence can change others' attitudes or behaviors in a preferred direction, which can be valuable in entrepreneurial activities (Baron & Markman, 2000). In order to identify an opportunity with commercial potential, having the right information at the right point in time is crucial because this information represents the core of an idea and consequently will determine whether a business opportunity can be created (Shane & Venkataraman, 2000, Baron, 2006). Knowledge of entrepreneurial value however, can be tacit (Sorenson & Audia, 2000) or specific (Liles, 1974; Chandler, 1996; Cressy, 1999). Social influence allows individuals to persuade others to reveal information. Individuals that lack social influence tend to have information that requires no persuasion, such as publicly available data with low market value. This information is of limited value in an entrepreneurship context and has low potential and viability. Lack of social influence consequently may inhibit the individual's ability to identify opportunities and ultimately limit the chances of transitioning to entrepreneurship. Socially influential individuals can make others disclose more critical information including forecasts, sensitive data and eventually ready-to-launch opportunities. In entrepreneurship, insights into technology or market trends, planned actions of competitors, i.e. product features and market launch dates and information about inventions and business ideas, have high market value. Indeed, high-quality opportunities have been found to increase the likelihood of firm foundation (Shane, 2001). Thus, given that influential individuals can evoke a desired behavior in others (Baron & Markman, 2000), more influential entrepreneurs can make others disclose more relevant information including in-depth knowledge,



and market and technology expertise. Social influence therefore, may have a positive impact on both the quantity and quality of information and knowledge needed for further discoveries of opportunities, and thus, experience.

Social influence may also play a role in the implementation of opportunities. It may in particular become essential with regards to potential customers and collaboration partners - especially when founding a firm for the first time where the liability of newness may be particularly severe (Stinchcombe, 1965). Customers and more importantly pilot customers are vital for piloting the market offering and testing its feasibility (e.g. Bruederl et al., 1992). Lack of social influence may limit the individual's ability to persuade potential customers about the quality of the market offering and his or her ability to deliver and satisfy these customers' needs. We assume that this skill is core in this respect because pilot customers need to be convinced about a new or not yet launched market offering. Lack of social influence therefore, may decrease the likelihood of transitioning to entrepreneurship. Social influence has also been argued to allow individuals to be successful in sales related activities (Wayne & Ferris, 1990) thus giving an individual the edge in convincing customers about the quality of their products despite potential skepticism about, and newness of the offering. Furthermore, persuasive individuals are able to get customers, willingly or unwillingly, to reveal key information for further developing the venture, i.e. needs, future projects, and sensitive data on previous suppliers, supplying the seeds for further new business opportunities. Influential entrepreneurs are more able to convince existing customers to test and buy newly created offerings, thereby overcoming potential lock-in effects (Arthur, 1989) of these customers to the focal entrepreneur's competitors. They are able to acquire new customers directly or indirectly through word-of mouth advertising. Influential entrepreneurs are also more skilled at winning collaboration or alliance partners to realize entrepreneurial opportunities. This can be essential since

the right network partner can be a vehicle for securing resources relevant for survival and growth (Stuart et al., 1999).

One of the biggest obstacles to entrepreneurship is acquisition of resources. Start-ups are subject to the liability of newness (Stinchcombe, 1965). They lack external acceptance (Stone & Brush, 1996) and legitimacy (Low & Abrahamson, 1997). Legitimation is crucial because it can facilitate acquisition of resources (Lounsbury & Glynn, 2001), and social influence can promote legitimacy and convince important stakeholders i.e. investors and founding members to support the business project improving the chances of successful entrepreneurship. In addition, socially influential individuals may be more able to exploit their potential success to achieve legitimacy, and to increasingly influence people to contribute to new additional entrepreneurial activities. Indeed, the ability to convince others through stories about the business idea's benefits for the market or society is an important skill for entrepreneurs to achieve legitimacy and resources (Lounsbury & Glynn, 2001). Socially influential individuals may also be better at attracting human resources and convincing potential employees about their business opportunity and its viability, thereby lowering the perceived risk of participating in the newly started firm. Finally, socially influential individuals can persuade others that their contributions were significant, and will be reflected in personal wealth, thereby building the foundations for subsequent entrepreneurial activities. Therefore, we hypothesize that:

*Hypothesis 3a. The greater an individual's social influence, the greater the likelihood he is an entrepreneur.*

*Hypothesis 3b. The greater the individual's social influence, the greater his entrepreneurial experience.*

## **EMPIRICAL SETTING**

To test the hypotheses we investigate the social skills and entrepreneurial experience of individuals active and participating in hacker and maker spaces. Hacker and maker spaces are open physical workspaces where like-minded individuals form communities for social interaction and engagement in projects in groups, or individually. Hacker and maker space members employ, modify, and reinvent various artifacts such as software, materials, and technologies. Their members are especially interested in entrepreneurship, and are usually representative of groups of individuals that deviate from convention. Furthermore, hacker and maker spaces provide platforms where individuals can engage in invention activities, creative problem-solving, exchange of ideas, and assistance. This makes hacker and maker spaces hotbeds of entrepreneurship. Physically, these communities may be located in garages, basements, warehouses, factory buildings, or education or social centers.

Members of these spaces are generally referred to as hackers or makers. Hackers are individuals that engage in the use and development of various types of software and hardware, beyond the original purpose of these IT related items. Makers undertake alterations to existing products or develop new products, designs, and concepts. In general, the activities in hacker and maker spaces are closely related to what is referred to generically as innovation or invention related activity. They engage in projects that involve creativity to produce new ideas and artifacts. They seek to provide solutions to identified problems and undertake the development of new products or services with entrepreneurial potential.

These communities are characterized by openness to sharing, and common development of new ideas, information, and knowledge. They operate according to values such as freedom of

speech, transparency, independence, and promotion of creativity and collaboration. The very low barriers to entry of these communities render them virtually non-exclusive. Given these values and beliefs, hackers and makers tend to be inclined not to affiliate themselves to large corporations and established organizations with formal hierarchies (Carlson, 2011). They are often highly educated, to college degree level, making their capacity to solve even complex problems relatively high (Lakhani & Wolf, 2005; Levi, 2010). Hackers often only engage in projects in which they have a particular interest, and perform in a rather informal way using shared common means of operation.

For these reasons, hacker and maker spaces are often seen as incubators of entrepreneurial activities making them an interesting focus for an investigation of entrepreneurship.

## **DATA AND METHOD**

This paper relies on an online survey administered between May and July 2012. The survey was designed specifically to investigate entrepreneurial activities and individual qualities, and targeted hackers and makers. Investigating hacker and maker space communities is desirable since the individuals involved tend to be highly comparable because of their common cultural persuasion, their strong sense of unification, and their solidarity towards each other (Lakhani & Wolf, 2005; Levi, 2010). By targeting hacker and maker spaces, many of the idiosyncrasies that apply to other datasets are eliminated. However, the results are less directly generalizable to a generic population of individuals.

Brewer (2000) and Barley and Kunda (2001) argue that when conducting context specific surveys, it is imperative to have ex ante insight into the setting. For this reason, one of the authors engaged in a field study and conducted numerous interviews and test studies with hackers and

makers before the survey. Accordingly, the survey design was tailored to investigating hacker and maker space communities. The survey was tested through a number of online and offline pilots among hackers and makers before formal data collection.

We marketed the survey in three hacker and maker social media platforms through the administrator of the biggest and the leading consortium of hacker and maker spaces worldwide. We did this to gain reliability from the endorsement of a trusted central institution in the community. We then emailed the hacker and maker spaces directly. The spaces were selected based on four criteria: accessibility, whether they were registered as being active, their claimed purpose and intention, and membership conditions. The survey was administered to 392 hacker and maker spaces and reached 369 (94%) members, located in the United States, Canada, Australia, New Zealand, Northern Europe, and the English and German speaking European countries.

We registered 2948 hits for the online survey. However, many visited out of curiosity with no intention of responding to the survey. 2324 respondent spent less than 10 minutes on the survey and were deleted from the analysis on the assumption of low validity and reliability;<sup>11</sup> 24 observations were deleted because response to the survey took more than 4 hours implying that other activities intervened, which in turn implied lack of complete attention to responding to the survey which might result in dubious and unreliable responses.<sup>12</sup> Finally, we dropped 146 respondents who did not complete a section in the survey on which our explanatory variables relied (see below). We were left with a sample of 454 responses. We tested the difference between the 146 observations that were dropped and the remaining 454, for number of start-ups founded by the individual. The 146 deleted observations exhibited an average of 0.92 startups, while among the

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<sup>11</sup> The pilots indicated it was virtually impossible to complete the survey in less than 10 minutes. We tested whether reducing the limit to 7 minutes changed the results. We found no cause for concern.

<sup>12</sup> Setting the upper bound to 2 hours removed an additional 10 observation. The results are not sensitive to this choice.

remaining observation the average is 1.03. The figures are not statistically different suggesting limited cause for concern from the removal of these 146 observations.

We also considered whether the final sample was representative with regard to hackers and makers in general. We found the sample reflected the characteristics of the community in relation to age, gender and entrepreneurship rate. However, hackers and makers tend to be more prone to entrepreneurial activities than the general population, thus the results may not reflect a representative individual.

### **Dependent variable**

The aim of the research was to understand how entrepreneurial experience might be associated with social skills. Prior studies measure entrepreneurial experience as number of firms the individual has founded (see e.g. Baron & Ensley, 2006, Dencker et al., 2009, Eesley & Roberts, 2012). An alternative measure could be number of years of the individual's involvement in entrepreneurial activities. However, the results for this measure might be high even if the experience involved only a single founding event. For this reason we exploited the responses from a question in the survey that asked respondents to report the number of firms they had founded or co-founded. This variable is useful for the purposes of this study since it allows us to test both the *a* and *b* hypotheses by distinguishing between the likelihood of not having founded a firm (*a* hypotheses) and investigating the number of events in which the individual has been involved (*b* hypotheses). Number of founding events captures diversity and also varied experiences, while number of years might reflect relatively low level of variation in experience.

## **Explanatory Variables**

We operationalize self-confidence, social awareness, and social influence through word patterns identified in the language used to write the haiku poems. A haiku poem is a distinct format of unrhymed Japanese poetry and consists of 17 syllables split across three lines. Survey respondents were instructed about how to write a three-line haiku poem, where lines 1 and 3 must contain five syllables, and line 2 seven syllables. After being presented with an example, respondents were asked to write a poem describing an event in their personal or social environment that had triggered an idea or flash of genius. Overall, the task was designed in line with previous creativity research (e.g. Amabile, 1996) and adjusted for usage in an online format, and hence, was appropriate for the context of hacker and makerspaces.

There were several motivations for deploying this particular verbal creativity task in entrepreneurship research. First, the combination of strict formal guidelines in terms of given lines and syllables with an open but guided instruction to write about recognition of an idea, refers to heuristics, and makes the performance of study subjects relatively comparable. Heuristics matter for decision making (Simon, 1997) and entrepreneurship (e.g. Busenitz & Barney, 1997). Second, collecting data through this task allows us to investigate the language used to describe the personal moment of opportunity discovery. The way individuals use language functions like a fingerprint and is relatively stable over their lifetimes (Pennebaker & King, 1999). Thus, operationalizing a person's social skills via language patterns can provide interesting insights for entrepreneurship research that are less vulnerable to potential bias.

In particular pronouns, i.e. "I", "you", "we", are an indicator of the individual's focus of attention, which is valuable to investigate since it increases our understanding of how people process situations and information (Tausczik & Pennebaker, 2010), as well as his or her discovery

of opportunities (Simon, 1997). Put differently, the words we use are important in social interaction (Kashima & Kashima, 1998), language provides insights into how people understand, evaluate, and draw conclusions from social interaction (Gumperz & Levinson, 1991). Because of their meaningfulness, pronouns are used in the literature to operationalize social skills, for instance, social awareness (Kern et al., 2012). Consequently, we assume that using pronouns to operationalize social skills is particularly appropriate in entrepreneurship research because social skills have major implications for entrepreneurship (Baron & Markman, 2000; 2003), in particular since firms are socially constructed (Whetten & Mackey, 2002).

Computational linguistics was used to operationalize the study's explanatory variables. We utilized the LIWC (language inquiry word count) program, because it is based on validated and reliable word categories (Pennebaker et al., 2003, 2001). This application has been used to examine emotional writing in psychology (e.g. Pennebaker, 1997), poetry (Kao & Jurafski, 2012), and computer science (Ranganath et al., 2013), and triggered an upsurge of interest in the management literature in measuring concealed dimensions of agents (Brett et al., 2007, Pfarrer et al., 2010, Bednar, 2012, Helms et al., 2012, Zavyalova et al., 2012). We selected this approach since language is a critical dimension of entrepreneurship (Aldrich & Fiol, 1994), and the analysis of narratives represents an important tool in the field (e.g. Lounsbury & Glynn, 2001).

**Self-confidence.** Self-confidence was operationalized by a score calculated in combination with the LIWC category "I" containing the expressions "I", "I'd", "I'll", "I'm", "I've", "my", "myself", "mine", "me". This score captures use of first person singular pronouns per total words in a poem, but in an inverse, negative format. We inversed the score because high usage of "I" related pronouns refers to high self-involvement (e.g. Davis & Brock, 1975, Ickes et al., 1986, Stirman &



Pennebaker, 2001) whereas very low rates of I-words in language are associated with very self-confident individuals (Pennebaker, 2011).

**Social awareness.** Social awareness was measured using the LIWC category “You” including “you”, “you’ll”, “your”. We operationalized the measure in line with prior work by computing the number of second personal pronouns divided by the total number of words (Kern et al., 2012).

**Social influence.** We measure social influence in analogy with social awareness by computing the percentage of first person plural pronouns (LIWC category “We”) i.e. “we”, “we’re”, “us”, “our”, “let’s”, “lets” in the haiku. Using “we” suggests shared beliefs as in the context of political speeches and hence, is associated with high status and leadership (Pennebaker, 2011). Given the aspect of persuading and influencing the social environment (Mooney et al, 2010), we operationalize social influence using this word category.

### **Control Variables**

Entrepreneurship is often about identification and development of opportunities (Ardichvili et al., 2003) with commercial value or at least potential commercial value. We control for whether the individual is able to do this by exploiting the responses to a survey question asking respondents to indicate how many of their hacks have been realized as new products or services, publicly performed plays, exhibitions, music compositions, novels, trademarks, patents or patent applications. We use this as a dummy for whether the individual has engaged in *opportunity implementation*.

To engage in entrepreneurial activities requires the individual to overcome substantial challenges. These involve recognizing and developing opportunities, transforming them into goods and services, and introducing novelty through the introduction of previously unseen business

opportunities. Thus, individual creativity has been argued to be central to understanding entrepreneurship (Amabile, 1996, Ward, 2004). We control for individual *creativity* by generating a latent variable using orthogonal rotated principal component factor analysis on four items from the survey. The survey asked respondents to characterize themselves with respect to how they work with ideas, information, and novelty, and rate themselves on these dimensions on a five point likert scale. These items correspond to implicit theories on thinking styles thereby reflecting the inside views of individuals (Sternberg, 1985) which are particularly appropriate for this study since implicit theories represent a mental framework within which information is processed (Chiu et al., 1997). All four dimensions load into a single factor identified by a unit eigen vector. The details of the principal component factor analysis and the questions, are presented in the top part of Table 1. The Cronbach's alpha of the items amounts to 0.686 suggesting an acceptable level of internal consistency.

Entrepreneurs and non-entrepreneurs are motivated by different things. It has been argued that intrinsic and extrinsic motivation are prerequisites for different stages of the entrepreneurial process (Amabile, 1997). For this reason, we control for intrinsic and extrinsic motivation using latent constructs of motivation based on six 7-point likert scale items from the survey. The items relate to the reasons why the individual engages in hacker and maker activities. These items follow the method for capturing motivations used by Deci and Ryan (1985) and Ryan and Connell (1989) and were adapted in line with studies investigating motivations in similar settings (e.g. Lakhani & Wolf, 2005; Roberts et al., 2006). The latent constructs were generated using principal component factor analysis subject to orthogonal rotation. The items load into two factors, which we are able to identify as representing extrinsic and intrinsic motivation. Details of the questions and related statistics are presented in the middle part of Table 1. The Cronbach's alpha with respect to the

extrinsic motivation latent construct is relatively high at 0.73, suggesting good internal consistency. The corresponding figure for intrinsic is a disappointing 0.3 indicating rather poor internal consistency.

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Insert Table 1 about here  
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The psychology literature suggests a close link between entrepreneurship and personality traits (see e.g. Zhao & Seibert (2006) for a meta-analysis). This chapter seeks to link identity with entrepreneurial tendencies. However, individual identities may be reflected in specific personality traits. In order to limit the likelihood of drawing conclusions based on spurious correlations acting through personality traits, we include controls for personality traits that have been found to be predominant among entrepreneurs. Specifically, we control for *Openness to experience*, *Agreeableness*, and *Conscientiousness*. Table 1 presents the results of an orthogonal rotated principal component factor analysis based on 11 items from the survey. Respondent were asked to indicate on a 5-point likert scale the extent of agreement with statements used in the prior literature to map personality traits (Donnellan et al., 2006). The Internal validity of the agreeableness construct proved strong with a Cronbach’s alpha of 0.771 while the corresponding numbers for conscientiousness and openness to experience proved acceptable only at 0.624 and 0.608 respectively.

Hacker/maker community members are often passionate about their activities (Lakhani & Wolf, 2005), often pursue hacker and maker activities in their professional lives. Entrepreneurship is an alternative if there is no appropriate professional occupation that matches their hobby interest. Accordingly, we control for whether their hacker/maker activities are *occupation related* and expect

a negative association. We exploited a question in the survey which asked respondents to indicate to what extent the activities in their current professional occupation related to their hacking activities. Responses were on a five point scale ranging from extremely unrelated to extremely related.

Entrepreneurship has been shown to be closely associated with personal and extended networks (Dubini & Aldrich, 1991). Indeed, forming a network and creating ties may low the barriers to an individual becoming an entrepreneur and provide a short cut to entrepreneurial venturing. It may also position the individual in the information corridor increasing the chances of recognizing and opportunity and exploiting it. We control for individual tendencies to create networks and ties by including a variable for the extent of embeddedness in the hacker/maker community. We utilize a dummy item based on responses to a question about whether the individual *Contributes* to or posts in hacker/maker communities.

We control for age in entrepreneurial experience following the prescriptions in entrepreneurship research, by including both normalized *Age* and its squared term (Dunn & Holtz-Eakin, 2000, Sørensen, 2007). We account for *gender* differences by adding a control for whether the respondent is female. Empirical evidence suggests entrepreneurship is pursued predominantly by males (see e.g. Hout & Rosen, 2000). Prior studies provide evidence that private status in terms of having a partner or not, matters for the rate of entrepreneurship (see e.g. Dunn & Holtz-Eakin, 2000). We control for this by including a dummy for whether the individual *Lives with a partner*. The questionnaire also asked whether the respondent had children. We use a dummy variable for the response *Has children*.

Finally, we are interested in whether there are overlaps in interests and ways of thinking among hacker communities. However, since the data are drawn from a variety of different geographical locations, differences in entrepreneurial tendencies may be due to institutional factors

(see e.g. Mueller & Thomas, 2001; Thomas & Mueller, 2000). We therefore control for whether the respondent is associated with a hacker/maker space in an *Anglo-Saxon region*.

### **Econometric Analysis**

Entrepreneurial experience, our dependent variable, is measured as the number of firms established by the individual. This becomes a count variable that takes on integer values for number of times an event occurs. We consider the family of count models as potential techniques for testing the hypotheses. We focus first on zero inflated models for two reasons. First, it is likely that the decision to establish the first firm is different from the decisions related to establishing subsequent start-ups. The variable for entrepreneurial experience may exhibit a quirky association, moving from 0 to some, compared to moving from some to more, for the same individual making the decision. Some individuals may never establish a firm, always scoring zero for the entrepreneurial experience distribution function, which triggers this quirk. This reasoning is expected based on the proposed a and b hypotheses.

Second, the variable entrepreneurial experience takes integer values between 0 and 10 with an average of 1.026. The percentage of respondents reporting never establishing a firm is 52. Although more than 20 percent of respondents established only one firm, the standard deviation is only 1.55 (see Table 2) suggesting over-dispersion of the data. Zero-inflated models are specifically designed to model over-dispersion, which may be attributed to excess numbers of zeros compared to the theoretical underlying distributions of the count variable.

We also empirically investigated the need to consider a zero inflation specification using the Vuong test. It was significant which supports the above reasoning. We also considered whether the zero-inflation choice removed any remaining concern about the over-dispersion finding, but this

was not the case. The log-likelihood ratio test indicates significant over-dispersion in zero-inflation models. Therefore, we chose a zero-inflated negative binomial model as opposed to the alternative Poisson specification. We ran the analysis using an OLS specification on observations where the individual had founded at least one firm. Finally we used a combination of probit regressions (to investigate the jump from 0 to at least 1 established start-up) and Tobit regressions (for entrepreneurial experience setting the lower limit at 0) thereby considering the data to be of a character dictating a hurdle model. These additional regressions establish the robustness of the results with regard to the model specification. All the reported results are shown to be robust estimations using the Huber-White sandwich technique which corrects at least partly for standard deviations for bias attributed to potential heteroskedasticity.

In the attempt to extract as much information as possible from the investigation, we also considered the marginal effects of the explanatory variables. We present the effects at different values in margin plots.

## **RESULTS**

Table 2 presents the descriptive statistics and Pearson correlation coefficients of the variables considered. None of the correlation coefficients approaches a magnitude that causes concern over multicollinearity. Also, the variance inflation factor indicates only a minute chance of bias due to multicollinearity.

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Insert Table 2 about here  
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Table 3 presents the results of the zero inflated negative binomial regressions. Model 1 includes only the controls. Model 2 includes only the three explanatory variables; *self-confidence*, *social awareness*, and *social influence*. Model 3 includes all independent variables. Model 4 is an OLS version of Model 3. Model 5 is the corresponding probit and Tobit specification combination.

Table 3 provides ample support for hypothesis 1b that *the greater the self-confidence of an individual, the greater his entrepreneurial experience*. The estimate associated with self-confidence in the count equation is significantly positive in both models 2 and 3 at the 1% and 5% levels respectively. We find no support for hypothesis 1a.

The regressions lend strong support to the hypotheses about social influence (hypotheses 2a and 2b). Hypothesis 2a states that *the greater an individual's social awareness, the lower the likelihood that he is an entrepreneur*. The positive estimate in the “inflated” equation of Model 3 indicates that high social awareness is associated with a high likelihood of never having founded a firm (i.e. zero) which supports this hypothesis. The positive estimate for the “count” equation supports hypothesis 2b indicating that *the greater the social awareness of an individual, the greater his entrepreneurial experience*.

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Insert Table 3 about here  
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Finally, the regressions do not provide much support for hypotheses 3a and 3b. The “inflated” equation is not significant, and the estimate of the “count” equation does not support the hypothesized association that *the greater the individual's social influence, the greater his entrepreneurial experience*. The estimate is strongly significant and negative rather than positive as expected.

The above findings for the b hypotheses are supported and confirmed by the OLS regression in Model 4. The Tobit specification reported in Model 5 also confirms all the results for entrepreneurial experience; when we consider the Probit specification as an alternative to the inflation equation, some discrepancies emerge. We interpret these findings as indicating that the results are not a bi-product of the selected regression technique.

Based on model 3, we estimate the marginal effects of the count equation considering in particular the three explanatory variables. The results of the analysis are displayed in Figure 1a-c below.

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Insert Figure 1a-c about here  
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The margin plots illustrate how the marginal effect changes as the values for self-confidence (Figure 1a), social awareness (Figure 1b) and social influence (Figure 1c) increase. The plots also include confidence intervals to assess the significance of the marginal effects. Figure 1a indicates clearly that entrepreneurial experience increases as individuals become more self-confident. Although the marginal effects do not differ across self-confidence values, it is evident that the marginal effects are significant at all values of the variable of interest.

The results for social awareness (Figure 1b) are similar with respect to the significance of the differences in marginal effects. However, there is a clear monotonic association suggesting greater social awareness is associated with greater entrepreneurial experience. The lack of significance in differences is due, at least in part, to relatively few individuals exhibiting a high level of social influence, producing relatively high standard errors in estimates.



Social influence (Figure 1c) does not provide equally strong results. The margins do not exhibit a monotonic tendency. Furthermore, the margins at different values of social awareness clearly are not significantly different from one another. However, the marginal effects tend to be significant at all values of social influence.

### **The pronoun “we” as a measure of social influence**

The rather puzzling results for social influence caused us to look closer at the poems and their content. Applying computational linguistics allows us to equate the use of lets, let's, our, us, we, we're, to social influence. However, we consider the possibility that hackers and makers use these words in a different way to what is described in the literature on which we rely for the analysis. Indeed, literature debates the multiple ways these words can be used and interpreted (see e.g Pennebaker, 2001, 2011, Gonzales et al., 2010).

Forty-five of the poems use one of the pronouns listed as representing social influence. The hypothesis is based on the assumption that the pronouns were used as “the every-likeminded-person-on-earth-We”. Some respondents use one of these pronouns in the way hypothesized. For example, one poem reads:

*Art lives within us*

*To make is to release it*

*Making room for more*

Here the use of “us” refers to mankind or the global us, thereby creating distance. However, not all poems use this form. In scrutinizing the poems we discovered that, in some cases it was difficult to identify whether the pronoun was used in this way or was used to refer to a group of

friends or akin individuals. In 27 cases we were able to categorize the poem as using the pronouns in the latter two ways. The following poem is a good example of the pronoun used to refer to the hackers and makers as a group and not the “every-likeminded-person-on-earth-We”, often used by politicians (Pennebaker, 2011, p. 276).

*All nerds laugh and talk*

*We exchange amusing puns*

*One word hits my head*

It is plausible that the identified group of individuals under investigation would use the first person plural pronouns in a different way to suggested by hypotheses 3a and 3b. Its use refers to a group of friends or a group of like-minded individuals rather than mankind or society. The respondents are members of communities that share strong and common social values. The respondents responded to the questionnaire from the point of view of being a member of the hacker and maker community; thus their use of this pronoun may often refer to this collective rather than the world in general. The two poems cited above clearly refer to characteristics of hacker and maker activities. Therefore, it is likely that respondents’ thought processes center around the confined group of individuals identified as the hacker and maker space community, or on their own locally defined hacker and maker space.

The alternative use of the first person plural illustrates a more collectivist culture among the respondents. It has been shown that collectivism compared to individualism may both hinder and promote entrepreneurship (see e.g. Tiessen, 1997). This makes it difficult to predict a positive or a negative sign for use of these particular pronouns.

## DISCUSSION

The results of our study suggest that the social skills of self-confidence, social awareness, and social influence vary in their effect on the individual's likelihood of becoming an entrepreneur and the individual's extent of entrepreneurial experience. By employing computational linguistics, especially analysis of pronouns, in the field of entrepreneurship our research highlights a new way to overcome potential bias when measuring individual-related variables. Specifically, we show that high levels of self-confidence and social awareness are positively linked to greater entrepreneurial experience, i.e. individual experience of firm foundation. At the same time, socially aware individuals are less inclined to follow the path of entrepreneurship. In addition, there is some indication (from our supplementary analysis) that the puzzling finding of social influence being associated with a lower level of entrepreneurial experience, can be explained by the different meanings implied by we-related pronouns. In the context of this study, hacker and makerspaces, shared basic values strengthen the feeling of collectivism which is expressed in the way the first person plural pronouns are used.

From a theoretical perspective, these findings support the notion of social skills being important assets in key entrepreneurial activities associated with accessing and leveraging opportunity-related knowledge and resource mobilization. Moreover, by disentangling these effects, we are able to consider the separate impact of the individual's social skills on the individual likelihood of becoming an entrepreneur, and the extent of entrepreneurial experience. Our empirical approach to the analysis of pronouns represents an innovative way to measure entrepreneurship-relevant variables but is consistent with the view that language functions as an important facilitator

of entrepreneurship (e.g. Aldrich & Fiol, 1994) and that the analysis of narratives is a crucial tool for advancing this field (e.g. Lounsbury & Glynn, 2001).

From the point of view of the cognitive science literature, our study complements research on verbal creativity. Prior studies have used haiku poems to measure creative performance in experimental settings with small numbers of participants (e.g. Amabile, 1996). Through the use of new media platforms, we are able to analyze hundreds of poems and to extend the investigation across regions and social groups (i.e. entrepreneurs, non-entrepreneurs, experienced entrepreneurs). Through experiments, previous studies demonstrate the influencing factors of creativity and its measurement, often with students in psychology-related disciplines functioning as study subjects. Consistent with the notion of analyzing a setting that is reasonably closed, we examined the hacker and maker community, a distinct real-life setting that is infused with creativity.

Furthermore, by analyzing the words used in the haiku poem and not just the participant's writing performance, we propose a new way of investigating data gathered in verbal creativity research. We link analysis of the haiku task to the field of entrepreneurship beyond the well-established relationship between creativity and entrepreneurship. We refer to the haiku task as a heuristic task, where no defined solution exists, and where participants' prior knowledge matters for examining the impact on the entrepreneur's experience defined as the individual's prior experience of firm foundation. Given that heuristics matter for entrepreneurship (Busenitz & Barney, 1997), and that experienced entrepreneurs process information differently (Baron & Ensley, 2006), we think this link is a reasonable one to make.

Our results are also consistent with research on psychology that uses sentiment analysis. Our findings support the notion that a dominance of the first person singular pronoun is counter intuitively an indicator of anxiety and low self-confidence. Furthermore, our results are in line with

the linguistics literature and supporting the view that “we” pronouns are the most puzzling in our vocabulary since their meaning is ambiguous. Accordingly, there is the global, rather equivocal “we”, favored in political speeches and academic writing, which has been identified as marker of power and leadership. But the first person plural can also refer to the “we” that expresses connection to others in the sense of shared identity (Pennebaker, 2011).<sup>13</sup> Methodologically however, we think that our approach, of analyzing haiku poems, is particularly interesting because the formula (i.e. given lines, syllables, and topic) creates a data sample in which the basic shape and content of the text corpus is defined and in which differences can be observed making the results more comparable across individuals.

Finally, our research has implications for the analysis of text data in entrepreneurship research. Language analysis is a promising trajectory in social science since the words individuals use, in particular pronouns, convey much information about their users. Computational linguistics, in particular sentiment analysis, provides new ways of revealing underlying aspects of individuals such as identity, status, behavioral tendencies and the networks individuals engage in. Hence, investigating core variables in entrepreneurship research through language patterns should be of interest to both scholars and practitioners.

### **Implications for Educators and Practitioners**

Among practitioners, in particular entrepreneurs, the natural conclusion would be to pay more attention to the words they use. However, this is not easy and requires thorough training and practice. Entrepreneurship educators try to instill an awareness of the importance of language, and style, when presenting a business idea. Consistent with the adage that “first impressions matter”,

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<sup>13</sup> For further meanings of “we”, e.g. the royal “we” (majestic plural), plural usage while referring to a single person, see Pennebaker 2011.

our research points to an important aspect in this respect. The style of language and speech is crucial for the social interaction, and matters considerably for achieving access to information sources for business opportunities and mobilizing relevant resources such as financial and human capital. The quality of the interaction with venture capitalists, key employees, and founding team members is crucial to entrepreneurship. In particular, in conflict-laden or unfamiliar situations, social skills such as social awareness, i.e. reflected in the usage of “you” pronouns, can be facilitators of negotiation and can bridge social distances (Kern et al., 2012).

### **Limitations and Future Research**

The limitations of our study suggest interesting avenues for future research. First, our results reveal insights into the role of personal pronouns for measuring social skills in entrepreneurship and entrepreneurial experience. Our pronoun analysis examined the style of the language but not its content. Although words reflecting style are more meaningful than content-related words, future research could use computational linguistics in combination with word dictionaries to extend this analysis. By combining both style and content analysis, future studies could analyze the narratives of entrepreneurs and their association with performance.

Second, previous creativity studies using the haiku writing technique to measure creative performance have mostly ignored natural language processing as an objective measurement method. Although our study does not measure creativity evaluated by external judges, we implement a self-reported measure to single out potential interferences. Future research could examine creativity related to word content, compared to self-reported creativity and externally rated creativity.

## **Conclusion**

This chapter analyzed self-confidence, social awareness, and social influence as important social skills for entrepreneurship, in particular with regards to entrepreneurial experience. Our empirical strategy of operationalizing social skills through computational linguistics proposes a new way to overcome potential bias in measuring individual-level variables in entrepreneurship research. We have provided theoretical and empirical insights into the value-laden usage of personal pronouns, and added to understanding of the role of social skills in core entrepreneurship activities related to accessing and processing opportunity-related information and mobilizing resources.

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**TABLE 1 Survey Questions, Factor Loadings, Variances and Cronbach's Alpha**

Creativity factor analysis			
Questions	Creativity		
I am someone who ...			
makes connections & distinctions between ideas & things			0.718
is able to grasp abstract ideas & focus my attention on those ideas			0.759
is able to put old information, theories, & so forth together in a new way			0.763
uses the materials around me & makes something unique out of them			0.633
Variance			2.075
Proportion			0.519
Cumulative			0.519
Cronbach's Alpha			0.686
Motivation factor analysis			
Questions	Extrinsic	Intrinsic	
I hack because ...			
I enjoy the activity of hacking itself			0.805
I enjoy being part of a community			0.576
I forget everything around me when I get into <i>the Zone</i>			0.567
I would like to discover a business opportunity	0.843		
I want to enhance my career opportunities	0.803		
the hacker community gives support to found a company	0.765		
Variance	1.972		1.305
Proportion	0.329		0.218
Cumulative	0.329		0.547
Cronbach's Alpha	0.730		0.300
Personality traits factor analysis			
Questions	Agreeableness	Conscientious- ness	Openness to experience
Indicate the extent to which you agree or disagree with the following statements:			
I sympathize with others' feelings	0.851		
I am not interested in other people's problems (reverse coded)	0.677		
I feel others' emotions	0.814		
I am not really interested in others (reverse coded)	0.718		
I get chores done right away		0.628	
I often forget to put things back in their proper place (reverse coded)		0.768	
I like order		0.589	
I make a mess of things (reverse coded)		0.736	
I do not have a good imagination (reverse coded)			0.593
I am not interested in abstract ideas (reverse coded)			0.831
I have difficulty understanding abstract ideas (reverse coded)			0.786
Variance	2.397	1.899	1.762
Proportion	0.218	0.173	0.160
Cumulative	0.218	0.391	0.551
Cronbach's Alpha	0.771	0.624	0.608

Note: Only factors loadings above 0.3 are reported



**TABLE 2 Descriptive Statics and Pearson's Correlation Coefficients (N=454)**

Variables	Mean	S.D.	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
[1] Entrepreneurial experience	1.026	1.55									
[2] Self-confidence	0.965	0.549	0.12								
[3] Social awareness	0.008	0.028	0.06	0.03							
[4] Social influence	0.010	0.033	-0.01	0.11	-0.07						
[5] Opportunity implementation	0.319	0.467	0.20	-0.02	0.03	-0.11					
[6] Creativity	0.000	1.000	0.20	0.07	-0.09	0.07	0.17				
[7] Extrinsic motivation	0.000	1.000	0.11	-0.02	0.01	0.00	0.10	0.16			
[8] Intrinsic motivation	0.000	1.000	-0.03	0.09	-0.01	0.00	0.06	0.28	0.00		
[9] Openness to experience	0.000	1.000	0.18	0.08	0.01	0.01	0.11	0.41	0.00	0.20	
[10] Agreeableness	0.000	1.000	-0.05	-0.01	-0.02	0.09	-0.07	0.17	0.03	0.15	0.00
[11] Conscientiousness	0.000	1.000	0.01	-0.04	0.03	0.03	0.03	0.01	0.07	-0.08	0.00
[12] Age (mean centred)	0.000	10.141	0.23	-0.05	-0.02	-0.04	0.10	0.12	-0.01	-0.04	0.14
[13] Age <sup>2</sup> (based on mean centered)	102.000	177.572	0.13	0.00	-0.06	0.02	0.03	0.04	0.01	-0.02	-0.02
[14] Occupational relatedness	3.046	1.395	0.07	0.06	0.05	0.03	0.19	0.05	0.13	0.20	0.05
[15] Gender: Female	0.141	0.348	0.03	-0.09	-0.04	0.00	-0.01	0.06	-0.01	-0.03	-0.08
[16] Lives with parents	0.496	0.501	0.05	0.04	-0.04	0.02	0.07	0.05	-0.04	0.03	0.04
[17] Has children	0.220	0.415	0.15	-0.02	-0.02	-0.04	0.09	0.05	-0.01	0.07	0.07
[18] Contribution	0.921	0.270	-0.15	0.00	-0.09	0.03	0.08	0.05	-0.04	0.23	0.12
[19] Anglo-saxon region	0.619	0.486	0.13	0.02	-0.04	-0.05	0.06	0.29	0.19	0.12	0.15

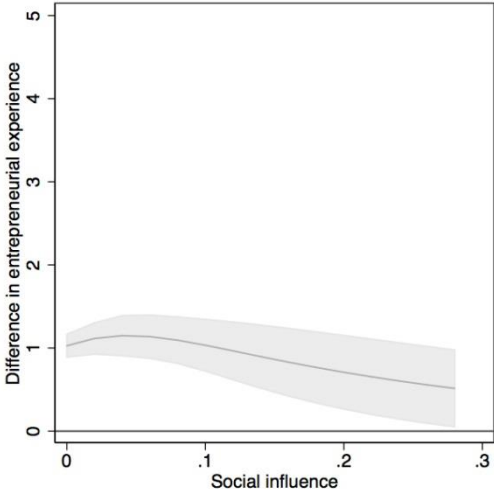
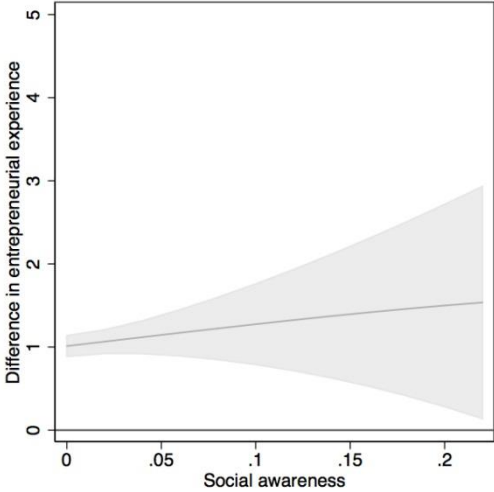
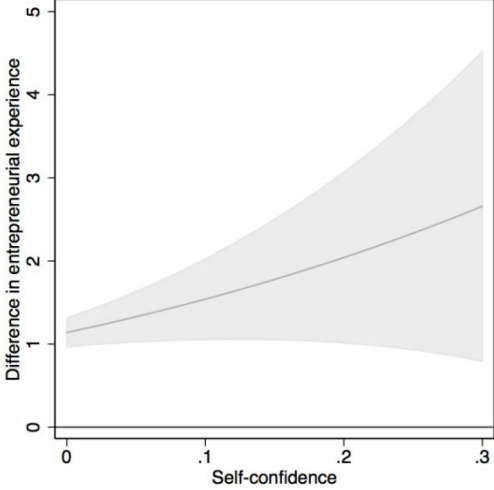
	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]
[11] Conscientiousness		0.00							
[12] Age		-0.11	0.01						
[13] Age <sup>2</sup>		-0.09	-0.04	0.61					
[14] Occupational relatedness		0.04	0.02	-0.11	-0.07				
[15] Gender: Female		0.12	0.01	0.01	0.00	-0.10			
[16] Lives with parents		0.02	-0.02	0.26	0.07	0.06	0.03		
[17] Has children		-0.10	-0.07	0.50	0.26	0.03	-0.11	0.42	
[18] Contribution		0.03	-0.03	-0.07	-0.04	0.07	-0.16	-0.02	0.02
[19] Anglo-saxon region		-0.06	0.06	0.21	0.01	-0.07	0.03	0.05	0.14

**TABLE 3 Determinants of Entrepreneurial Experience, Results of Zero Inflated Negative Binomial Regressions, OLS and Probit and Tobit Regressions**

	Model 1		Model 2		Model 3		Model 4	Model 5	
	Controls Count	Model Inflated	Explanatories Count	Model Inflated	Full Model Count	Inflated	OLS	Probit	Tobit
<i>Explanatories</i>									
Self-confidence			4.540***	2.918	2.235**	-4.216	3.638***	2.104**	3.625***
			[1.444]	[5.853]	[1.315]	[4.336]	[1.387]	[1.199]	[1.342]
Social awareness			5.450***	8.377*	4.331***	9.174**	8.341**	-0.771	8.201**
			[1.915]	[5.604]	[1.680]	[4.691]	[4.735]	[1.934]	[4.539]
Social influence			-2.987*	-22.734	-3.73**	-21.803	-3.806**	2.458*	-3.543*
			[2.093]	[45.737]	[2.020]	[20.591]	[2.289]	[1.853]	[2.168]
<i>Controls</i>									
Opportunity implementation	0.392***	-0.055			0.261*	-0.572	0.266	0.382***	0.283*
	[0.149]	[0.554]			[0.161]	[0.581]	[0.213]	[0.138]	[0.203]
Creativity	0.298***	0.098			0.341***	0.313	0.325***	0.159**	0.301***
	[0.102]	[0.336]			[0.098]	[0.366]	[0.125]	[0.081]	[0.119]
Extrinsic motivation	0.085	0.076			0.079	0.073	0.104	0.061	0.081
	[0.100]	[0.317]			[0.112]	[0.387]	[0.116]	[0.067]	[0.111]
Intrinsic motivation	-0.133**	0.109			-0.138**	0.049	-0.098	-0.132**	-0.104
	[0.069]	[0.214]			[0.067]	[0.232]	[0.117]	[0.072]	[0.111]
Openness to experience	0.102*	-0.214			0.057	-0.263	0.091	0.158**	0.096
	[0.072]	[0.239]			[0.079]	[0.258]	[0.097]	[0.075]	[0.093]
Agreeableness	0.019	0.244			0.037	0.261	-0.005	-0.028	-0.004
	[0.074]	[0.314]			[0.080]	[0.324]	[0.108]	[0.064]	[0.104]
Conscientiousness	0.11*	0.552***			0.106*	0.578***	0.096	-0.068	0.086
	[0.067]	[0.208]			[0.066]	[0.202]	[0.117]	[0.064]	[0.113]
Occupational relatedness	-0.076*	-0.605***			-0.068	-0.57***	-0.113	0.143***	-0.105
	[0.059]	[0.169]			[0.070]	[0.206]	[0.100]	0.143***	-0.105
Contributes	-0.8***	-0.668			-0.781***	-0.552	-1.781***	-0.105	-1.824***
	[0.248]	[0.674]			[0.265]	[0.742]	[0.691]	[0.235]	[0.680]
Age	-0.01	-0.136**			-0.009	-0.149***	-0.014	0.036***	-0.013
	[0.014]	[0.061]			[0.013]	[0.062]	[0.019]	[0.010]	[0.019]
Age-square	0.001*	0.002*			0.001*	0.003*	0.001**	-0.001	0.001**
	[0.000]	[0.002]			[0.000]	[0.002]	[0.001]	[0.000]	[0.001]
Gender: Female	0.01	-0.202			0.012	-0.339	-0.028	0.089	-0.024
	[0.183]	[0.743]			[0.198]	[0.858]	[0.328]	[0.191]	[0.315]
Lives with partner	-0.277**	-0.83*			-0.231*	-0.75	-0.332*	-0.004	-0.330*
	[0.168]	[0.560]			[0.162]	[0.644]	[0.210]	[0.142]	[0.201]
Has children	0.575***	1.809**			0.519**	1.724*	0.582**	0.026	0.545**
	[0.204]	[0.961]			[0.242]	[1.175]	[0.334]	[0.197]	[0.322]
Anglo-Saxon region	-0.204	-1.749***			-0.226	-1.821***	-0.398*	0.370***	-0.199
	[0.171]	[0.578]			[0.194]	[0.622]	[0.271]	[0.139]	[0.226]
Constant	1.217***	2.176**	4.131	-4.026	-0.949	6.223	6.629	-0.654**	4.124***
	[0.379]	[0.959]	[1.434]	[5.965]	[1.376]	[4.524]	[1.468]	[0.289]	[0.851]
log( $\alpha$ ) Constant/ $\sigma$	-1.712***		-0.492		-1.847***			1.429***	
	[0.492]		[0.474]		[0.513]			[0.110]	
Number of Observations	454		454		454		214	454	214
Number of zeroes	240		240		240				
Log-Likelihood	-567.691		-627.718		-558.451			-266.777	-380.013
$\chi^2$ /F-Statistics	78.092***		17.882***		101.09***		2.38***	77.918***	2.600***
Vuong Statistics/ $R^2$ /Pseudo $R^2$	3.61		1.43		3.89		0.213	0.150	0.063

Note: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ , Standard errors in parentheses

**FIGURES 1a-c Margins plot of explanatory variables associations with entrepreneurial experience**



# Chapter 5

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## CONCLUSION

Situated at the intersection of entrepreneurship and psychology this thesis applied an individual-level perspective to the notion of entrepreneurship as a process which starts with the exposure to an opportunity and ends with the exit of the venture from the market. The three chapters investigate different activities of the process before and after the transition to entrepreneurship. The thesis has provided theoretical and empirical insights into the individual-level variables that are associated with the core entrepreneurial activities - that is the exposure, recognition and exploitation of opportunities in chapter 2, firm exit in chapter 3 and repeated firm establishment in chapter 4. Accordingly, these thesis chapters are related based on their dependent variables stemming from the field of entrepreneurship, while the independent variables in the separate chapters are drawn from psychology research.

The thesis draws on a self-collected dataset on hackers and makers, individuals who engage in entrepreneurial activities related to technology, computing, science, art and who are registered members in hacker- and makerspaces, open communities with physical workspaces where these entrepreneurial individuals can exchange ideas and collaborate.

Chapter two analyses how opportunity exposure, recognition and exploitation relate to an individual's creativity and different forms of motivation. While results suggest a positive influence of creativity across all entrepreneurial activities, intrinsic motivation is conducive at the front-end of the entrepreneurial process and detrimental at the backend. Moreover, extrinsic motivation increases the likelihood to implement opportunities and start firms. Chapter three investigates how

founder identity influences firm exit and finds that the exit rates of firms vary based on founder identity. Specifically founders with a more community-oriented identity and eager to learn are less likely to exit. Chapter four examines how the social skills self-confidence, social awareness and social influence relate to individuals' repeated engagement in the establishment of firms. Results suggest that when equipped with high scores on the self-confidence and social awareness. In contrast, entrepreneurial experience is negatively associated with social influence.

The adoption of a psychological perspective provides a valuable contribution to entrepreneurship research, because it allows taking into account the intra-psychic dimensions of individuals and the reasons underlying their behavior. The thesis provides empirical evidence that different individual-level factors influence different entrepreneurial activities and ultimately lend insights into why individuals are not equally likely to engage in entrepreneurship. Each of the three chapters contributes to the entrepreneurship literature in important ways.

First, the findings related to the varying effects of the individual-level variables in chapter two offer a possible explanation of why there are fewer entrepreneurs than opportunities. Specifically, the findings suggest that with respect to the exploitation of opportunities, i.e. firm foundation or other forms of implementation, intrinsic and extrinsic motivation stand in contrast, while from a process point of view both motivation forms are required to start and accomplish all activities. The consistently positive influence of creativity contributes to the long-debated association between creativity and entrepreneurship and offers a more fine-grained view on the importance of a creative thinking style that goes beyond a pure ability.

The social identity perspective taken in chapter three theorizes that entrepreneurial activities are highly social and of profound personal value to the founder. It extends existing research by showing empirically that identity shapes not only entrepreneurial action and strategy, but also firm

exit. The results related to the varying effects of founder identities on exit point to a potential substitution effect between the identity and the quality of the entrepreneurial opportunity over time. In addition, the findings are consistent with psychology research on overachievers since they indicate that a transition to entrepreneurship may be a vehicle for community-oriented founders to become “highflyers” in the group, which in turn feeds their feeling of belonging and hence, their identity. In chapter four, the thesis’ findings support prior work stating that social skills are core in entrepreneurship to access and leverage opportunity-related information and mobilize resources. By applying computational linguistic tools on haiku poems, chapter four introduces an innovative way of measuring social skills through language patterns which allows for overcoming potential bias related to hitherto self-reported measures.

The limitations of the thesis unfold interesting opportunities for future research. Using hackers and makers as study subjects to examine entrepreneurial individuals may raise concern with respect to the generalizability of the thesis’ findings. Individuals in this setting pursue entrepreneurial activities typically in collaboration with others. Also, the prevailing privacy concerns of community administrators limit the possibility to check for sample representativeness. Although the results of various checks with respect to demographics, entrepreneurial tendencies and regional effects suggested that the thesis’ final sample reflects the characteristics of the overall community, hackers and makers appeared to be more inclined to entrepreneurship than the general population. Hence, the thesis’ findings are less informative about a population in which entrepreneurial activities and cooperation are considerably lower, but appear to be of relevance in settings where developing and innovation activities occur, such as research and development departments of corporations, think tanks and innovation labs. For a more comprehensive test of the individual-level factors relevant for creativity-, innovation- and entrepreneurship-related activities,

future research could engage in investigating these variables in further settings, for instance in the organizational contexts as mentioned or in experiments. Since entrepreneurship relates to heuristics, future research could for instance use heuristic tasks in experiment-like settings to analyze differences between entrepreneurs, non-entrepreneurs and serial entrepreneurs. Following this approach could increase our understanding of how entrepreneurs are different from non-entrepreneurs, and how the performance in this task (e.g. measured by peer-rated creativity) relates to or potentially predicts entrepreneurial behavior, or whether for instance serial entrepreneurs' decision-making processes differ from those of entrepreneurs.

Second, the cross-sectional design of the data used in the thesis represents a further limitation which could be addressed in future research. Although the survey was designed in a way that, for instance, questions on identity and on the firm were purposely located in different sections of the survey, findings would be strengthened by using multiple sources on the independent and dependent variable. Moreover, future work could engage in creating panel data to gather additional information related to firm performance over time. In this way, it would be possible to create a larger sample useful to analyze whether different founder identities have different performance thresholds which could influence the exit rates of their firms.

Finally, chapter four offers several intriguing opportunities for research. Analyzing language through computational linguistic tools, specifically sentiment analysis, allows new ways of indirectly measuring individual-related variables. Words and in particular pronouns reveal core aspects of individuals' identity, thinking style, networks and status as well as behavioral tendencies. Given that the words individuals use are like fingerprints and that language represents a crucial facilitator in entrepreneurial activities, the analysis of language appears to be an interesting research tool in entrepreneurship literature and a promising research trajectory in future studies.





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