

# **MASTER THESIS**

## **Women wanted:**

### **An exploratory study on female entrepreneurial networks in tech ventures**

#### **Double degree program**

M. Sc. Business Administration (University of Twente)

M. Sc. Innovation Management and Entrepreneurship (Technical University Berlin)

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**“What would you do if  
you weren’t afraid?”**

Sheryl Sandberg, COO Facebook

## ABSTRACT

The ability to develop a diverse professional network is a crucial entrepreneurial competence to identify opportunities, access resources and gain legitimacy. Relatively little attention has been paid to the network structure of female entrepreneurs in general, and even less on women entrepreneurs of tech ventures. Therefore, this thesis examines how these processes are influenced by the network structure of female tech entrepreneurs. Data collection was based on triangulation including semi-structured interviews as well as quantitative network analysis of seven female tech entrepreneurs. This exploratory study has been conducted in Germany and provides empirical insights into the network structure of female tech entrepreneurs. Findings suggest that German female tech entrepreneurs display a diverse network, enabling the women to recognize opportunities, access resources and gain legitimacy through their network. Furthermore, it has been observed that families, as part of the network of female tech entrepreneurs, play a crucial role in opportunity recognition and resource allocation, but not in gathering legitimacy. Drawing upon this evidence, several propositions have been developed for testing in future studies. Additionally, an own conceptual model has been developed uniting for the first time network structure and family embeddedness within the venture creation process of female entrepreneurs. The thesis contributes in gathering new empirical data for academia and partially confirms recent research findings. Furthermore, the study points towards future research avenues. Besides, information-rich practical implications for female tech entrepreneurs and women who want to become one are presented.

### **Keywords:**

*Female entrepreneur, venture creation, network structure, family, tech venture, opportunity recognition, resources access, legitimacy*

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## LIST OF ABBREVIATIONS

API	Application programming interface
CEO	Chief executive officer
E.g.	Exempli gratia
Et al.	Et aliae / alii
Etc.	Et cetera
FE	Female entrepreneurship
Fig.	Figure
GDP	Gross domestic product
GE	General entrepreneurship
I.e.	Id est
L	Legitimacy
MBA	Master of Business Administration
n/a	not applicable
OECD	Organisation for economic co-operation and development
OR	Opportunity recognition
RA	Resource access
R&D	Research and development
TIME	Telecommunication, information technology, media and electronics
TV	Tech ventures

# 1 Introduction

## 1.1 Context of the study

Melinda Gates, the first lady of philanthropy, is calling out her new mission: tackle the roots of gender inequality for women in tech (Hempel, 2016). Female entrepreneurs are one of the fastest growing populations among entrepreneurs worldwide (Brush, de Bruin, & Welter, 2009). Nevertheless is the start-up and tech scene, which has been built and shaped by the young generation like no other economic sector, to a great extent a boys-only-club (Schwesinger, 2016). Nearly half of German entrepreneurs are female, but only 9% of tech start-ups are founded by women (Herrmann, Gauthier, Holtschke, Berman, & Marmer, 2015).

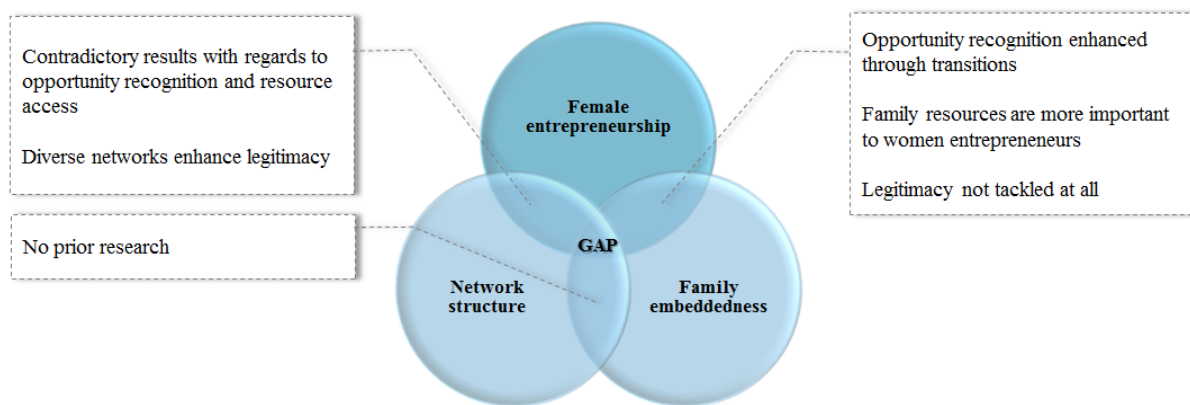
Nowadays, tech ventures producing software-based goods are especially important for the global economy exemplified by tycoons such as Amazon, Google and Facebook (Forbes, 2016). In Germany, tech businesses are also drivers of economic growth. The revenues of German tech ventures are increasing annually about 9%, outperforming the average gross-domestic-product growth of the national economy (Statista, 2016). Therefore, this study focuses on female entrepreneurs of tech ventures with software-based products including web, mobile, and telecom software, as well as e-Commerce (Herrmann et al., 2015).

In order to tackle the gender inequalities within the tech sector the availability of data for female entrepreneurs is crucial, especially on the venture creation process. Recently, the so far neglected gender role in entrepreneurship research has been more in focus when it comes to the foundation of a business (Brush et al., 2009; De Bruin, Brush, & Welter, 2007; Hampton, Cooper, & McGowan, 2009; Hughes, Jennings, Brush, Carter, & Welter, 2012). According to research, three entrepreneurial processes are especially important for the venture creation process: opportunity recognition, resource access and legitimacy (Elfring & Hulsink, 2003; Witt, 2004; Zaheer, Gözübüyük, & Milanov, 2010). Among others, female entrepreneurship research has identified two prominent factors influencing the venture creation process: network structure and family embeddedness (Aldrich & Cliff, 2003; Hoang & Antoncic, 2003; Uzzi & Lancaster, 2003; Witt, 2004; Zaheer et al., 2010). On the one hand, former research indicates that female entrepreneurs might not be able to build a beneficial network structure the same way male counterparts do (Hampton et al., 2009; Hanson & Blake, 2009), other studies suggest that women are able to build inclusive network structures (Martin, 2001). Consequently, there has been a call for more research focused on female entrepreneurial networks (Hughes et al., 2012). Besides network structure, the family embeddedness perspective emerged to be of special importance within female entrepreneurship. Former research argues that women, in comparison to men, view their businesses as interconnected systems and not isolated economic units, with families being the most important player in this interconnected system (Mari, Poggessi, & De Vita, 2016). Relatively little

insights are available for female entrepreneurs and the relation towards family embeddedness. Researchers call for the inclusion of this aspect during the examination of women entrepreneurs (Brush et al., 2009). Therefore, this study aims at closing the existing gap in research with regards to network structure and family embeddedness and their influence on the venture creation process for female entrepreneurs of tech ventures.

## 1.2 Justification for research

This research combines three research strands, namely female entrepreneurship, family embeddedness and network structure. In order to identify a research gap, existing literature in the intersecting areas has been reviewed and knowledge gaps have been identified (see Fig. 1).



**Figure 1. Research domains and research gap**

Source: own depiction

As shown in Fig.1, extant research is available for female entrepreneurs and their network structure as well as the influences of family embeddedness on women-business-ownership. Still, the total amount of studies is low when searching for female-only-samples. Furthermore, studies emphasizing on female entrepreneurial networks present mixed results. All in all, researchers are calling for more qualitative studies on gender and network structure in relation to entrepreneurial activities (Brush et al., 2009; Hanson & Blake, 2009).

The review of the intersection of female entrepreneurship and family embeddedness shows also significant knowledge gaps, especially for gaining legitimacy of the new venture. Furthermore, former research indicates that families shall enhance opportunity recognition and provide access to resources, especially for women (Aldrich & Cliff, 2003; Mari et al., 2016). A call for more research on this topic has been expressed by various researchers (Aldrich & Cliff, 2003; Mari et al., 2016; Powell & Eddleston, 2013).

Lastly, the intersection between family embeddedness and network structure for female entrepreneurs has not been neglected so far in former research. Both concepts have been in focus individually, but a model uniting these important influencers of the venture creation process has not been developed yet. In order to close this research gap, this thesis shall answer the following research question:

How does the network structure influence the venture creation process of family embedded female tech entrepreneurs?

### **1.3 Scientific and practical contribution**

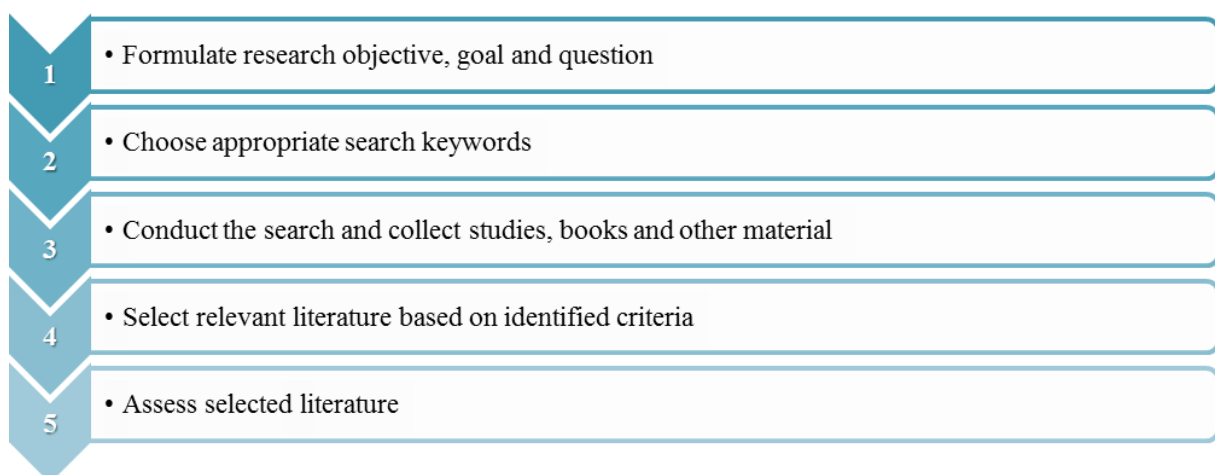
The study at hand provides implications for both, academia as well as management practitioners. The benefit for research is two-fold. First, the literature review reveals current knowledge gaps in the intersections of female entrepreneurship, network structure and family embeddedness. So far, research on female entrepreneurship does not combine the two important concepts of network structure and family embeddedness on the venture creation process. Secondly, in order to close the identified research gap an own research framework based on the literature review and a small-scale mixed-methods study has been developed. Finally, the results of both, the literature review and the own data collection and analysis, lead to the development of a detailed set of propositions with regards to network structure and family embeddedness on the venture creation process. Findings of this explorative study on female entrepreneurs contribute to entrepreneurship literature and also support some recent findings in literature. Lastly, the developed propositions point towards future research paths.

Besides academia, practice can derive alternatives for action from this study at hand. First and foremost, female tech entrepreneurs and those planning to become them can learn from their peers. Hands-on tips for the development and management of networks in a male dominated environment are presented. Furthermore, the results show for which issues family resources are more suitable than resources from business contacts. Additionally, this study provides suggestions for policy makers to lower the barriers for women to become entrepreneurs.

## 2 Literature review

### 2.1 Methodology of the literature review

Conducting a systematic literature review is a key step of every scientific project. A high-quality literature review is unbiased and covers significant literature not restrained to a certain research methodology, journal or geographic region, mapping and assessing existing knowledge (Tranfield, Denyer, & Smart, 2003). Furthermore, an effective review demonstrates the awareness of the current state of knowledge on a chosen topic, but also the limitations and the application of own research to the broader context (Saunders, 2011). A thorough literature review serves as a foundation for the creation of new knowledge and theory development (Webster & Watson, 2002). In this chapter, the methodology used to conduct the systematic literature review leading to the development of an own conceptual framework for this project will be explained (see Fig. 3). The whole process was based on the framework of Webster and Watson (2002).



**Figure 2. Systematic literature review**

Source: own depiction

Commonly, the review of the literature is a task starting at the beginning of an academic project. Nevertheless, searching for relevant literature continues throughout the whole project and is an iterative process. For this study, mainly academic journal articles have been reviewed, but also books, management magazines and institutional reports have been included in the analysis. In order to assess the usefulness of each potential source, assessment criteria have been developed. Research suggests several criteria to evaluate studies; this paper followed the approach of Booth et.al. (2008), using two criteria: relevance and reliability. To assess the relevance of each source, the text was skimmed with regards to pre-defined key words. For the purpose of judging the reliability of each source, several criteria have been included (see Table 1). If a source meets at least 80% of the above mentioned criteria, it has been included in the literature review.

**Table 1. Reliability criteria for literature review**

Criteria	Meaning	Fulfilled, if
<b>Reputable press</b> (see Appendix 1)	Is the source published by a reputable press?	... paper is published by top management journal or top research journal (Utewente, 2016)
<b>Peer-review</b>	Is the article peer-reviewed?	... paper is peer-reviewed (Booth et al., 2008)
<b>Up-to-datedness</b>	Is the source current?	... paper has been published after 2000, the more recent the better (own parameter definition, based on Saunders, 2011)
<b>Relevance</b>	Has the source been frequently cited by others?	... paper is among the top fifty search results on Google Scholar or Science Direct (own parameter definition, based on Saunders, 2011)
<b>Research methodology</b>	Is the source explaining the methodology?	... paper explains methodology in detail (Booth et al., 2008)

In order to build a theoretical framework for the thesis, a four-step approach during the literature review has been implemented (see Fig. 3). First, the literature search was signified by the three themes entrepreneurship in general (GE), female entrepreneurship (FE) especially and tech ventures (TV). For each search string, a list of key words has been established to search for relevant literature on key bibliographic databases such as Google Scholar or Science Direct. The overall goal of the first step of the literature review was to identify overlapping key research streams within the three themes entrepreneurship in general, female entrepreneurship especially and tech ventures. Two key concepts important for female entrepreneurs emerged: network structure and family embeddedness. Secondly, based on this prevalence, the definition of these key terms had to be revealed within the next step. The aim of the third step was to identify at which stage the network structure and family embeddedness influences the entrepreneurial process. By means of logical argumentation, narrowing down and digging deeper into underlying issues, the influence of the two identified search strings have been in focus. Lastly, research gaps and state-of-the-art results on these relations among female and male entrepreneurs had to be found in order to develop an own conceptual framework for this thesis. The next chapter describes the results of each of these four steps in more detail.

STEP	GOAL	RESULTS	NO. PAPER BEFORE / AFTER ASSESSMENT
1	Identify key research streams among female entrepreneurship & entrepreneurship in general	Research streams: Network structure and family embeddedness	52 / 19
2	Definition of key terms	Definition: Tech ventures , network structure and family embeddedness	56 / 27
3	Influence of key research streams on entrepreneurial processes	Entrepreneurial processes: Opportunity recognition, resource access and legitimacy	19 / 10
4	Identify former research findings on key research streams in dependence with entrepreneurial processes	State-of-the-art research findings and research gaps for each relation	66 / 16

**Figure 3. Four-step approach of literature review**

Source: own depiction.

## 2.2 Results of the literature review

### 2.2.1 Network structure and family embeddedness

The first step of the literature review aimed to identify key research streams. Therefore, the leading question within this stage was: “Which research streams are the most prominent ones within female entrepreneurship, general entrepreneurship and tech ventures?” In order to answer the question, numerous sources have been obtained. At the end of the first stage, over 50 sources have been identified among one or more of the three search strings. An overview of the remaining articles after assessing them can be found in Table 2. Thereof, two main research streams emerged. On the one hand the theory on network structure and their importance for entrepreneurs appeared to be predominant in research. Furthermore, extant research indicates that female networks are characterised differently than networks of male counterparts leaving room for interpretation and further research (Hampton et al., 2009). 10 out of the resources from the first literature review round are coping with this topic. On the other hand, the concept of family embeddedness emerged out of the search string on female entrepreneurship an general entrepreneurship. Here, also eight resources include this variable in their scope. In sum, two key research streams have been identified, namely network structure and family embeddedness, fulfilling the first goal of this literature review.

**Table 2. First key literature**

Key words	Topic	Title	Author, Year
<b>Gender + entrepreneurship</b>	GE, FE	Understanding Gendered Variations in Business Growth Intentions Across the Life Course	Davis & Shaver, 2012
		Women Entrepreneurs in the OECD	Piacentini, 2013
		Do different factors explain male and female self-employment rates?	Saridakis, Marlow, & Storey, 2014
		Gender matters in venture creation decision	Aragon-Mendoza, Raposo, & Roig-Dobon, 2016
<b>Women/female + entrepreneur</b>	FE	The Making of the Female Entrepreneur	Ahl, 2003
		Towards Building Cumulative Knowledge on Women's Entrepreneurship	De Bruin, Brush, & Welter, 2006
		Advancing a Framework for Coherent Research on Women's Entrepreneurship	De Bruin, Brush, & Welter, 2007
		A gender-aware framework for women's entrepreneurship	Brush et. al., 2009
		Are Successful Women Entrepreneurs Different From Men?	Cohoon, Wadhwa, & Mitchell, 2010
<b>Network + entrepreneur</b>	GE	Network-based research in entrepreneurship: A critical review	Hoang & Antoncic, 2003
		Entrepreneurs' networks and the success of start-ups	Witt, 2004
		It's the Connections: The Network Perspective in interorganizational Research	Zaheer, Gözübüyük, & Milanov, 2010
<b>Networks + tech ventures</b>	GE, TV	Networks in Entrepreneurship: The Case of High-technology Firms	Elfring & Hulsink, 2003
		Female entrepreneurial networks and networking activity in technology-based ventures	Hampton et al., 2009
<b>Family + entrepreneurship</b>	GE, FE	The pervasive effects of family on entrepreneurship: toward a family embeddedness perspective	Aldrich & Cliff, 2003
<b>Start-up + report</b>	GE, TV	Global Entrepreneurship Monitor: Länderbericht Deutschland	Sternberg, Voerderwülbecke, & Brix, 2015
		KfW-Gründungsmonitor 2015	Metzger, 2015
		3. Deutscher Start-up Monitor	KPMG, 2015
		The Global Startup Ecosystem Ranking 2015	Herrmann, Gauthier, Holtschke, Berman, & Marmer, 2015

### ***2.2.2 Delineation of key terms***

The second step of the literature review aimed to identify the definition for the two identified research streams from step one as well as a proper delineation of the chosen organizational type of tech ventures. Therefore, the leading question within this stage was: “How are the terms tech ventures, network structure and family embeddedness defined in research?” Followed by the results out of the first step of the literature review, the most prominent paper on network structure and family embeddedness had to be revealed in order to define these key terms. Soon, the literature review of Hoang (2003) and the study of Aldrich (2003) emerged as key articles for the definition part. Supported by other well-regarded papers, the second step, the definition part has been executed. The results are displayed in the following chapter.

#### ***2.2.2.1 Tech ventures***

Tech ventures play a decisive role in national economies, not only by creating numerous jobs, but also in contributing a significant amount of innovations driving the market efficiency of an economy (Audretsch, Keilbach, & Lehmann, 2006). Especially for countries with poor natural resources, characterized by high wages and strong export rates such as Germany, tech companies are crucial for staying competitive on a global scale (Bertoni, Colombo, & Grilli, 2011). A lot of terms have been used to include and group tech ventures: web economy, net economy, electronic economy and new economy. In research, Clement (2001) integrates the aforementioned terms to the new term digital economy, including the economic sectors telecommunication, information technology, media and electronics. Based on this definition, the technology sector includes companies which produce technology-based products such as semiconductors, communications equipment, computer hardware and technology-related office equipment, providers of consulting and IT services or software (Clement, 2001).

A summary of the developments over the last decades spanning the four industries telecommunication, information technology, media and electronics (TIME) are displayed in Fig. 4. The innovations in these four industries enabled the development of the digital economy (Kollmann, 2011).

T	Teletext	Videotext TV cable network	Video conferences Telephone conferences	Private satellites Network technologies	Drones
	Data packages	ISDN Mobile phones	UMTS High speed networks		LTE
I	PC	Portable PC	Network PC	Laptop	Tablet Smartphone
	Local-, Wide-Area networks Intra-, Extranet		World-wide-web Call center, Online services	Virtual societies	Cloud computing Big data
M	Colour TV	Stereo TV	Set top boxes		Online service provider
E	Microprocessors Logic chips		Optical chips Neuronal networks	Biochips	Internet of things
	1970	1980	1990	2000	2010

**Figure 4. History of digital commerce**

Source: own depiction, based on Clement (2001) and Kollmann (2011)

Tech ventures can be categorized along various dimensions. First, the differentiation of tech ventures can be based on their *products*. Nowadays, a special focus lies on tech companies, producing software-based goods. Three out of the five most valued brands are such ventures: Amazon, Google and Facebook (Forbes, 2016). In Germany, the relevance of software-based tech ventures is growing as well indicated by increased revenues and employees of digital companies. Sales of German digital firms are growing annually about 9%, outperforming GDP-growth of the German economy (Statista, 2016). As tech companies and especially software-based tech ventures become increasingly important globally, the organizational focus of this thesis lies on tech ventures. Therefore, in this thesis, a tech business is defined as a firm whose products are mostly software-based including web, mobile, and telecom software, as well as e-Commerce (Herrmann et al., 2015). The terms digital venture and tech venture are used synonymously in this study.

Secondly, tech ventures are often categorized according to the *research and development (R&D) intensity*. The most prominent differentiation has been developed by the OECD separating between high-tech, medium-tech and low-tech industries. The differentiation depends on two indicators: direct R&D intensity and R&D embodied in intermediate and investment goods (Hatzichronoglou, 1997). A high-tech company with products based on software is Amazon. They spend approximately 4% of their revenues on R&D (Ycharts, 2016). Zalando is an example for a low-tech company, spending less than three percent of their revenues for R&D (Investing.com, 2016).

Third, tech ventures can be distinguished based on their *growth*. Growth, and especially high-growth serves as an indicator for success of a new venture, but is reached only by few companies (Colombo & Grilli, 2010). Recently, high-growth ventures are also referred to as “unicorns”. These businesses are characterized by a business valuation of more than one billion dollar before going public. The Wall

Street Journal identified 146 high-growth companies, with more than 100 of them being digital companies (Scott Austin, Canipe, & Slobin, 2015). Especially digital companies are able to obtain high growth rates due to their business model characterized by low marginal costs, network effects and low entry barriers to the market. In Germany, so far seven companies could establish the status of a “unicorn”, namely Zalando, Rocket Internet, home24, Auto1 Group, CureVac, Delivery Hero and HelloFresh (Dörner & Trentmann, 2016). Six out of these seven high-growth companies are operating in the digital sector stressing again the economic relevance of tech start-ups in Germany.

Finally, a tech business can be distinguished based on their *online business model*. A simple online presence of a traditional company is called brick-and-mortar. A business that sells both online and at a physical location is called brick-and-click also known as click-and-mortar. A pure-play business is an online business with no physical counterpart (Atkinson, Ezell, Andes, Castro, & Bennett, 2010). Examples for pure-play tech companies based on software products are Delivery Hero, Zalando or Facebook. A brick-and-click venture is for example a traditional retailer with an online shop such as Tchibo or Otto. A brick-and-mortar business is for example a traditional bakery store from around the corner.

#### 2.2.2.2 Network structure

Research on networks, as a coherent strand of research within the field of entrepreneurship, emerged approximately 15 years ago (Hoang & Antoncic, 2003). Instead of seeing the entrepreneur as an isolated economic actor, scholars began to examine the causes and consequences of being embedded in social relationships. One key construct that developed among research on networks in relation to entrepreneurship is the structure of networks (Hoang & Antoncic, 2003; Witt, 2004). Network structure is hereby defined as “the pattern of relationships that are engendered from the direct and indirect ties between actors” (Hoang & Antoncic, 2003, p. 166). The position an actor inhabits within the network influences the resource flows and with that entrepreneurial outcomes (Hoang & Antoncic, 2003).

The structure of a network can be measured in different ways. First, the network structure can be examined based on the most intuitive characteristic, the *size of the network*. The size of the network is defined by the number of networking partner directly linked to the focal actor (Hoang & Antoncic, 2003; Witt, 2004). Studies suggest that the size of the network has a positive influence on various entrepreneurial processes such as growth, foundation of a business or profitability (Witt, 2004). Taking that findings literally, entrepreneurs would be encouraged to increase the size of their network infinitely. An increased network size results in lower dependency on single actors within the network, nevertheless, the maintenance and acquisition of this relations needs time. Therefore continuous

growth of the network is clearly not possible due to time constraints (Zaheer et al., 2010). Based on this assumption, Zaheer (2010) proposes the existence of a nonlinear (inverted u-shape) relation between the size of the network and the influence on entrepreneurial processes, meaning there is an optimal size of the network (Witt, 2004). The size of the network can be measured through various ways. One of the most prominent methods in research is the number of actors a person is connected with on social networks such as LinkedIn for professional purposes or Facebook for non-professional uses.

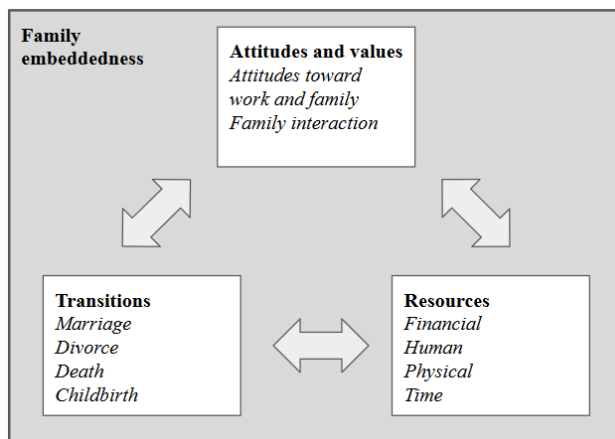
Secondly, the structure of the network can be characterized based on its *composition*. In research, two measurement dimensions for network composition are predominant: diversity and density. First, based on Granovetter's (1973) theory of strong and weak ties, network diversity is one of the most frequently chosen measurement dimension of the network structure within research (Elfring & Hulsink, 2003). Hereby, the focus lies not on the amount of resources an actor can obtain, but on the heterogeneity among the network partner (Witt, 2004). In research, strong ties are defined by high levels of emotional underpinning i.e. family and friends. These ties are very reliable sources of information, but also signified by a high degree of redundancy. In comparison, weak ties underlie a strong rational component, i.e. colleagues or business partner. Weak ties are less reliable than strong ties but offer better access to unique information. In terms of entrepreneurship, a mixture of strong and weak ties seems to be favourable for start-up success (Witt, 2004). A proposed measurement for network diversity is to group the actors according to different criteria such as family, friends and acquaintance (Witt, 2004). Lastly, the measurement of the network density displays the extent to which the focal actor's ties are interconnected. Here, also social network analysis tools are used. The higher the density, the more unlikely is it that new actors and with that new resources will enter the network (Hoang & Antoncic, 2003). Therefore an open network is suggested to be beneficial for entrepreneurs (Hoang & Antoncic, 2003).

### *2.2.2.3 Family embeddedness*

One of the most prominent streams within women entrepreneurship deals with the family embeddedness of female entrepreneurs. Former research argues that women, in comparison to men, view their businesses as interconnected systems and not isolated economic units, with families being the most important player in this interconnected system (Mari et al., 2016). Hereby, a family is defined as two or more persons related by blood, marriage, or adoption (census, 2012). Furthermore, research defines family embeddedness with "the perception or experience that one is loved, cared for by others, esteemed, valued, and part of a mutually supportive social network" (Edelman, Manolova, Shirokova, & Tsukanova, 2016, p.1).

So far, former research exploring women's entrepreneurship developed some consensus that family embeddedness shapes their relationship with employment and self-employment (A. Davis & Shaver, 2012; Greene, Han, & Marlow, 2013; Marlow & McAdam, 2013). All in all, research increasingly recognizes the importance of the household and family context for women in relation to their career named under different concepts such as motherhood, family obligations or family embeddedness. In line with this argumentation, research calls for the inclusion of family embeddedness in women entrepreneurship (Aldrich & Cliff, 2003; Brush et al., 2009; Mari et al., 2016; Saridakis, Marlow, & Storey, 2014).

To this point, entrepreneurship research has not yet found a consensus with regards to the concept of family embeddedness, which is often also called family obligations, family composition or family context. The most regarded concept within general entrepreneurship has been developed by Aldrich and Cliff (2003) and shall therefore serve as a foundation for this paper. The perspective of family embeddedness based on Aldrich and Cliff (2003) is a concept that includes three main pillars: transitions, resources, values and attitudes (see Fig. 6).



**Figure 5. Main pillars of family embeddedness**  
Source: own depiction, based on Aldrich & Cliff, 2003

**Transitions** comprise significant lifetime events such as marriage, divorce, childbirth, retirement or death. In western countries the trend can be observed that family sizes are shrinking and become less customary due to significant changes in marriages, divorce and childbirth rates. In experiencing such disruptions within personal life, individuals may recognize unmet needs which open up as attractive prospects for new ventures. Additionally, the roles within families are changing, especially for women. Former research supports that the occurrence of such lifetime events provide individuals with unique knowledge influencing the venture creation process on various stages such as opportunity recognition or resource access (Aldrich & Cliff, 2003). Transitions can be measured in various ways,

either quantitatively based on demographic statistics for the respective country or region as well as qualitatively through interviews.

*Values, norms and attitudes* include attitudes toward work and family, but also the social interaction between family members (Aldrich & Cliff, 2003). Furthermore, families with entrepreneurs can significantly change the attitude towards entrepreneurship either serving as a role model or as a deterrent. Additionally founding teams are often composed of family members, which might be based on the norms and attitudes towards entrepreneurship within the family (Aldrich & Cliff, 2003). Ultimately, former research suggests that values, norms and attitudes within the family influence new venture creation including processes such as opportunity recognition (Aldrich & Cliff, 2003). Values, norms and attitudes measurement is possible throughout quantitative data collection such as interviews.

Lastly, families provide *access to resources* which are essential within the venture creation process. A resource is defined as an “economic or productive factor required to accomplish an activity or as means to undertake an enterprise and achieve desired outcome.” (BusinessDictionary, 2016a). Examples for resources are land, labour and capital. Individuals are able to access resources through their families such as financial, human, social, physical or time resources. The most prominent resource accessed throughout the family is human resources. For example, former studies revealed that almost one-fourth of new ventures are founded by relatives and kin ties represent another 27% (Ruef, Aldrich, & Carter, 2002). Additionally, extant research indicates that families provide access to financial resources and physical resources such as office space in the household (Aldrich & Cliff, 2003). To measure the access of resources through the family, various methods can be used. First, questionnaires may be able to deliver such data. Furthermore, data can be obtained through qualitative methods such as interviewing entrepreneurs.

### ***2.2.3 Venture creation processes: opportunity recognition, resource access and legitimacy***

The third step of the literature review aimed to identify intersecting influence of the key research streams during the lifetime of an entrepreneur. Therefore, the leading question within this stage was: “Which entrepreneurial processes are influenced by network structure and family embeddedness?” Based on the first two steps of the literature review, an analysis which entrepreneurial processes are influenced by network structure and family embeddedness had to be undertaken. Therefore the key articles identified in the first round were analysed again in order to find the prominent entrepreneurial processes influenced by network structure and family embeddedness. One of the most prominent papers on the topic of network structure has been published by Elfring and Hulsink (2003). This research unites the chosen organizational unit tech ventures and the recognised key concept network

structure. Findings of their study show the influence of network structure on the new venture creation process signified by opportunity recognition, resource access and legitimacy. Additionally, the results of Elfring (2003) have been supported by the key articles of Aldrich (2003) and Hoang (2003) stressing out the influence of both key research streams network structure and family embeddedness on the new venture creation process. Therefore, the venture creation process signified by opportunity recognition, resource access and legitimacy emerged as prevalent for this thesis. Based on that result, the three entrepreneurial processes opportunity recognition, resource access and legitimacy are in focus of this paper. In the following, each of these three concepts is described and the influence of network structure as well as family embeddedness is explained briefly.

The discovery of opportunities, also called *opportunity recognition* is essential for creating an own business. Opportunity recognition is seen as a cognitive process in which individuals try to connect the dots between changes, events and trends to derive new product or service ideas (Ma, Huang, & Shenkar, 2011). In research, a differentiation between first-person opportunities (one recognizes an opportunity for himself or herself) and third-person opportunities (one recognizes an opportunity for someone with the right knowledge and motivation) is prominent. Networks and the exchange of information in these can influence the discovery of opportunities (Hoang & Antoncic, 2003; Ma et al., 2011; Witt, 2004; Zaheer et al., 2010). Based on the interchange of information within networks, entrepreneurs or soon-to-be-ones deliver and capture unique knowledge about the markets and the needs of the customers in order to identify opportunities. Furthermore, possible failures from entrepreneurs within the network might result in the recognition of opportunities among (potential) entrepreneurs. In addition to the network structure, family embeddedness seems to influence opportunity recognition. Former research indicates that individuals identify unmet needs due to the occurrence of lifetime events resulting in the recognition of business opportunities (Aldrich & Cliff, 2003; Brush et al., 2009).

Additionally to the discovery of opportunities, a business needs access to a diverse set of *resources* in order to create a new venture. Again, a resource is defined as an “economic or productive factor required to accomplish an activity or as means to undertake an enterprise and achieve desired outcome.” (BusinessDictionary, 2016a). Former research suggests that individuals are able to access resources through their network more cheaply than under free market conditions. Furthermore, entrepreneurs are also able to access resources through their networks which are not available on the market (Witt, 2004; Zaheer et al., 2010). In addition, extant research indicates that entrepreneurs access resources especially through a mix of strong and weak ties. Strong ties are for example family members. One of the most dominant resources obtained through strong ties are human resources followed by financial resources (Aldrich & Cliff, 2003; Ruef et al., 2002).

Lastly, entrepreneurs need to gather *legitimacy* for their new ventures. Legitimacy in the business context means to be “acceptable or recognized as genuine, valid, or conforming to established codes, customs, rules, or standards of conduct.” (BusinessDictionary, 2016b). New ventures are offering innovative solutions to problems, often inhibiting unknown characteristics resulting in a perceived risk to the customer and resource holders (financiers and employees). In order to reduce this risk, entrepreneurs can gain endorsement from well-respected actors in their network (Zaheer et al., 2010). Furthermore, former research points out that a diverse network enhances the ability to gain legitimacy for the new venture (Elfring & Hulsink, 2003; Hoang & Antoncic, 2003). With regards to family embeddedness, no former research is existent.

### 2.2.4 Research gaps and state-of-the-art research findings

The last step of the literature review aimed to identify the relation of the key research streams and the entrepreneurial processes. Therefore, the leading question within this stage was: “In which way influence network structure and family embeddedness the venture creation processes?” Based on that question, state-of-the-art results within research on the relation between the key research streams on opportunity recognition (OR), resource access (RA) and legitimacy (L) as well as research gaps could be identified. Hereby, each measurement variable has been considered, not only the key construct in general. Especially interesting was to investigate whether research indicates that female entrepreneurs (FE) display differences on these concepts and measurement variables in comparison to results from entrepreneurship in general (GE). Therefore a precise search for literature was initiated (see Fig. 6).

Research stream	Network structure				Family embeddedness			
	Size		Composition		Transitions		Norms, values, attitudes	
Measured variable								
Research area	<i>GE</i>	<i>FE</i>	<i>GE</i>	<i>FE</i>	<i>GE</i>	<i>FE</i>	<i>GE</i>	<i>FE</i>
Entrepreneurial process	OR	OR	OR	OR	OR	OR	OR	OR
Entrepreneurial process	RA	RA	RA	RA	RA	RA	RA	RA
Entrepreneurial process	L	L	L	L	L	L	L	L

**Figure 6. Precise search streams**

Source: own depiction

#### 2.2.4.1 Network structure

Several studies examined the relation between network structure and *opportunity recognition* for entrepreneurs in general and for female founders in specific as well. Both measurement variables, network size and composition have been in focus in former studies. Findings from general entrepreneurship suggest that a big network also delivers more information and with that increases the ability to recognize opportunities. Nevertheless, research indicates that for each individual an optimal network size exists depending on resource constraints such as time (Witt, 2004; Zaheer et al., 2010). With regards to the second measurement variable for the network structure, the network composition, several studies have been examined. Foremost, research supports the view of Elfring and Hulsink (2003) that the network composition, especially a diverse network, enhances access to new information and with that the discovery of opportunities. A beneficial, diverse network composition is shown by low density, based on diverse groups of actors within the network such as gender or a mixture of strong and weak ties (Ardichvili, Cardozo, & Ray, 2003; Arenius & De Clercq, 2005; Hoang & Antoncic, 2003).

Similar to men, women also need to develop an effective network in order to recognize opportunities. Former research studying female founder's networks in relation to opportunity recognition and the network characteristics size and composition reveal mixed results. With regards to network size of female entrepreneurs, Hampton (2009) suggests that female networks are limited in size and therefore in discovering opportunities as well. Findings regarding the network composition of female entrepreneurs are inconclusive. On the one hand, former research indicates that female entrepreneurs inhibit less diverse networks, inhibiting the ability to discover business opportunities (Hanson & Blake, 2009). Women tend to build women-exclusive networks, lacking diversity in terms of gender, resulting in more dense networks. One explanation for that originates in the newness of women business ownership and with that their limited presence (Hampton et al., 2009; Hanson & Blake, 2009). Research points out that especially women in the early phases of their business display less variety in their networks. The more experienced and successful female entrepreneurs are able to maintain diverse networks, overcoming these constraints (Hampton et al., 2009). On the other hand, former studies suggest that women are able to form inclusive and open networks in all stages of the business lifecycle, contrary to the results of Hampton (2009) and Hanson (2009) showing the need for further studies on that topic (Martin, 2001).

Former research examined the relation between network structure and *resource access* extensively for male and female entrepreneurs. Findings obtained for entrepreneurship in general suggests that the size of the network is beneficial for the access of resources. The larger a network, the less is the dependency to access a specific resource through one single partner within the network and the diversity of accessible resources increases as well. Still, research also points out that no individual is

able to grow the network indefinite due to time constraints and therefore suggests that an optimal network size exists (Witt, 2004; Zaheer et al., 2010). In addition to the network size, network composition has been investigated in former studies in relation to resource access. Findings reveal that both measurements of the network composition (density and diversity) are central in accessing resources in an efficient way (Hoang & Antoncic, 2003; Uzzi & Lancaster, 2003; Witt, 2004; Zaheer et al., 2010). An optimal network composition beneficial to access resources is less dense and is diverse in terms of gender and tie strength ((Hoang & Antoncic, 2003; Zaheer et al., 2010).

In line with the results on female entrepreneurial networks and opportunity recognition, results on resources access are mixed. Former studies suggest that women entrepreneurs, especially in the early stages of entrepreneurship, display smaller networks than their male counterparts. This leads to a higher dependency on single actors within the network to access specific resources and the variety of resources is smaller as well (Hampton et al., 2009). Furthermore research suggests that female entrepreneurial networks display network compositions less favourable for accessing resources. Women entrepreneurs, especially in the early stages of entrepreneurship, tend to build less diverse networks, resulting in higher density (Hampton et al., 2009; Hanson & Blake, 2009). A possible explanation for this as indicated by former studies is the missing identification of women with the old-boys-network including formal and informal social organizations (Hampton et al., 2009). In addition, women tend to lack self-confidence, are anxious about discrimination and perceive a lack of competence in comparison to their male counterparts when it comes to entering male-dominated networks. It appears that men and women have different approaches to networks. While females seem to favour social relationships with persons they share empathy, men are more formal, seeking personal advantages from networks (Hampton et al., 2009). This might be an explanation for the indicated limitations with regards to network size and composition of female entrepreneurial networks as well. Nevertheless, some researchers also argue that women entrepreneurs tend to build inclusive and collaborative networks, contrary to the other results (S. E. Davis & Long, 1999; Martin, 2001).

The last entrepreneurial process of the venture creation process, *legitimacy*, has been less in focus of prior research. Some studies tackling entrepreneurs in general indicate that the network composition as well as the network size influences the ability to gather legitimacy for the business. Here, a diverse and open network is seen as especially favourable in order to gain legitimacy (Elfring & Hulsink, 2003; Hoang & Antoncic, 2003). With regards to female entrepreneurial networks and legitimacy, extant research is still scarce. Only one study could be obtained, dealing with this subject. Murphy et. al. (2007) conducted a study on female entrepreneurs and their perceived credibility. Their results emphasize that female entrepreneurs who rely on expert capital from their network are perceived as more legitimate (Murphy et al., 2007). Therefore a network with a lot of experts seems to be important for gaining credibility.

The network structure of females and their influence on the entrepreneurial process is still limited as shown in the limited amount of studies on this subject. Researchers are calling for more studies to further develop theory and increase the knowledge base (Hampton et al., 2009; Hanson & Blake, 2009; Murphy et al., 2007)

#### *2.2.4.2 Family embeddedness*

Following the same approach as with the key concept network structure, the key research stream family embeddedness has been examined. Both identified measurement variables, transitions and norms and values, as well as in the different research areas general entrepreneurship and female entrepreneurship have been in focus. All three entrepreneurial processes as part of the venture creation process have been studied.

The review on the first entrepreneurial process, *opportunity recognition* revealed already blank spots within research. In general, transitions seem to enhance opportunity recognition. Individuals experiencing lifetime events identify unmet needs due to their new circumstances which lead to the discovery of business ideas (Aldrich & Cliff, 2003). Furthermore, former research suggests that values, norms and attitudes within the family influence new venture creation including processes such as opportunity recognition (Aldrich & Cliff, 2003). Findings dealing with female entrepreneurs are still scarce on that subject. Research on female entrepreneurs suggests that women have to leave at least partially their network due to household and caring obligations leading to limited access of market information and with that a decreased ability to identify opportunities (Brush et al., 2009).

The second entrepreneurial process, *access to resources* through family members has been examined by extant research confirming the results of Aldrich and Cliff (2003). Entrepreneurs are able to obtain a variety of resources through family ties, especially human resources and financial resources. Especially transitions seem to influence access to resources. On the one hand, family sizes are shrinking, limiting the ability to access resources through family members. On the other hand, changes in the family structure through divorce, re-marriage or adoption increase the amount of family members and with that the ability to access a variety of resources (Aldrich & Cliff, 2003). Positive norms, values and attitudes towards entrepreneurship seem to be especially important when accessing human resources shown by the high amount of founding teams with relatives or spouses (Ruef et al., 2002). Findings on female entrepreneurs indicate that family resources are more important to women than men, since women show difficulties in developing strong relationships outside the family (Mari et al., 2016; Powell & Eddleston, 2013).

Lastly, the dependency between family embeddedness and *legitimacy* has been examined. Here, significant blank spots and areas for future research have been identified. No prior studies could be obtained on that relationship.

### ***2.2.5 Summary of literature review results***

As stated in the last chapters, both identified concepts, the network structure and family embeddedness, have an influence on three entrepreneurial processes: opportunity recognition, resource access and legitimacy. During the literature review process, differences between results studying male networks and female networks have been revealed. Therefore, the distinction between results on entrepreneurship in general, dominated by male samples, and female entrepreneurship, has been necessary. The literature review on these concepts can be summarized as displayed in Table 3. First, the research results are displayed; afterwards the most prominent researchers contributing to the results are indicated in italic in brackets.

**Table 3. Results of literature review**

Research stream	Network structure		Family embeddedness	
Research area	Entrepreneurship in general	Female entrepreneurship	Entrepreneurship in general	Female entrepreneurship
<b>Opportunity recognition (OR)</b>	<p>Size Curvi-linear relation suggested (Witt, 2004)</p> <p>Composition Open and diverse network enhances access to new information and with that discovery of opportunities (Ardichvili et al., 2003; Arenius &amp; De Clercq, 2005; Elfring &amp; Hulsink, 2003; Hoang &amp; Antoncic, 2003)</p>	<p>Size Female entrepreneurial networks are limited in size (Hampton et al., 2009)</p> <p>Composition 1. Networks are dominated by women, leading to less diversity and more dense networks inhibiting potential to OR (Hampton et al., 2009; Hanson &amp; Blake, 2009) 2. Women build inclusive networks beneficial for OR (Martin, 2001)</p>	<p>Transitions Coping with transitions can enhance recognition of new products/services to fulfil unmet needs (Aldrich &amp; Cliff, 2003)</p> <p>Norms, values and attitudes Positive attitude towards entrepreneurship favours OR, seen in high amount of founding teams consisting of relatives and spouses (Ruef et al., 2002)</p>	<p>Transitions Motherhood limits opportunity recognition (Brush et al., 2009)</p> <p>Norms, values and attitudes Future research</p>
<b>Resource access</b>	<p>Size Curvi-linear relation suggested (Witt, 2004)</p> <p>Composition Open and diverse networks enhance resource flows (Hoang &amp; Antoncic, 2003; Uzzi &amp; Lancaster, 2003; Witt, 2004; Zaheer et al., 2010)</p>	<p>Size Female entrepreneurial networks are limited in size (Hampton et al., 2009)</p> <p>Composition 1. Networks are dominated by women, leading to less diversity and more dense networks inhibiting potential to access resources (Hampton et al., 2009; Hanson &amp; Blake, 2009) 2. Women build inclusive networks enhancing resource flows (Martin, 2001)</p>	<p>Transitions Shrinking family size may reduce the utilization of resources; the increasing prevalence of stepfamilies may increase the pool of potential resources available (Aldrich &amp; Cliff, 2003)</p> <p>Norms, values and attitudes Future research</p>	<p>Transitions Motherhood limits resource access (Brush et al., 2009)</p> <p>Norms, values and attitudes Family resources are more important to women, since women show difficulties in developing strong relationships outside the family (Díaz García &amp; Carter, 2009; Mari et al., 2016; Powell &amp; Eddleston, 2013)</p>
<b>Legitimacy</b>	<p>Size Future research</p> <p>Composition Open and diverse network enhances the ability to gain legitimacy for the new venture (Elfring &amp; Hulsink, 2003; Hoang &amp; Antoncic, 2003)</p>	<p>Size Future research</p> <p>Composition Female entrepreneurs who rely on expert capital are perceived as more legitimate (Murphy et al., 2007)</p>	<p>Transitions Future research</p> <p>Norms, values and attitudes Future research</p>	<p>Transitions Future research</p> <p>Norms, values and attitudes Future research</p>

As shown in the summary of the literature review in Table 3, research faces significant knowledge gaps in tackling the gender aspect in terms of network structure and family embeddedness, whereas a lot of studies are available for entrepreneurship in general. When it comes to the importance of the network structure on entrepreneurial activities, only a handful of studies have been found for women-owned businesses, strengthening the importance for future research on this topic. Even scarcer are the evidence on family embeddedness and its influence on entrepreneurial processes of women-owned ventures. The matrix reveals that opportunity recognition and legitimacy are mostly neglected in extant research on female entrepreneurship and in the case of legitimacy for entrepreneurship in general as well. The summary of the literature review reveals the need for further research on the topic of female entrepreneurship with regards to family embeddedness, since these areas are still blank spots. Furthermore, the matrix displays areas which are filled, but still need further development such as the network structure within female entrepreneurship.

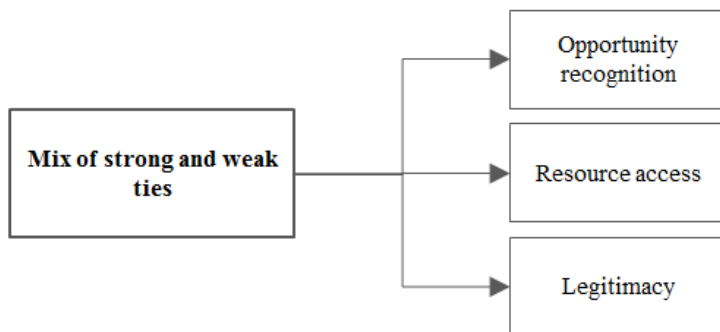
### **2.3 Conceptualisation towards an own framework**

Based on the above stated outcomes of the literature review, this study aims at closing the aforementioned research gaps as well as enriching the existing knowledge about female entrepreneurs. In order to answer the overall research question “How does the network structure influence the venture creation process of family embedded female tech entrepreneurs?” an own conceptual model has been developed based on the following argumentation.

The review revealed various factors influencing female entrepreneurship. The two most prominent concepts network structure and family embeddedness have been discovered during the first stage of the literature review. Based on the importance of this two constructs, their influence on specific processes in the lifetime of an entrepreneur had to be examined. During the following phases of the literature review, three entrepreneurial processes have been identified which are especially important for new venture creation: opportunity recognition, resource access and legitimacy. Sound evidence was found that network structure as well as family embeddedness influences these three entrepreneurial processes. Nevertheless, the reviewed literature showed that these concepts are examined separately, but a holistic concept including network structure and family embeddedness could not be found.

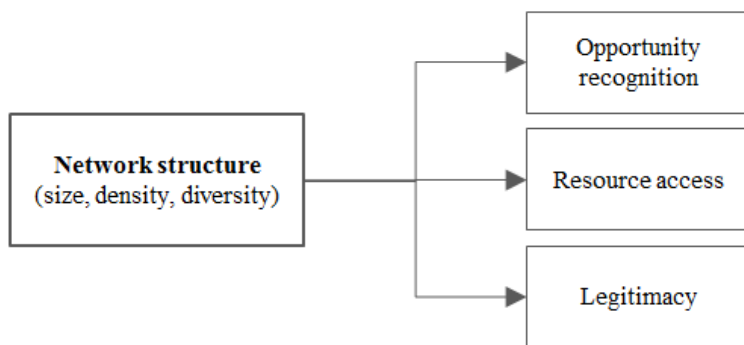
In order to close the research gap an own model has been developed in this thesis, integrating for the first time the two key constructs within female entrepreneurship and new venture creation: network structure and family embeddedness. The model bases on well-regarded findings from the literature review, extending the theoretical knowledge about female entrepreneurship, network structure and family embeddedness in combining these concepts.

First, the model of Elfring and Hulsink (2003) served as a foundation for this thesis (see Fig. 7). As already explained in the previous chapter, the model examines the relation of network structure on the venture creation process for tech ventures. Hereby, the study focused on the mix of strong and weak ties as one aspect of diversity with regards to networks and its influence on the three entrepreneurial processes opportunity recognition, resource access and legitimacy.



**Figure 7. Simplified research framework of Elfring and Hulsink (2003)**  
 Source: own depiction, based on Elfring and Hulsink (2003)

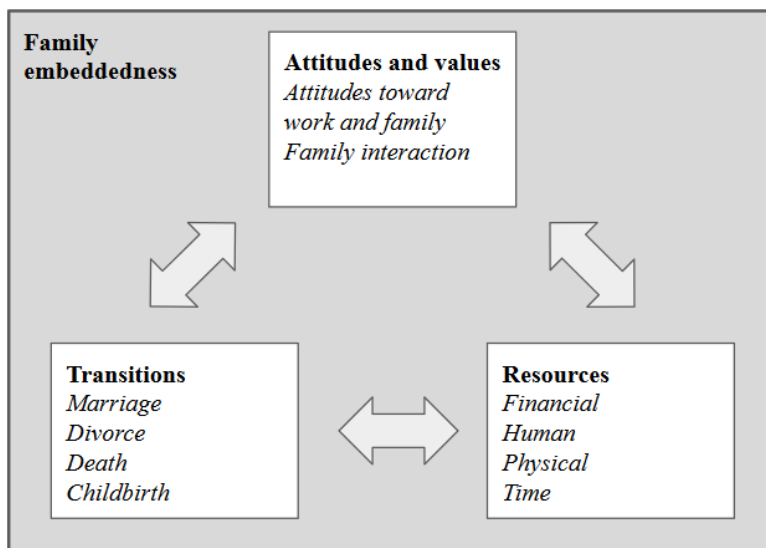
During the literature review, not only diversity in terms of strength of ties emerged to influence the new venture creation process. Three additional network structure dimensions, namely network size, gender diversity and density, emerged to influence opportunity recognition, resource access and legitimacy. First, former research indicates that the size of the network also influences opportunity recognition and resource access (Hampton et al., 2009; Zaheer et al., 2010). No former research exists for the relation between network size and legitimacy, but it is assumed that the network size also influences the ability to gain legitimacy. Second, diversity in terms of gender emerged as an important aspect during the literature review especially for female entrepreneurs. Here, former research indicates that females limit their networks in terms of gender and based on that inhibiting new venture creation processes (Hampton et al., 2009). In order to capture the limitations indicated by former research, the gender diversity aspect needs to be included in the own model. Lastly, the need to further extend the model by density as a dimension of network structure has been based on the literature review. Extant research suggests that open networks, meaning less dense networks, enhance all three entrepreneurial processes (Hoang & Antoncic, 2003). To conclude, the need to extend the model of Elfring and Hulsink (2003) emerged based on latest research findings. The network dimensions size, gender diversity and density have been added to the research framework of Elfring and Hulsink (2003), leading to the following preliminary conceptual model for this thesis:



**Figure 8. Preliminary own model**

Source: own depiction.

Apart from the network structure, family embeddedness has been identified as a key concept within female entrepreneurship during the literature review. Therefore, the model of Elfring and Hulsink had to be extended to show the full picture of new venture creation process among female entrepreneurs. Based on the literature review results and the well regarded perspective on family embeddedness of Aldrich (2003) the components transitions, values and attitudes as part of family embeddedness served as framework for this thesis (see Fig. 9).

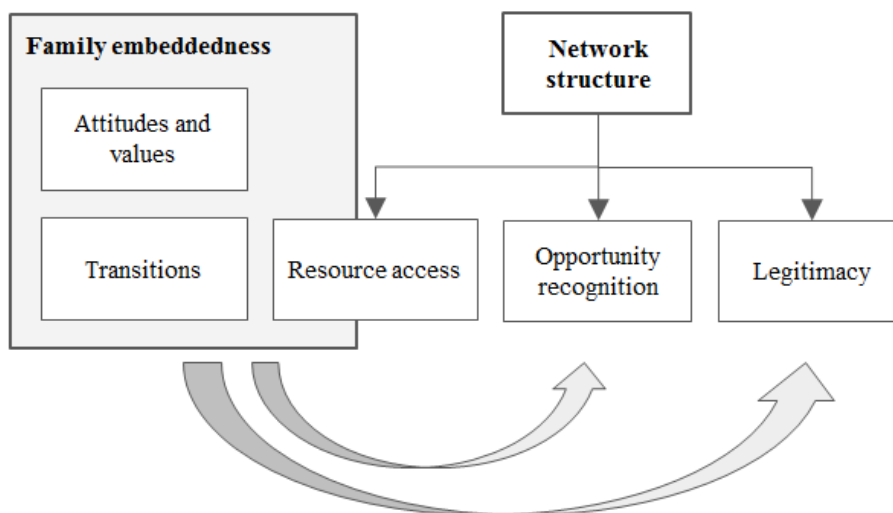


**Figure 9. Family embeddedness model**

Source: own depiction, based on Aldrich & Cliff, 2003

In order to integrate the family embeddedness perspective into the own preliminary model, the relations of family embeddedness on the entrepreneurial processes had to be shown. Former research already indicated that family embedded persons contribute in the opportunity recognition process (Aldrich & Cliff, 2003; Brush et al., 2009; Ruef et al., 2002). No former research exists with regards to

legitimacy, but here also an influence is assumed. Lastly, resource access is part of the family embeddedness model as the only entrepreneurial process (Aldrich & Cliff, 2003). With the purpose of showing the special importance of this entrepreneurial process, resource access will be partly shown as fragment of family embeddedness as well as a stand-alone entrepreneurial process. The resource and information flows are displayed as arrows. For opportunity recognition and legitimacy, the arrows symbolize information flows whereas for resource access the arrow stands for both, information and resource flows. Based on the aforementioned argumentation, the following framework has been derived for this paper (see Fig. 10). This conceptual framework will serve as a foundation for the empiric part of this study.



**Figure 10. Conceptual framework**

Source: own depiction.

So far, both original models of Elfring and Hulsink (2003) and Aldrich and Cliff (2003) have been applied to entrepreneurship in general only, including samples dominated by men. This study will enlarge the applicability of the frameworks by extending the scope examining female entrepreneurs. Furthermore, for the first time, this model will be used to examine the influence of network structure together with family embeddedness on female founder's entrepreneurial processes.

Based on the own conceptual model and the literature review findings, first theoretical general propositions for female entrepreneurs can be developed for testing in this project:

*1.a Female entrepreneurial networks are limited in size, inhibiting opportunity recognition, resource access and gaining legitimacy.*

*1.b Female entrepreneurial networks are dense, restricting opportunity recognition, resource access and legitimacy.*

*1.c Female entrepreneurial networks are less diverse in terms of gender and tie strength, restricting opportunity recognition, resource access and legitimacy.*

*2. Female entrepreneurs embedded in families enrich opportunity recognition, resource access and legitimacy.*

## 3 Methodology

The data gathering is based on empiric triangulation, also known as mixed-method-approach (Bryman, 2006). In this way, qualitative and quantitative methods for data collection are combined in a meaningful structure to answer the research question. In order to ensure that the chosen methods, semi-structured interviews and quantitative network analysis, deliver appropriate results, a pre-test has been conducted. This pre-test revealed that some changes within the interview questions were necessary. After implementation of the changes, the data was obtained. First, a qualitative method, semi-structured interviews, has been used for data collection. In addition to the interviews, a quantitative analysis of the network of the participants has been used to collect data. Each method alone would not be enough to answer the research question based on the own developed conceptual framework. Both data collection methods together serve to answer the research question, combining quantitative data and qualitative data as identified in the literature review. Afterwards, the obtained data has been analysed using coding and pattern recognition among the sample. A detailed guideline on the methodology of this thesis which can be applied to similar future research projects can be found in Appendix 2. The methodology for each of the aforementioned steps is explained in detail in the following chapter.

### 3.1 Data collection methods

#### 3.1.1 *Semi-structured interviews*

Qualitative data collection is especially useful when there is no existing research on the topic as it is the case in this research project (Thompson & Walker, 1998). Furthermore, qualitative methods are recommended for exploratory studies, since new insights can be gathered and the researcher can find out what is happening (Saunders, 2011). Primary data is usually collected via interviews. An interview is hereby defined as “a face-to-face verbal exchange, in which one person, the interviewer, attempts to elicit information or expressions of opinion or belief from another person” (Maccoby & Maccoby, 1954, p. 449). Researcher can choose between different types of interviews depending on the standardization (structured interviews, semi-structured interviews, unstructured or in-depth interviews). Each of these interview types serves a distinct purpose depending on the research question. Non-standardized interviews such as the semi-structured interview, are used not only to comprehend and expose the “what” and “how” of a certain situation, but also to explore the “why” (Saunders, 2011). Additionally, semi-structured interviews can better use the potential of producing knowledge out of the conversations due to their flexibility on following up angles that deem to be important for answering the research question (Leavy, 2014). Lastly, advantages of semi-structured

interviews are a deep understanding through the opportunity of follow-up questions and the capturing of non-verbal expressions (Symon & Cassell, 2012).

Therefore, semi-structured interviews have been chosen as the method to collect qualitative data for this study. Based on an interview guide with a fixed set of mainly open questions, semi-structured interviews have been conducted (see Appendix 3). Each session took approximately one hour. Each interview has been conducted face-to-face or via Skype. Respondents living in Berlin could choose between face-to-face meeting and video chatting. The place and time of the interviews was also selected by the participants. Additionally, the interview language has been chosen by the participants, according to their preference of German or English.

In line with the methodology of semi-structured interviews, not every respondent has been asked all of the questions. The order of the questions also varied during the interviews. Depending on the respondent, questions may have been added as well. All semi-structured interviews have been audio-recorded before transcription. The interview questions have been derived based on the literature review and the derived framework. Therefore, initial questions gather information about the network structure as well as the size and characteristics of the family. In the second steps, questions with regard to the network structure or family embeddedness and their influence on the three entrepreneurial processes opportunity recognition, resource access and legitimacy have been asked.

Each question is based on the systematic literature review, exemplified on the following question from the section “structure of the network”:

<i>S2Q5</i> <i>How many of your contacts are family, friends and business contacts of your network?</i>
---

This question is based on chapter 2.2.2 network structure and is referring to the diversity of the network as emphasized by Witt (2004). The full interview guide as well as the mapping to the literature review can be found in Appendix 3.

As for every research project, potential drawbacks have to be considered when conducting semi-structured interviews with regards to reliability, validity, and generalisation. When it comes to reliability and generalisation, researchers using a qualitative, non-standardised approach need to make clear that the explored circumstances are complex and dynamic and the findings reflect reality at one point of time (Kvale & Brinkmann, 2009). In order to avoid validity concerns, several methods have been applied during preparation and execution of the interviews.

First, researchers have to acknowledge the possibility of interviewer bias, meaning that comments, tone or non-verbal behaviour can prejudice responses (Saunders, 2011). In order to reduce the

possibility of interviewer bias, professional business attitude accompanied by appropriate clothes were used. Furthermore, appropriate facial expressions or nodding have been used to communicate empathy. Lastly, the role of the pollster interviewer was used, interfering as little as possible in order to gain unbiased responses.

Secondly, the response bias has to be considered when conducting semi-structured interviews. The interviewee may only provide a partial picture, trying to look desirable and avoid sensitive information (Saunders, 2011). In order to reduce response bias, the interviewee chose the location for the interview, ensuring a secure atmosphere. Additionally, the beginning of each interview included a description of the content of this study and a little small talk to lighten the mood. Furthermore, each interviewee was again reminded that the information provided will be confidential. At the end of the interview, a short summary of the main points was given. Then the interviewee had the possibility to add missing points or correct points. Each interview has been concluded in the following way: “I have no further questions. Is there anything else you would like to bring up, or ask about, before we finish the interview?” This last sentence provided the subject again the opportunity to mention worries or additional comments (Kvale & Brinkmann, 2009).

### ***3.1.2 Quantitative data collection***

In combination with the semi-structured interviews, the network structure of the participants has been analysed quantitatively with Socilab. Socilab is an open-source, web-based tool to visualize, analyse, and download data of the LinkedIn network (Tutterow, 2015). LinkedIn is one of the most prominent tools within research when it comes to social network analysis and has been chosen for this analysis as well. The tool works with the LinkedIn API and delivers various characteristics of the user's LinkedIn network such as size and network composition. Since Socilab uses slightly different terms for the measurement variables, a mapping of Socilab items to the defined terms of this study has been prepared (see Fig. 6):

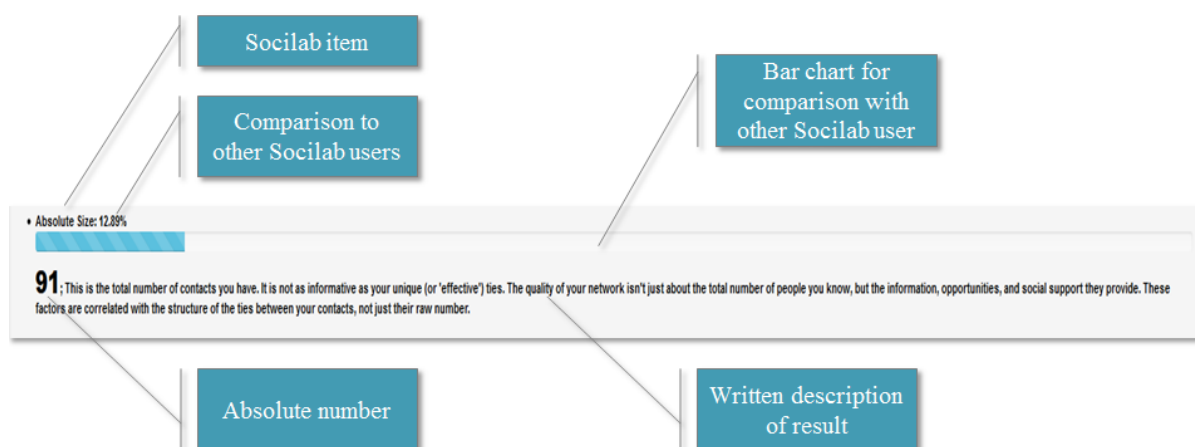
#	Socilab Item	Definition Socilab	Measurement variable		
			Size	Composition	
				Density	Diversity*
1	Absolute size	Total number of contacts	x		
2	Effective size	Not every contact counts the same or adds the same value to the network. Some ties are 'redundant' because some network members know the same people. This measure controls for that fact and gives an estimate of the unique number of actors you are connected to.		x	
3	Network constraint	This is an index measure that describes the extent to which your network spans different groups (i.e. bridging structural holes) or is concentrated in one or two areas. The higher the number, the closed the network is.		x	
4	Density	This is a percentage that represents the number of ties between your contacts divided by the total number of possible ties. The lower the number the less dense the network is.		x	

\* - diversity data has been obtained through semi-structured interviews

**Figure 11. Mapping measurement variables**

Source: own depiction, based on Socilab (2016).

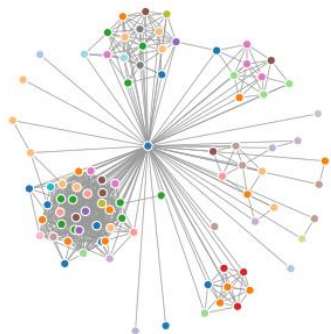
The obtained data from Socilab consists of two parts. First, the items as seen in the mapping are displayed separately as bar charts. Each participant on Socilab gets the own result as absolute figure, a comparison to the total amount of users of Socilab (in percentage and as bar chart) as well as a written description of the result. For the network size of 91, the Socilab analysis would look like the following (see Fig. 7): A bullet indicates which item is analysed, here “absolute size”, followed by a percentage. This percentage shows the comparison of the absolute size to other Socilab users. In this case 12.89% are displayed, showing that the network size of the participant is relatively small in comparison to other Socilab users. This is also shown by the bar chart, directly underneath. Under the bar chart, the number of the actors of the network is displayed in bold (91). Lastly, for each item is a written description provided. This logic is used for every Socilab item, except for the visualisation.



**Figure 12. Example for a Socilab item**

Source: Socilab, 2016.

In addition to the items displayed as bar charts and absolute amounts, the network is displayed graphically (see Fig. 8). Hereby, each dot signifies a direct network partner of the focal actor. The visualisation again allows additional network analyses. Here, the number of clusters can be seen and whether these clusters contain many or few actors. In order to ensure comparability among the participants, the same settings for visualisation have been chosen for all respondents.



**Figure 13. Network visualization on Socilab**  
Source: Socilab, 2016.

Based on Socilab, the data on network structure including measurements regarding size as well as network composition could be obtained. First, the network size is measured by the Socilab item “absolute size”. The network composition and its two components are measured through a number of items within Socilab such as density, network constraint or betweenness (see Fig. 7). For each item, an explanation of the meaning of this value is given in Fig. 9.

#	Socilab Item	Measurement variable		Meaning of absolute value	
		Size	Composition		
			Density		Diversity*
1	Absolute size	x			
2	Effective size		x	The higher this figure the better, meaning that the participant inhibits an open network.	
3	Network constraint		x	The lower this figure the better, meaning that the participant has an open network, bridging a high amount of structural holes and is diverse.	
4	Density		x	The lower this figure the better, meaning that the participant has an open network.	

\* - diversity data has been obtained through semi-structured interviews

**Figure 14. Meaning of items**  
Source: own depiction.

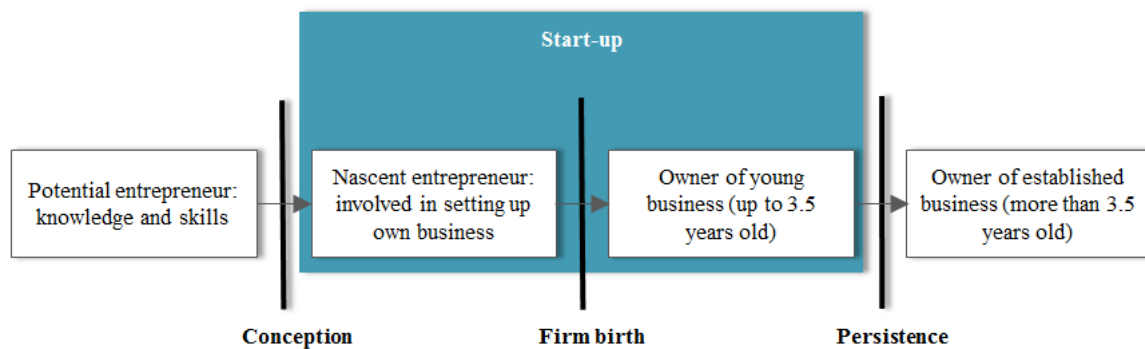
### 3.2 Sample selection

Samples have to be collected with regards to time, access and resources constraints. Qualitative researchers sample for different reasons than quantitative researchers. This is attributable to the research goal, aiming to understand meanings or explanations people assign to certain activities or behaviours. Therefore, validity is of more concern for qualitative researchers than generalizability (Lapan, Quartaroli, & Riemer, 2011). The sample selection for qualitative studies follows one of these prominent concepts: convenience, purpose or theory (Marshall, 1996). A convenience sample is the least severe technique, basing the sample on accessibility of the cases. This usually results in poor data quality and lack of generalizability. Theoretical sampling is based on the grounded theory approach and necessitates the development of new theory. Based on this new model, a sample to examine and elaborate the new concept is derived. This form of sampling is used in almost all qualitative studies. Lastly, the purposeful sampling, also referred to as judgement sample is the most common sampling technique in collecting qualitative data (Marshall, 1996). Based on the work of Marshall (1996) the development of a sample can be based on the following concepts: “study a broad range of subjects (maximum variation sample), outliers (deviant sample), subjects who have specific experiences (critical case sample) or subjects with special expertise (key informant sample). Furthermore, subjects may be able to recommend useful potential candidates for study (snowball sample)” (Marshall, 1996, p. 523). In this study, the principle of judgemental sampling and theory sampling has been the foundation for sample selection based on the following argumentation.

Berlin is the place where most people in Germany found a new business. Berlin has evolved as one of the fastest growing tech hubs, with more than 3,000 active digital start-ups forecasted to create up to 40,000 jobs by 2020 (Herrmann et al., 2015). Berlin, as the start-up capital of Germany, is ranked as the 9th biggest tech hub worldwide. According to the Global Start-up Ecosystem Report (Herrmann et al., 2015) only ten percent of tech entrepreneurs are female. This leads to a total population of female tech entrepreneurs of 300 located in Berlin. Since the probability to reach female tech entrepreneurs is highest in Berlin, the collection of the sample will be concentrated within this city.

When it comes to the process of creating a business, also called the entrepreneurial process, four phases can be distinguished. First, a person needs the skills and knowledge to start up, called the potential entrepreneur. Then, a business idea and the phase of setting up a venture are followed in the phase of a nascent entrepreneur (Sternberg, Vorderwülbecke, & Brixy, 2015). Finally, a firm is officially registered and the entrepreneur owns this young company. Afterwards, the entrepreneur persists in the venture ensuring its long-term success (see Fig. 9). Of these four phases, a start-up is hereby defined as a company in its first stages of operations and includes the stages of a nascent entrepreneur as well as the owner of a young business up to 3.5 years old (Reynolds et al., 2005). In this study, the sample shall contain female entrepreneurs of tech ventures of three stages within the

entrepreneurial process (nascent entrepreneur, owner of young business, owner of established business).



**Figure 15. Phases of the entrepreneurial process**

Source: own depiction, based on Reynolds et. al., 2005.

Furthermore, based on the literature review, the tech ventures themselves have to display certain characteristics. First, only digital companies with software-based products are included in the sample. Second, a tech firm in the context of this study can either be a high-, medium or low-tech company producing software-based goods. Third, digital companies included in the sample can be a high-growth venture, but that is no necessary attribute. Lastly, a tech venture within this study is considered either as brick-and-click or a pure-play business.

Lastly, based on the literature review, female entrepreneurs in different concepts of family embeddedness will be included in the sample based on the theoretical sampling technique. Therefore, the sample shall include i.e. different marital states (single, in a relationship, married, divorced), motherhood or entrepreneurs with entrepreneurial family members.

### 3.3 Sample characteristics

The sample consists of seven female entrepreneurs in Germany. All of them are either the owner (founder) or manager (CEO) of the business (Reynolds et al., 2005). Furthermore, the company is operating in the tech industry, meaning that the products are mostly software-based, such as web or mobile applications or e-commerce (Herrmann et al., 2015). The different businesses are operating in various segments such as e-commerce, online platforms or data analytics. The age of the business ranges from three months up to five years. The mean age of the business within this sample is two years and two months. All women in the sample founded their business on the basis of opportunities, not out of necessity.

In terms of family embeddedness, three out of seven founded their business together with family members. Furthermore, six women of the sample are single, one woman is married. Besides, only one female entrepreneur who participated is a mother. The age of the female entrepreneurs ranges from 25 to 36, whereas the group of 25 to 30 year olds resembles the biggest share with 57%. The average age of the sample is 30. The education level of the female entrepreneurs included in the sample is high. All of them attended higher education at the university and have at least a bachelor's degree; the majority (71%) even have a master degree or a MBA.

The summary of the sample characteristics is displayed in the following table:

**Table 4. Summary sample characteristics**

	Age	Owner/ manager	Type of entrepreneur	Foundation of business	Type of business	Family status	No. kids	Degree
1	32	Manager	Manager young business	Q2 2013	Ecommerce	Single	0	Master
2	25	Owner	Nascent entrepreneur	Q2 2016	Mobile application	Single	0	Master
3	36	Owner	Owner established business	Q4 2011	Ecommerce	Married	2	MBA
4	29	Owner	Owner young business	Q1 2013	Online sharing platform	Single	0	Bachelor
5	28	Owner	Owner young business	Q2 2016	Data analytics	Single	0	Master
6	29	Owner	Owner young business	Q2 2014	Ecommerce	Single	0	Bachelor
7	34	Owner	Owner young business	Q4 2014	Online coaching platform	Single	0	Master

### 3.4 Data analysis

#### 3.4.1 Analysis of qualitative data

All interviews have been recorded using the free android application “Audio recorder” and transcribed using the application “Express scribe”. Research distinguishes four types of transcription: verbatim (representing word-for-word), Jeffersonian (expressing additional features beyond words), gisting (representing just essence or condensed version) and visual transcription (indicating meaning with images) (Paulus, Lester, & Dempster, 2013). In this study, Jeffersonian transcription has been used. In addition to the word-for-word capture of the recording, Jeffersonian transcription aims at displaying further features such as rate of speech, volume or overlapping speech. This is especially useful in the context of coding, making it easier to identify important passages within the vast amount of text. The notation system has been used based on Paulus et. al. (2013) and can be found in Appendix 4.

Besides the approach of Jeffersonian transcription, a mixture of naturalized and denaturalized transcription has been used (Oliver, Serovich, & Mason, 2005). Naturalized transcription refers to word-for-word record, whereas denaturalized transcription rather emphasises on the meanings and perceptions of the participant, excluding unnecessary noise. None of the participants are native speaker in English; therefore wrong grammar or incorrect wording has been edited when the content was not falsified. This editing allows the reader of the transcripts an easier understanding and better comprehensibility (Oliver et al., 2005). In order to capture the maximum of the communication, several cycles of transcription including reviewing the recording several times has been done (Paulus et al., 2013).

As for the data analysis part, the freely available software ATLAS TI has been used. The focus of the analytical part of this project has been the coding. Nevertheless, also other tasks such as patterning, categorizing, interrelating and reasoning have been part of the data analysis. Starting with the most prominent part, coding is hereby referred to as “the process of attaching a meaningful label to a specific portion of the data.” (Paulus et al., 2013, p.127). Nowadays, software tools such as ATLAS TI easily support researcher in creating and assigning codes to data, retrieving data assigned to a particular code, reviewing data in the original version and renaming codes (Paulus et al., 2013). Before elaboration of the coding process, a definition of a code shall be given:

“A code in qualitative data analysis is most often a word or a short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based (...) data. (...) The portion of data to be coded can (...) range in magnitude from a single word to a full sentence to an entire page of text to a stream” (Saldaña, 2009, p.3).

The process of coding followed the framework of Corbin and Strauss (2014), starting with open coding, followed by axial coding and ending with selective coding. Initial coding, also called open coding, has been conducted by reading and analysing the transcripts word by word. The data was disaggregated into conceptual units and labelled with an appropriate code. Similar units of data have been given the same label (Saunders, 2011). Strauss and Corbin (2014) propose three main types to develop names for codes: utilising terms that emerge from the data; basing codes on actual terms used by the respondents (‘in vivo’ codes); or using terms coming from existing theory and the literature. All three methods have been used to generate codes in the open coding process. After discovering the most frequent codes in the initial coding, a shift towards axial coding has been done. Axial coding refers to the process of finding relationships among the categories found in open coding. In the next step, these relationships are used to develop hierarchies among the codes by implementing subcategories. Lastly, one core category emerged in the selective coding process. The whole list of codes and their hierarchy can be found in Appendix 5.

### ***3.4.2 Analysis of quantitative data***

The first step for analysing the quantitative data was to bring them into a comparable format. Therefore Excel has been chosen since the amount of data was small enough to manually transfer and analyse it. First, data with regards to the network diversity in terms of gender as well as tie strength was obtained through the interviews with female tech entrepreneurs and had to be retrieved from the transcripts. Hence, the respective sentence or paragraph was searched and the data was transferred to the table.

Second, the majority of quantitative data has been obtained through the Socilab network analysis application. Here, network size as well as the network composition characteristic density was in focus. For density, three measurement items are provided from Socilab: effective size, network constraints and density (see § 3.1.2). In addition to these characteristics a visual impression of the professional network is provided by Socilab. In order to analyse the data, the input from Socilab was also entered into Excel to have an overview of all network measurements at one place.

All gathered data has been compared within the group of participants, using various univariate analysis methods. First, the range and possible outliers have been identified. Second, measures of central tendency such as mean, mode and median have been calculated. Lastly, percentages for all data in relation to each other have been implemented such as the portion of effective size of the network in relation to the absolute size. Furthermore, the relation of absolute size to density and network constraint has been analysed.

In addition to the comparison within the sample, Socilab also provides a comparison to the whole user group. This data is displayed, as explained in § 3.1.2 as a percentage next to the name of the measured item as well as with a bar chart. Each item in focus has been compared to the whole user base of Socilab and the data was added to the quantitative analyses part in Excel.

### ***3.4.3 Triangulation of qualitative and quantitative data***

In addition to the preparation and analysis of the quantitative and qualitative data individually, both data sources have been analysed together. Therefore, the whole set of obtained data was screened in order to find patterns among the sample.

First, all metrics with regard to the network structure were in focus. Here, for each metrics the data was analysed in relation to each of the three identified entrepreneurial processes opportunity recognition, resource access and legitimacy. That means that the absolute size and the network composition including the diversity (gender and tie strength) and density (effective size, density and network constraint) have been in the centre of attention. For each metrics the analyses from the

quantitative part was interrelated to the data obtained through the semi-structured interviews. Here, it was of special importance to recognize patterns among the sample, for example whether female entrepreneurs with a low diversity in terms of gender display different relations to the venture creation processes than female entrepreneurs with a high gender diversity. The same approach has been applied with the other measurement metrics (diversity tie strength, density and absolute size).

Second, all metrics in relation to family embeddedness were in focus within the triangulation part of the analyses. During this part of the analyses, also pattern recognition was in focus among the sample. Main parts were to identify differences between female well embedded in families and females which have a more distant relation to the family. Furthermore the norms and values within the family and their relation to the entrepreneurial processes have been analysed. Lastly, the different roles within the families and transitions were part of the triangulation of this project.

Third, quantitative and qualitative data have been compared to each other in order to proof whether the subjective impression of the female entrepreneur about the network is congruent with the quantitative data and vice versa. A good example for that is the diversity in terms of gender. Each participant has been asked to state the relation of female and male network partners. During triangulation this subjective impression of the female entrepreneur was compared to the quantitative data in order to see whether they fit together. Additionally, all the other measurement variables such as density or size of the network have been compared in the same way.

## 4 Results and discussion

Despite the increasing importance of women entrepreneurs for national economies (De Bruin, Brush, & Welter, 2006), still huge knowledge gaps exist when examining the unique aspects female entrepreneurs have to face. Hence, this thesis sought to explore the entrepreneurial networks of female tech entrepreneurs and how these influence the entrepreneurial processes opportunity recognition, resource access and legitimacy. Therefore the still barely examined concept of family embeddedness has been adopted from Aldrich (2003). Additionally, the network structure in terms of size, density and diversity has been analysed to investigate its influence on opportunity recognition, resource access and legitimacy. Previous research has explored some of these aspects, but never investigated it before including all this aspects in one study. Furthermore, the organizational type of tech ventures has been neglected in studies so far when it comes to female entrepreneurship in Germany. In order to answer the research question the results of the literature review and the results of this paper shall be compared. This approach enables to see similarities as well as differences and areas where new knowledge has been obtained.

Networking clearly plays an important role for female tech entrepreneurs for obtaining market information, customer needs, resources as well as legitimacy. The women in this study included informal as well as formal activities in their networking behaviour, showing their natural strength as communicator (Hampton et al., 2009). In congruence with the conceptual framework, two central themes, the network structure and family embeddedness have been within the focus of data analysis. The network structure was analysed with regards to three dimensions. First, the network has been characterized based on the measurements identified in the literature review (absolute size, diversity and density). These characteristics were measured using the tool Socilab. Moreover, the features with regard to network diversity have been obtained during the semi-structured interview such as proportion of family and friends within the professional network or the share of male and female network members. Furthermore, the influence of the network structure on opportunity recognition, resource access and legitimacy has been investigated during the semi-structured interviews.

The second theme explored in the semi-structured interviews is the family embeddedness of female tech entrepreneurs in Germany. Aligned with the overall perspective on family embeddedness in research, the dimensions transitions, attitudes and values as well as resources have been examined. Furthermore, the two still missing entrepreneurial processes, opportunity recognition and legitimacy, obtained through the families have been in focus.

Each theme and dimension comprises several codes (see Appendix 5). In order to support the analysis, most appropriate statements from the participants will be included in the results section. With attention to the anonymity of the respondents, the statements are not assigned to an interviewee.

## 4.1 Network structure

### 4.1.1 Network structure results

Based on the literature review, the following data has been obtained quantitatively via Socilab: size of the network and the network composition (density). Furthermore, data concerning network diversity was obtained through the interviews. All data was then compared to each other for confirmation during triangulation.

First, the results for the *network size* shall be shown. Only six participants have a LinkedIn profile, therefore, the variable network size is only available for this six. The smallest professional network included in this sample contains 108 actors, whereas the biggest network comprises more than 500. Due to the constraints of LinkedIn and Socilab, all networks bigger than 500 are only displayed with 500+, the absolute figure is not shown anymore. This results in a large range of 392 for network size among the sample. The comparison of quantitative and qualitative data revealed that all female entrepreneurs have a very good estimate of the size of their network, which was confirmed in the quantitative data.

Secondly, the result for the *network composition* containing diversity and density shall be displayed. The diversity of the network has been analysed with regards to two dimensions: gender and strength of ties. In terms of gender, a tendency towards male-dominated networks could be observed. Only one participant inhibits a network dominated by female actors. On average, 42% of the network members of the respondents are female, 58% are male, showing a high diversity with regards to gender. In terms of tie strength, business contacts display the biggest group within female entrepreneurial networks on average (60%). Strong ties, consisting of family members and friends represent 40% of the network, whereas family actors are the smaller group within that. Only one participant stated that family members are not seen as part of the professional network. In sum, diverse network in terms of gender as well as with regards to the tie strength could be observed among the sample.

The second dimension of the network composition, density, has been measured by the Socilab item effective size, density and network constraint. The effective size displays the number of actors only the participant is connected to, subtracting redundant ties. If a network is very dense, then this figure is small in comparison to the absolute size of the network. Among the sample, the smallest effective size was 56, the highest number obtained was 480. The results on the effective size are especially interesting in relation to the absolute size, showing that a big network is also less dense. The Socilab item density displays how open or closed the network of the participant is based on the analysis of ties between the actors and the total number of possible ties within the network. A low percentage on this item is beneficial, meaning that the participant displays an open network. In the sample, the smallest percentage obtained was 0.95% and the highest percentage was 13,85%. Still, these results are among

the lower quartile of the Socilab users, showing an open network for all the participants in the sample. Here again, it could be observed that a higher absolute size of actors results in lower density. Lastly, density has been analysed using the Socilab item network constraint. This number describes if the network spans different groups and with that if the network is open or closed. A high number describes a closed network, a low number an open network. In this sample all participants displayed a low number, showing an open network. In sum, all three items on density showed that the sample presents an open network. These results have been confirmed by the qualitative data obtained through the semi-structured interviews. Furthermore, it could also be observed that the openness of a network is positive related to the absolute size of the network. A summary of the results with regards to the network structure is displayed in Table 5.

**Table 5. Network characteristics of sample**

	Size	Composition								
		Diversity					Density			
	Absolute size	Gender		Strength of ties			Effective size	as % of absolute size	Density	Network constraint
#		Female	Male	strong ties		weak ties				
				Family	Friends	Business contacts				
1	500	40%	60%	2%	20%	78%	434	87%	3,27	0,7
2	108	50%	50%	n/a*	70%	30%	56	52%	12,19	3,39
3	256	30%	70%	10%	40%	50%	115	45%	13,85	1,53
4	500	25%	75%	5%	15%	80%	480	96%	0,95	0,54
5	500	50%	50%	10%	20%	70%	465	93%	1,72	0,65
6	395	70%	30%	10%	20%	70%	292	74%	6,56	0,96
7	-	30%	70%	40%	20%	40%	-	-	-	-
<b>Univariate analysis</b>										
Mean	377	42%	58%	11%	29%	60%	307	74%	6	1
Mode	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Range	392	45%	45%	38%	55%	50%	424	51%	13	3

\* family not seen as part of professional network

## 4.1.2 Discussion of the relation of network structure and venture creation processes

### 4.1.2.1 Opportunity recognition

When asking whether their network helps the participants to recognize opportunities, similar statements were given by the respondents. All participants stated that they are more aware of business chances due to their network. The focus of the identification of opportunities lies clearly on first-person-opportunities in this sample. This means the female tech entrepreneurs discovered an opportunity for themselves. This led either to the foundation of the now existing company or to the foundation of even more than one start-up.

*“Yeah, I mean the idea for our business, we developed ourselves, but there are often little opportunities were we think ‘ah, that would be also a good idea’. We write it in our, let’s say notebook, idea book, and if we have more capacity this would also be a good addition to our business or this would be a completely different business opportunity which might be worth pursuing.”*

Linking this information to the diverse *network sizes* of the female entrepreneurs, no difference could be observed among the sample. Former research suggests that female entrepreneurial networks are limited in their size (Hampton et al., 2009). Due to this restriction less information is exchanged and with that, the ability to identify business opportunities is less strong for female entrepreneurs than for male entrepreneurs (Hampton et al., 2009). In this sample, 50% display a big network with more than 500 contacts. The smallest network contains 108 actors, but that is due to the fact, that the female entrepreneur just recently joined LinkedIn. Therefore, the real size of the professional network might not be captured yet. The two remaining entrepreneurial networks are medium-sized with 256 respective 395 contacts. Altogether, this study cannot support former evidence that female entrepreneurial networks are restricted in size resulting in the first proposition for this study:

#### *1.a Female tech entrepreneurial networks are not limited in size.*

As the results of this study indicate that female tech entrepreneurial networks are not limited in size, the potential influence on opportunity recognition had to be examined. Women entrepreneurs of the sample exhibiting small networks stated that they gather new business opportunities through their networks. The same could be observed for female entrepreneurs with a large network. Therefore, findings from former research suggesting that an optimal network size exists for recognizing opportunities could not be supported (Witt, 2004). Here it can be assumed that the network size might not be the right variable to investigate the relation between network structure and opportunity recognition. A large network, containing only persons from the same field, education, age, gender or background might deliver a lot of redundant information. Instead, the more appropriate variable in order to examine the relation between network structure and opportunity recognition might be the network composition with regards to diversity and density. An open and diverse network is able to deliver a variety of information about markets and customer needs which in turn enhances the recognition of first-person-opportunities (Ardichvili et al., 2003; Arenius & De Clercq, 2005; Elfring & Hulsink, 2003; Hoang & Antoncic, 2003). Based on the above mentioned findings, the following proposition with regard to professional network size and opportunity recognition has been developed:

*1.b The network size of a female tech entrepreneur does not influence the ability to recognize opportunities.*

In addition to the network size, the *network composition* and its influence on recognizing opportunities has been examined. Former research evidence suggests that the two measurement variables (diversity, density) affect the identification of business opportunities. Findings lead to the assumption that a diverse network with regards to tie strength and gender supports opportunity recognition (Ardichvili et al., 2003; Arenius & De Clercq, 2005; Elfring & Hulsink, 2003; Hoang & Antoncic, 2003). Furthermore, research presents mixed results on the diversity in terms of gender for female entrepreneurial networks. On the one hand, evidence suggests that women entrepreneurs build networks dominated by women, limiting exchange of information and with that the ability to recognize opportunities (Hampton et al., 2009; Hanson & Blake, 2009). On the other hand, former research could not detect such differences for female networks (Martin, 2001). The results of this study support the findings of Martin (2001) indicating that female tech entrepreneurs have no tendency to build women-only-network. While this is contradictory to the results of the literature review dealing with female entrepreneurial networks (Hampton et al., 2009; Hanson & Blake, 2009) these differences might root in the special circumstances of women in tech. The tech industry is highly dominated by men and in order to exchange information within this field, women have no other choice than to network with males. The findings of Hampton (2009) and Hanson (2009) focus more on women in service sectors, which are more equal in terms of gender. Hence, it is reasonable that female entrepreneurs in the service sector can build women-only-networks and still be successful. Furthermore, the findings support former research evidence that female entrepreneurs are able to build inclusive networks with regard to tie strength (Martin, 2001). Both aspects of diversity, gender and tie strength are beneficial for opportunity recognition (Ardichvili et al., 2003; Arenius & De Clercq, 2005; Elfring & Hulsink, 2003; Hoang & Antoncic, 2003). Therefore, the following proposition on female tech entrepreneurs has been developed:

*1.c Female tech entrepreneurs inhibit a diverse network, enabling the ability to recognize opportunities.*

According to former research not only a diverse network, but also an open one supports opportunity recognition (Hoang & Antoncic, 2003). Open networks span different groups and based on that a

higher variety of information is exchanged. This in turn increases the ability to identify opportunities since the information flow regarding markets as well as customer needs is more varied. In this sample, all female tech entrepreneurs display an open network. Hence, former research is supported by this study. Based on the results from the data analysis, the last proposition with regards to network structure and opportunity recognition has been derived:

*1.d Female tech entrepreneurs inhibit an open network, enabling them to recognize opportunities.*

#### *4.1.2.2 Resource access*

Resource access is one of the main benefits of a professional network as indicated by numerous studies (Hoang & Antoncic, 2003; Uzzi & Lancaster, 2003; Witt, 2004; Zaheer et al., 2010). In line with these results, all respondents gave multiple examples in which way their network helped them to access resources. The foremost resources named to be obtained have been financial resources, knowledge about funding and business processes and personnel resources. When asked about the benefits of networks, all participants stated that they could access financial resources via their network or that they are currently seeking for investors via their network. The importance of networks with regards to financial resources can be seen in the following statement:

*“For example two years ago I ran a crowdfunding campaign and you can analyse where all the money comes from. And 80% came from my network.”*

Another important aspect mentioned by the majority of the participants is the access to knowledge through their network. The respondents mentioned that they exchange their experience in funding with other network members, but that they also get access to knowledge about funding such as legal matters in Germany. Furthermore, the respondents could acquire information about the business setting and potential threats, enhancing their knowledge about the market environment they are embedded in. Lastly, the respondents mentioned they were able to access personnel resources through their network. The range of human resources acquired through the network reached from partnering up with members of the network to found the business together up to hiring employees for their business.

*“I mean, in terms of recruiting I use my network. Get access to people, somebody knows someone through someone.”*

Former research on the *size of the network* suggests that female entrepreneurial networks are limited in their size resulting in less resource exchange (Hampton et al., 2009). In line with the results on

network size in relation to opportunity recognition, no such evidence has been found. All participants had a medium-sized or large networks; Therefore, this study cannot support former research findings stating that female entrepreneurial networks are limited in size which lead to less resource flows. Therefore, the following proposition has been derived:

*2.a Female tech entrepreneurial networks are not limited in size, enabling access to resources.*

Furthermore, when asked about the size of the network, it could be observed that the less experienced the entrepreneur is the more activities are in focus to enlarge the network whereas the experienced entrepreneurs were satisfied with their network structure.

*“I would say at the moment it [the network] is kind of organic growth. In the beginning when I was new in the scene I networked a lot. I was almost at every event in Berlin. [...] But I try to scale it down now, because my network is already established.”*

This observation suggests that experienced female entrepreneurs have built a network with a sufficient size with access to all potential resources which might be needed. Therefore, former research indicating that the size of the network is u-shaped in relation to resource access, is supported by these findings (Witt, 2004). Furthermore, this is in line with former findings indicating that the maintenance of a network increases with the amount of network partners (Witt, 2004). Hence, female tech entrepreneurs as well as other entrepreneurs have to manage their time resources in an efficient way and managing a network is part of that. Based on the results of this study on female tech entrepreneurs, the following proposition has been developed:

*2.b Female tech entrepreneurial networks reach an optimal size ensuring access to resources.*

In addition to the network size, the **network composition** has been observed in relation to resource access. Former research on female entrepreneurial networks with regards to diversity presented mixed results. Whereas some research indicates females build less diverse networks in terms of gender and tie strength (Hampton et al., 2009), other findings on female entrepreneurial networks present opposite results (Martin, 2001). First, the network diversity with regards to gender has been examined in this

study. Here, findings of this study suggest that female tech entrepreneurs have no problems in building diverse networks including male and females which ultimately enables resource flows. This contradicts former research results of Hampton (2009) but supports extant findings of Martin (2001). In line with the findings on opportunity recognition, women in tech might display these differences since they are operating in a different environment than the typical female entrepreneur. In order to access the right resources needed in a tech environment, females have to approach male counterparts since they are the ones holding the resources in this sector.

With regards to the tie strength, former research suggests that females rely more on strong ties, inhibiting resource flows (Hampton et al., 2009). The results of this study contradict former findings on female entrepreneurial networks. The differences displayed by women in tech might have their roots in the analytical way of thinking which is especially important in the tech sector. Women in tech often have an educational background within mathematics, engineering, informatics or natural sciences. Again, these fields require analytical skills more often than the typical environment of a female entrepreneur in the service sector. This is one possible explanation for the differences among female entrepreneurs and female tech entrepreneurs. Nevertheless, the findings support evidence from general entrepreneurship, stating that a mix of strong and weak ties is beneficial for resource access. As shown in the analyses, all participants displayed a diverse network in terms of tie strength. Furthermore, it could be observed that female entrepreneurs access their resources through various members of their network depending on the information and resources needed. Family and friends, the strong ties, are approached especially for emotional support whereas business contacts are mainly used to access knowledge, funding or personnel resources. Furthermore, some of the interviewees stated that they would first approach their strong ties and if they cannot provide the resource, other network members would be approached.

*“It is hard to separate business and personal life. So every very very big decision somehow affects your private life and that's why you are obviously go into personal topics and then you are asking family for advice or friends.”*

In line with the results on gender diversity and tie strength, the following proposition has been derived:

*2.c Female tech entrepreneurs display a diverse network, enabling the exchange of resources.*

Lastly, the network composition with regards to density has been observed in relation to resource access. Former research suggests that an open network is preferable for accessing resources (Hoang & Antoncic, 2003; Zaheer et al., 2010). An open network spans different groups of actors and with that increases the ability to approach different people with different knowledge as well as resources. In the sample, all female tech entrepreneurs showed an open network. Therefore, this study supports former research leading to the following proposition:

*2.d Female tech entrepreneurs display an open network, enhancing resource flows.*

*4.1.2.3 Legitimacy*

Lastly, the influence of the network structure on gaining legitimacy for the women-owned business has been questioned. The majority of the respondents were able to gain credibility for their venture on a diverse set of issues. Some were able to hire new people due to recommendations through their network, others acquired funding or access to potential customers. On all these topics, the network helped to reduce the perceived risk that comes along with a relatively young and/or small business.

*“Yeah, it’s all about sharing and caring. So I am somehow also supporting other start-ups that I like to be more aware of within society. So I am sharing as well as my guys within my network sharing news about my company.”*

The *network size* of the sample showed a huge range. Still, every participant could gather legitimacy in this way or another through the network. Again, in line with the findings on size of the network and opportunity recognition, it is assumed that the network size might not be the right measurement instrument to show the relation between network structure and legitimacy. The network composition with diversity and density might deliver better results for that. In line with the findings of this study and due to the fact that no prior research exists on that topic, the following proposition has been developed:

*3.a The network size of a female tech entrepreneur does not influence the legitimacy.*

In addition, the *network composition* has been analysed and interpreted with regards to gaining legitimacy. With regards to gathering legitimacy from the network, former research indicates that a diverse and open network enhances the ability to gain credibility for the business (Elfring & Hulsink, 2003; Hoang & Antoncic, 2003). Indeed, the majority of the sample gave examples supporting this argument. Both measurement variables, diversity in terms of gender and tie strength are high among the sample. The evidence from research suggests that female tech entrepreneurs gained legitimacy in a diverse environment spanning potential customers, employees as well as financiers. When examining the source for legitimacy with regards to their expertise as done by former studies (Murphy et al., 2007), one participants also confirmed that she gained legitimacy through experts. Nevertheless, the results with regards to expert legitimacy have been weak. Therefore, the following proposition with regards to legitimacy and network structure can be formulated:

*3.b Female tech entrepreneurs display a diverse network, helping to gather legitimacy for their business.*

Finally, the density measurement as part of the network composition has been observed in order to gain legitimacy. Here, former research indicates that an open network is beneficial for gathering credibility (Elfring & Hulsink, 2003; Hoang & Antoncic, 2003). An open network spans different groups of actors and with that the potential to gather legitimacy from different actors increases as well. The results of the study support these extant research findings, leading to the following proposition:

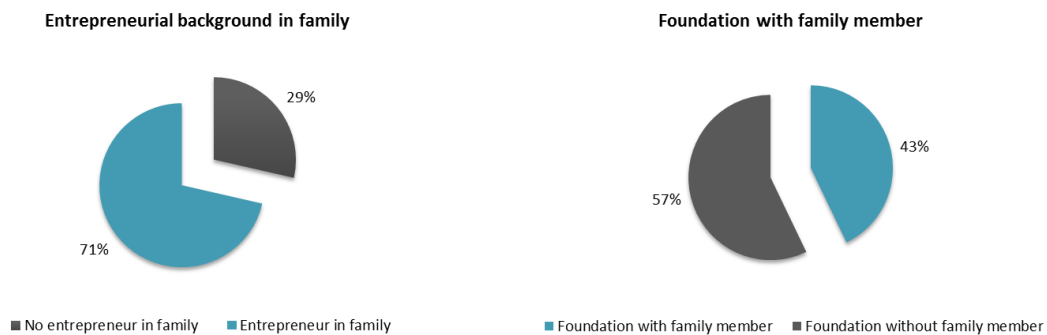
*3.c Female tech entrepreneurs display an open network, positively influencing the ability to gain legitimacy for their business.*

## **4.2 Family embeddedness**

### ***4.2.1 Family embeddedness results***

Based on the literature review, the two variables transitions as well as norms, values and attitudes towards entrepreneurship have been analysed and interpreted for the sample. First, respondents have been asked about their *norms and values* towards entrepreneurship within their family starting with an examination of the entrepreneurial background within the family. Five participants (71%) stated that

entrepreneurs are part of their family; three participants even founded their business together with family members, such as their partner or relatives. These results are displayed in Fig. 13.



**Figure 16. Entrepreneurial background in family**  
Source: own depiction.

Furthermore, in order to get a better impression about norms and values within the family on entrepreneurship, a diverse set of questions has been asked. First, participants were asked to state whether the role of an entrepreneur is seen as desirable in their family accompanied with questions about the support of their family in starting up. The majority of female tech entrepreneurs mentioned that in their family an entrepreneur is seen as a reputable occupation, which is further acknowledged in the support given by the families. All women entrepreneurs declared that they received help from their family, beginning with emotional support or advice and ending in financial support.

When asked about *transitions* occurred during their time as an entrepreneur, only childbirth has been revealed to influence the entrepreneurial processes. Marriage was stated to have no influence on the network, other lifetime events such as death did not occur in the sample. Furthermore, the transition to become a mother enhanced the discovery of opportunities and lead to founding a business targeting families.

## ***4.2.2 Discussion of the relation of family embeddedness and venture creation processes***

### ***4.2.2.1 Opportunity recognition***

First, the influence of *transitions* has been analysed and interpreted. The literature review revealed significant knowledge gaps with regards to the research stream on family embeddedness. The female tech entrepreneurs in this study emphasized the importance of their family with regards to decision making, acquisition of resources, knowledge and emotional support. Former research indicates that lifetime events enhance opportunity recognition (Aldrich & Cliff, 2003). On the other hand, extant

research indicates that transitions, such as becoming a mother, may hinder opportunity recognition (Brush et al., 2009). In this exploratory study, with concern to opportunity recognition only the transition of becoming a mother could be observed to be of importance, but this may be due to the small sample. Marriage as a lifetime event could be observed in the sample, but did not have an impact on opportunity recognition. With regards to motherhood, only one participant gave birth to children so far. Still, the birth of a child resulted in the identification of an unmet need for families and ultimately in closing this gap by founding an own business. This evidence is contradictory to the results of former studies on female entrepreneurship with regards to motherhood and opportunity recognition. Instead, support for findings from general entrepreneurship, indicating that transitions enhance opportunity recognition has been found in the sample. Since only one participant could share experiences on transitions with regard to opportunity recognition, support for former research has been examined, but is very weak because of the sample size. Further research is needed on that relationship.

Secondly, the *norms, values and attitudes* towards entrepreneurship and opportunity recognition have been analysed. The majority of the female tech entrepreneurs had entrepreneurs in their family serving as a role model. Additionally three of the seven female tech entrepreneurs founded their business together with relatives or their partners, showing the importance of relatives on opportunity recognition leading to the foundation of a business.

*“Yeah, I would even say both, because the idea for our business was that we saw the dad of my fiancée, and he did some things in a way we would not do it like that. And that were we said okay, we can do it better or we can make more and that was the way the idea for our own business came up [...].”*

The result supports evidence from former research on entrepreneurship in general, suggesting that relatives and spouses are especially important when recognizing opportunities (Ruef et al., 2002). In this sample, especially first-person-opportunities have been noticed and lead to the foundation of an own business together with relatives or spouses. This is a new insight into female entrepreneurship, since former research was only available for entrepreneurship in general. Therefore, the following proposition for female entrepreneurs has been derived:

4. *Positive norms, values and attitudes towards entrepreneurship within the family of female tech entrepreneurs enhance opportunity recognition.*

#### 4.2.2.2 Resource access

With regards to *transitions* and resource access the following observations and analyses have been obtained. Despite the general trend of shrinking families, a huge amount of resources can be accessed through the family. In line with the network structure, the participants mentioned various resources, which are obtained through the family such as personnel resources, financial resources, advice or knowledge. The most prominent resource provided by the family was stated as personnel resources. As mentioned before, three of the female tech entrepreneurs founded their business together with relatives, showing the huge amount of human resources within the family. Furthermore, several participants could not only find co-founders for their business, but also expertise in other areas.

Besides acquisition of personnel resources, the second most important resource which was obtained through the family is funding. Three of the female tech entrepreneurs interviewed for this thesis received financial support from their family.

*“Definitely, they support me financially. And also they invested in my first company, they were the first investors. [...] otherwise I could not have done it.”*

Lastly, the family provides a lot of emotional support when it comes to business decisions that affect the personal life or vice versa. The interviewees mentioned that they get support if they have problems with employees in the firm, but also for other operational matters such as project management. All in all, the women entrepreneurs stated that they are lucky to have such a supportive family, and without them they could not have started the business. The view emerged that family support is a crucial factor for the resource access.

*“ [...] they [the family] are also one of my biggest advisors in terms of taking decisions and what to do [...]”*

In line with former research results (Aldrich & Cliff, 2003), families are an important basis for accessing resources. Despite the shrinking size of families, female tech entrepreneurs face no difficulties in obtaining resources through their families. The obtained resources reach from personnel resources, financial resources and knowledge up to emotional support. Therefore, the following proposition can be derived:

**5.a**     *The families of female tech entrepreneurs enable the access to a diverse set of resources.*

In addition to transitions, *norms, values and attitudes* towards entrepreneurship and their impact on resource access have been in focus. Contradictory to the literature review (Mari et al., 2016; Powell & Eddleston, 2013), female tech entrepreneurs do not rely more on resources from their family. They prefer to approach their strong ties, but only if they know they will be able to obtain the needed resources. On the other hand, female tech entrepreneurs do not have problems to gather resources through other network members. The argument that female entrepreneurs are not able to develop strong relationships outside their family could not be observed. Again, this difference may have its roots in the operational environment of tech ventures. Typically women entrepreneurs operate businesses in the service sector. Issues occurring there might be not as technical as in the digital sector and can therefore be solved by family members more often. Therefore female entrepreneurs within the service business field do not need to approach weak ties necessarily. Contrary to that, the tech sector requires a specific set of knowledge which might not be accessible through families. Therefore, the following proposition for female tech entrepreneurs has been derived:

*5.b Female tech entrepreneurs approach strong ties first, but not exclusively, to access resources.*

#### 4.2.2.3 Legitimacy

Finally, the respondents were asked to state the importance of their family with regards to gaining legitimacy for their business. With regards to gathering credibility through the family, the results have been unsatisfying. Former research is not existent; still it was assumed that family embedded female entrepreneurs can gather legitimacy for their business from their families. Only one participant confirmed that she could gather legitimacy through the family with regards to potential customers, the other participants stated that this was not the case. Since this participant has not encountered *transitions* during the lifetime of an entrepreneur, no proposition can be derived on this relation. With regards to *norms, values and attitudes*, the absence of gaining legitimacy from the family in this sample delivers some evidence. The missing ability to gather credibility for the business from the family might have its causes in the organizational type of tech ventures. Again, very specific knowledge is necessary to act as source of trust. Family members might not operate in the tech sector and can therefore not deliver this specific knowledge. Hence, family members are also not able to reduce the perceived risk of the new tech venture towards new clients, financiers or future employees. Therefore, a proposition has been derived as following:

6. *The families of female tech entrepreneurs do not enhance the ability to gain legitimacy for the business.*

#### 4.2.2.4 Network structure

This study unites for the first time the two key concepts network structure and family embeddedness. During the course of the project it became obvious that these two factors relate to each other as well. Since no prior research exists, this thesis contributes in creating new theory on the influence of family embeddedness and network structure which in turn might influence the venture creation process. In terms of *transitions*, no generalization for the sample can be withdrawn, since only one female entrepreneur experienced a lifetime event. Furthermore, the relation of *norms and values* and network structure was in focus. Interesting was to find out whether the relation is two-fold or just a one-way-road. Based on the findings of this study, only evidence for the influence of family embeddedness on the network structure has been found. First, families are part of the professional network as shown in the diversity of the networks of the female entrepreneurs. But the impact of family embeddedness goes beyond being a part of the professional network. The analysis of the data has shown that families also influence the network structure through for example delivering new networking members. Based on that, the network structure in terms of size but also in the composition is changing. The findings of this study lead to the emergence of the last proposition with regards to norms and values. Family embeddedness does not only influence the venture creation process directly through opportunity recognition and resources access but also indirectly through its impact on the network structure. Therefore, the last proposition has been developed:

7. *The families of female tech entrepreneurs influence the network structure.*

### 4.3 Summary of empiric results

In the following table, a summary of the results in form of propositions is displayed:

**Table 6. Summary of data analysis results**

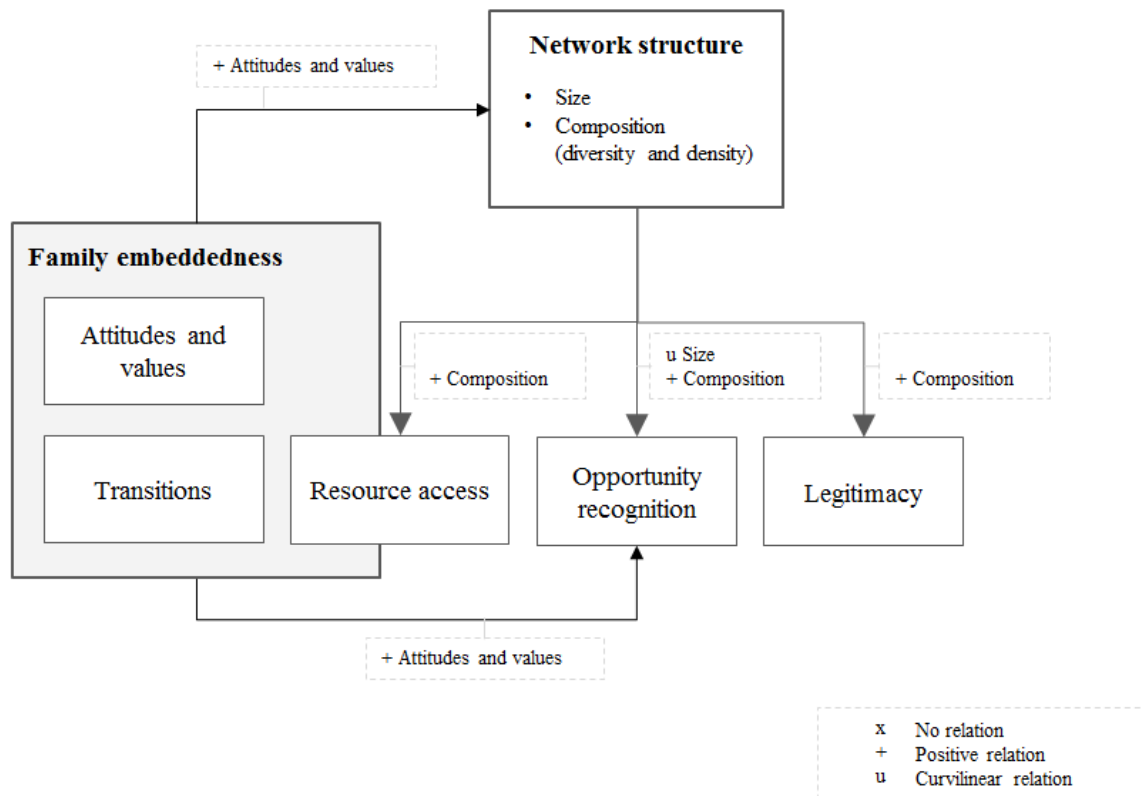
	Network structure	Family embeddedness
<b>Opportunity recognition</b>	<p>Size</p> <p>1.a <i>Female tech entrepreneurial networks are not limited in size.</i></p> <p>1.b <i>The network size of a female tech entrepreneur does not influence the ability to recognize opportunities.</i></p> <p>Composition</p> <p>1.c <i>Female tech entrepreneurs inhibit a diverse network, enabling the ability to recognize opportunities.</i></p> <p>1.d <i>Female tech entrepreneurs inhibit an open network, enabling them to recognize opportunities.</i></p>	<p>Transitions</p> <p><i>Future research needed</i></p> <p>Norms, values, attitudes</p> <p>4. <i>Positive norms, values and attitudes towards entrepreneurship within the family of female tech entrepreneurs enhance opportunity recognition.</i></p>
<b>Resource access</b>	<p>Size</p> <p>2.a <i>Female tech entrepreneurial networks are not limited in size, enabling access to resources.</i></p> <p>2.b <i>Female tech entrepreneurial networks reach an optimal size ensuring access to resources.</i></p> <p>Composition</p> <p>2.c <i>Female tech entrepreneurs display a diverse network, enabling the exchange of resources.</i></p> <p>2.d <i>Female tech entrepreneurs display an open network, enhancing resource flows.</i></p>	<p>Transitions</p> <p>5.a <i>The families of female tech entrepreneurs enable the access to a diverse set of resources.</i></p> <p>Norms, values, attitudes</p> <p>5.b <i>Female tech entrepreneurs approach strong ties first, but not exclusively, to access resources.</i></p>
<b>Legitimacy</b>	<p>Size</p> <p>3.a <i>The network size of a female tech entrepreneur does not influence the legitimacy.</i></p> <p>Composition</p> <p>3.b <i>Female tech entrepreneurs display a diverse network, helping to gather legitimacy for their business.</i></p> <p>3.c <i>Female tech entrepreneurs display an open network positively influencing to gain legitimacy for their business.</i></p>	<p>Transitions</p> <p><i>Future research needed</i></p> <p>Norms, values, attitudes</p> <p>6. <i>The families of female tech entrepreneurs do not enhance the ability to gain legitimacy for the business.</i></p>
<b>Network structure</b>	n/a	<p>Transitions</p> <p><i>Future research needed</i></p> <p>Norms, values, attitudes</p> <p>7. <i>The families of female tech entrepreneurs influence the network structure.</i></p>

In this paper, a comprehensive framework on the new venture creation process of female entrepreneurs has been developed. Therefore, a thorough and systematic literature review has been conducted. First, factors influencing the venture creation process of female entrepreneurs have been identified, namely network structure and family embeddedness. These two concepts have been the baseline for the development of an own conceptual model, showing not only which factors are dominant but also the relationship between network structure and family embeddedness on the venture creation process among female entrepreneurs. Existing knowledge from former research has been combined in order to create this new framework, explaining why these two concepts are important for further research based on state-of-the-art findings and identified research gaps. At the end, a new model for female entrepreneurs focusing on the venture creation process could be developed. This framework served to answer the overall research question, aiming to identify how the venture creation process of female entrepreneurs is influenced.

Based on this new model, quantitative and qualitative data has been obtained. The results of the study partly reinforce existing insights in the literature. With regards to the network structure, former results especially on female entrepreneurs have been inconclusive. The findings of this study support the view from general entrepreneurship, showing that especially an open and diverse network is desirable for opportunity recognition, resource access and legitimacy. Furthermore, insights on possible restrictions of female entrepreneurial networks could not be supported in this sample.

In addition, the still scarce knowledge on the role of families on the venture creation process has been in focus. Results partly reinforce existing knowledge such as the relevance of families to get access to resources. New insights could be obtained for female entrepreneurship and opportunity recognition, confirming the importance of families in this process. Another new angle which has been in focus is the restriction of female entrepreneurs with regards to resource access. Here, findings of this sample suggest that female entrepreneurs do not rely on family resources exclusively as indicated by former research. Women are able to access resources through a diverse network, including families, but not dominated by this part.

All in all, the theoretical contribution of this study is two-fold. First a new model for the venture creation process of female entrepreneurs has been developed. Second, this model has been examined on a small scale in order to derive a set of proposition partly reinforcing former research and partly creating new knowledge within the field of female entrepreneurship. The findings of this project can be summarized as in the above table and lead to the elaboration of the final research model as displayed in the next figure.



**Figure 17. Final research model**

Source: own depiction.

In comparison to the conceptual model established after the literature review, more in-depth knowledge could be obtained and implemented in the final model after the data analysis. With regards to the network structure, the explicit measurement variables and their examined influence on the venture creation process have been added to the model. One example is the relation of the network structure on resource access, where findings suggest that only an open and diverse network in terms of network composition has a positive influence on this entrepreneurial process. Furthermore a new relation has been identified and displayed in the final model: the influence of family embeddedness on the network structure.

## 5 Practical implications

Important lessons can be drawn from these women entrepreneurs in tech for those seeking to start an own venture in this environment and for those who support women entrepreneurship in general. The findings of the exploratory study also offer detailed insights how to manage a professional network in the best way to gain profit for the tech venture and how families can influence women entrepreneurship.

First of all, the experienced female entrepreneurs exhibited a larger and more open network; despite the fact that the priority for formal networking is less in focus than for young entrepreneurs. Network benefits for established entrepreneurs could be observed in a diverse set beginning with the access to resources and ending with legitimacy. Therefore, it can be suggested that female tech entrepreneurs in their early business phases should concentrate on enlarging their business network so that they can benefit from it in later stages. For example women who successfully managed to establish a venture over a longer period also displayed a highly diverse network whereas the young entrepreneurial networks were not as diverse.

Contradictory to the popular assumption that networks in the tech sector are hard to access for females due to the male dominance (Hampton et al., 2009), this exploratory thesis suggests that few barriers exist. All women interviewed stated that there is no physical barrier to attend formal tech networking events as a female, indeed female attendance was very welcome. Anxiety based on gender inequality before such events proved to be unnecessary, leading to the implications that women in tech should not be shy when thinking about attending such events. In contrary, the outcome was positive all the times.

Interestingly, this exploratory study supports the importance of the family in managing and developing a business. Almost all of the women in the sample have been experienced benefits rooting within the family in various ways. Some females could get access to financial or human resources, other women could rely on emotional support for difficult decisions. The results suggest that support from families supports the entrepreneurial processes such as access to resources. Furthermore, families and friends have been the preferred source for information and resources. Therefore, women who consider starting up should not be too proud to ask for help among family and friends, but assess these easily available resources to nurture their business.

Furthermore, the sample consisted of highly educated women, which started their tech business out of opportunities. This evidence allows underlining the importance to foster educational training for entrepreneurship in order to increase the amount of female tech entrepreneurs. Therefore, easily accessible training programmes have to be established capturing issues such as basics on entrepreneurship, financing as well as networking among others.

For policy makers seeking to support female tech entrepreneurs or trying to encourage women to take the path into an own career as entrepreneur, evidence emerges which might help to understand the actual needs of female tech entrepreneurs and would be-entrepreneurs. Some negative aspects such as guilt in not having enough time for family and friends, childcare issues or general concerns in being an entrepreneur may inhibit barriers for future female entrepreneurs. Therefore, German policy makers should focus on establishing policies supporting female founders for example in childcare, and with that lowering these negative aspects. Additionally, a suitable recommendation is to establish more visible role models of successful female entrepreneurs managing to balance work and life. This would likely attract more women to start a career as business owner as well as encourage females currently struggling as entrepreneurs.

## 6 Limitations and future research

The present study has several limitations that should be noted and point towards future research avenues. First, the sample size of seven does not allow a generalization among female tech entrepreneurs or women entrepreneurs in general. This exploratory qualitative study shows first and unique insights in the opinions and circumstances of female tech entrepreneurs located in Germany, leading foremost to an increased knowledge base. Due to the data collection method, the results may be not reproducible, lacking reliability, but not lacking objectivity. They show a picture of the networks and their benefits for women founders at a certain point of time, allowing deriving propositions, which have to be tested with a larger sample size, preferably also in a longitude quantitative setting. Despite these general limitations with regard to reliability and generalization, several specific limitations based on the setting of this study have to be considered.

First, data from female tech entrepreneurs has been collected only in one nation, Germany. Results may be different when sampling in more rural areas or different regions as well as different nations. Therefore, future studies should include other regions and nations as well.

Second, the qualitative data obtained in the interviews may be biased, despite the taken effort to reduce them (see § 3.4.1). At some point, the behaviour of the researcher may have led to biased responses due to the nature of the interview. Furthermore, each interviewee and the responses are based on the daily mood, which may have led to variations in the data such as avoidance of certain topics or the desire to be recognized as a desirable person.

Third, transcription inhibits real challenges for qualitative researchers. In this study, naturalized as well as denaturalized transcription methods have been used in order to minimalize the negatives sides of both methods. Still, transcribing can never really display reality and all surrounding features.

Fourth, the study relied on self-reported data with regards to the network diversity in terms of gender and tie strength. Whereas data from established sources would have been preferred, such data was not available. This leads the road towards future studies, which should obtain data from more independent sources such as professional social networks.

Fifth, data for the network characteristics have been obtained through the professional social network LinkedIn. Here, only six out of seven participants used this network, showing that LinkedIn, as a network originated in the US, is not used by every professional in Germany. Furthermore, it only displays a part of the professional network of female tech entrepreneurs. Some members might not use LinkedIn, and are therefore not included in the analysis. Future studies should try to identify whether LinkedIn displays the majority of professional network members within Germany.

## 7 Conclusion

As Melinda Gates already proclaimed, we have to fight the gender inequality for women in tech, where only one out of ten founders is female (Herrmann et al., 2015). In order to increase the amount of female tech entrepreneurs, the venture creation process and potential obstacles are especially important. Here, the literature review revealed the three processes opportunity recognition, resource access and legitimacy to be of special significance when starting a business (Elfring & Hulsink, 2003; Hoang & Antoncic, 2003; Witt, 2004; Zaheer et al., 2010). Research shows that an open and diverse network is beneficial for the venture creation process (Hoang & Antoncic, 2003; Witt, 2004; Zaheer et al., 2010). Furthermore, extant research suggests that family embedded entrepreneurs have benefits as well when it comes to founding a business (Aldrich & Cliff, 2003). Despite the fact that females are one of the fastest growing populations among entrepreneurs, research so far neglects whole areas within female entrepreneurship such as the role of families on these key entrepreneurial processes or the network structure in combination with that (Brush et al., 2009; Hampton et al., 2009; Hughes et al., 2012). In order to close this research gap, the thesis aimed at answering the central research question: How does the network structure and family embeddedness influence the venture creation process of female tech entrepreneurs?

Therefore, based on the systematic literature review, an own framework for female tech entrepreneurs and the venture creation process has been developed. Based on this framework, the network structure and family embeddedness of seven female tech entrepreneurs has been examined systematically. The results partly emphasize existing research. All female tech entrepreneurs displayed a diverse network enhancing opportunity recognition, resource access and legitimacy. Contradictory to extant research, women in tech do not built women dominated networks. Furthermore, the special role of family on the key entrepreneurial processes has been examined. Results suggest that families play an important role in opportunity recognition and resource access, but not for legitimacy. This research provides unique insights in the entrepreneurial networks of females in tech and the role of the family within this network. The thesis helped to address some of the perceived gaps in research with regard to female entrepreneurship, network structure and key entrepreneurial processes. The newly found evidence points towards future research avenues along the developed propositions and the final research model. Since these propositions are based on a small sample size, future research can advance the generalization of the results by further developing the propositions into testable hypotheses on the basis of a large sample.

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## Appendix

Appendix 1: List of top research journals

Appendix 2: Guideline for researcher

Appendix 3: Interview guide and mapping to literature review

Appendix 4: Jeffersonian transcription system

Appendix 5: List of codes

## **Appendix 1: List of top research journals**

### ***Top management journals:***

AMR – Academy of Management Review  
AMA – Academy of Management Annals  
IJMR – International Journal of Management Reviews  
AMJ – Academy of Management Journal  
OrgScience\* – Organization Science  
Management Science – Operations Management  
ASQ – Administrative Science Quarterly  
SMJ – Strategic Management Journal  
JoM – Journal of Management  
JMS – Journal of Management Studies  
SO – Strategic Organization  
OrgStudies – Organization Studies

### ***Top entrepreneurship journals:***

ETP – Entrepreneurship: Theory and practice  
JBV – Journal of Business Venturing  
SBE – Small Business Economics

### ***Top research methods journals:***

Organizational Research Methods  
Structural Equation Modelling – A Multidisciplinary Journal  
Sociological Methods and Research  
Multivariate Behaviour Research  
Qualitative Research  
Qualitative Inquiry  
Behaviour research methods  
Social Science Research  
Journal of Mixed Methods  
International Journal of Social Research Methodology  
Field Methods  
Methodology - European Journal of Research Methods for the Behavioural and Social Sciences

## Appendix 2: Guideline for researcher

#	Task	Status
<b>1</b>	<b>Data collection preparation</b>	
<b>1.1</b>	<b><i>Methodic preparation for interviews</i></b>	<input type="checkbox"/>
1.1.1	Prepare written introduction for possible participants including: Purpose of the study Explanatino on structure of the interview (semi-structured interview, Socilab) Link to own LinkedIn profile Contact details Link to Socilab	<input type="checkbox"/>
1.1.2	Prepare interviewguideline One-pager on sample characteristics (Name, age, education, family status, number of children, type of business, business model) Guideline with interview questions	<input type="checkbox"/>
1.1.3	Test Socilab (e.g. with own LinkedIn profile)	<input type="checkbox"/>
<b>1.2</b>	<b><i>Identificatoin of participants</i></b>	<input type="checkbox"/>
1.2.1	Define sample Age of business Location of business Type of business	<input type="checkbox"/>
1.2.2	Search for suitable participants i.e. in social networks (facebook groups), professional networks (LinkedIn groups), personal contacts, web-search for female entrepreneurship organisations	<input type="checkbox"/>
1.2.3	Send identified possible participants or organisations written introduction	<input type="checkbox"/>
1.2.4	Schedule meeting for interview	<input type="checkbox"/>
1.2.5	Send follow-up message for possible participants which did not respond after one week	<input type="checkbox"/>
<b>2</b>	<b>Data collection</b>	
<b>2.1</b>	<b><i>Execution of interview</i></b>	<input type="checkbox"/>
2.2.1	Introduction Welcome participant and short small talk Short introduction tot the topic and meeting structure Ask permission to record session Start recording	<input type="checkbox"/>
2.2.2	Part 1: Semi-structured interview Execute semi-structured interview part based on interview guideline Short summary Ask participant if she wants to add something to the interview not caught so far Finish interview	<input type="checkbox"/>
2.2.3	Part 2: Socilab Open socilab Ask participant to connect LinkedIn profile with Socilab Explain Socilab results to participant Ask participant to send screenshots of Socilab results to researcher	<input type="checkbox"/>
2.2.4	Closing Explain next steps for research project State when participant will receive results of the study Thank respondent for participation	<input type="checkbox"/>

<b>3</b>	<b>Data analysis</b>	
<b>3.1</b>	<b><i>Data analysis semi-structured interview</i></b>	<input type="checkbox"/>
3.1.1	Transcription of semi-structured interview First loop: Verbatim transcription Second loop: check verbatim transcription Third loop: add jeffersonian transcription	<input type="checkbox"/>
3.1.2	Coding of semi-structured interviews Open coding Axial coding Selective coding	<input type="checkbox"/>
<b>3.2</b>	<b><i>Data analysis Socilab</i></b>	<input type="checkbox"/>
3.2.1	Transfer results into Excel	<input type="checkbox"/>
3.2.2	Calculate univariate indicator	<input type="checkbox"/>
3.2.3	Analyse figures	<input type="checkbox"/>
<b>3.3</b>	<b><i>Triangulate data from semi-structured interview and Socilab</i></b>	<input type="checkbox"/>
3.3.1	Analyse data with regards to each identified relation in literature review	<input type="checkbox"/>

<b>4</b>	<b>Results and discussion</b>	
<b>4.1</b>	<b><i>Formulate results</i></b>	<input type="checkbox"/>
4.1.1	Results with regard to network structure in general	<input type="checkbox"/>
4.1.2	Results with regard to network structure and each entrepreneurial process Opportunity recognition Resource access Legitimacy	<input type="checkbox"/>
4.1.3	Results with regard to family embeddedness in general	<input type="checkbox"/>
4.1.4	Results with regard to family embeddedness and each entrepreneurial process Opportunity recognition Resource access Legitimacy	<input type="checkbox"/>
<b>4.2</b>	<b><i>Formulate proposition</i></b>	<input type="checkbox"/>
4.2.1	Compare results from study with results from literature review State differences and similarities Define propositions For network structure and each entrepreneurial process For family embeddedness and each entrepreneurial process	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

<b>5</b>	<b>Limitations and future research</b>	
<b>5.1</b>	<b><i>Formulate limitations</i></b>	<input type="checkbox"/>
<b>5.2</b>	<b><i>Deviate future research avenues</i></b>	<input type="checkbox"/>

### Appendix 3: Interview guide and mapping to literature review

Research stream	Entrepreneurial process	Measurement	Method	Item
n/a	n/a	Sample characteristics	Interview	Name of participant
n/a	n/a	Sample characteristics	Interview	Age
n/a	n/a	Sample characteristics	Interview	Education
n/a	n/a	Sample characteristics	Interview	Family status
n/a	n/a	Sample characteristics	Interview	No. of children
n/a	n/a	Sample characteristics	Interview	Name of business
n/a	n/a	Sample characteristics	Interview	Foundation of business
n/a	n/a	Sample characteristics	Interview	Reason for self-employment
n/a	n/a	Sample characteristics	Interview	Business model (in one sentence)
Network structure	n/a	Size	Sociolab	Absolute size
Network structure	n/a	Density	Sociolab	Effective size, density
Network structure	n/a	Structural holes	Sociolab	Network constraints & betweenness
Network structure	n/a	Centrality	Sociolab	Hierarchy
Network structure	n/a	Diversity	Sociolab	Visualisation
Network structure	n/a	Diversity	Interview	Can you describe the composition of your network in terms of gender? Please try to provide percentages for the amount of male and female network members.
Network structure	n/a	Diversity	Interview	Do you feel intimidated by the large amount of men in business networks?
Network structure	n/a	Diversity	Interview	How many of your contacts are family, friends and business contacts of your network? Please also try to break down a percentage for each group.
Network structure	n/a	Diversity	Interview	Do you network mainly with existing contacts or to gather new contacts? Where do you get new contacts?
Family embeddedness	n/a	Network structure	Interview	Have you been able to gather new contacts through your family?
Network structure	n/a	Diversity	Interview	Has the composition of your network changed over time? e.g. prior funding
Network structure	n/a	Diversity	Interview	Do you prefer to network with people you like or people who bring you advantages?
Network structure	n/a	Opportunity recognition	Interview	Have you been able to gather access to unique information via your network that lead e.g. to the discovery of business opportunities?
Network structure	n/a	Opportunity recognition	Interview	How often do you gather new information through your network?
Network structure	n/a	Opportunity recognition	Interview	In your opinion, have you been more aware of business opportunities due to your network?
Network structure	n/a	Opportunity recognition	Interview	Have you been able to identify business opportunities through your family?
Network structure	n/a	Resource access	Interview	Have you been able to access resources through your network? e.g. funding, personal resources etc.
Network structure	n/a	Resource access	Interview	Do you think your network helps you in case of problems within your business? Please describe what kind of problems.
Network structure	n/a	Legitimacy	Interview	Has your network help to gain legitimacy e.g. for business partners or customer?
Network structure	n/a	Legitimacy	Interview	Has someone in your network increased your credibility to accessing funding?
Network structure	n/a	Legitimacy	Interview	Has someone in your network recommended you to potential future employees?
Family embeddedness	n/a	Legitimacy	Interview	Did you gain legitimacy for funding or gatherin business partner or potential employees from your family?
Network structure	n/a	Legitimacy	Interview	Do you think your network encouraged you to found an own (tech) business?
Family embeddedness	n/a	Norms, values, attitudes	Interview	Is the role of an entrepreneur seen as desirable in your family?
Family embeddedness	n/a	Norms, values, attitudes	Interview	Is one of your family members owner or manager of a business?
Family embeddedness	n/a	Norms, values, attitudes	Interview	Has your family supported your idea of founding a business?
Family embeddedness	n/a	Resource access	Interview	How has your family supported you in founding your business? Please describe how they supported you.
Family embeddedness	n/a	Resource access	Interview	Do you think you rely more on your family in accessing resources or other members of your network?
Family embeddedness	n/a	Transitions	Interview	Has a lifetime event (marriage, childbirth, death, etc.) occurred during your time as an entrepreneur?
Family embeddedness	n/a	Transitions	Interview	Has this lifetime event (marriage, childbirth, death, etc.) changed your presence in your network?
n/a	n/a	n/a	Interview	Do you know other female tech entrepreneurs?

#### **Appendix 4: Jeffersonian transcription system**

- ↑ Upward arrows represent marked rise in pitch
- ↓ Downward arrows represent marked fall in pitch
- > < Text encased in “greater than” and “less than” symbols is hearable faster than surrounding speech
- = Equal signs at the end of a speaker’s utterance and at the beginning of the next utterance represent the absence of a discernible gap
- the Underlining represents words uttered with added emphasis
- [ ] Extended square brackets mark overlap between utterances
- (7) Numbers in parentheses indicate pauses timed to the nearest second. A period with no number following, (.), indicates a pause which is hearable, but too short to measure

## Appendix 5: List of codes

Super code	Family code	Codes
Network structure	Diversity	Location network members
		Occupation within network
		Share business contacts within network
		Share family within network
		Share friends within network
		Share male/female in network
		Change network over time
		Gathering new contacts
		Hustling/rational network
		Age composition network
		Amount of people in network
	Diversity and gender	More women lower pressure
		No problems because of gender
		Only few women at network events
		Share male/female in network
		Tech scene dominated by men
		Women more reserved
		Difference men and women
		Emotions in network
		Hustling/rational network
		Men are more rational
		Strong ties first
		Concerns before attending network event unnecessary
	Opportunity recognition	Network support startup decision
		Priority of networking not high at the moment
		Awareness business opportunities through personality
		Awareness of business opportunities via network
	Resource access	Access to finance via network
		Operational information access via network
		Access to personnel resources via network
		Personal development via network
		Priority of networking not high at the moment
		Access knowledge
		Advice from network
		Strong ties first
		Benefits of networks
	Legitimacy	Gaining credibility for finance via network
		Gaining credibility for new employees through network
		Gaining legitimacy through network
		Expert legitimacy

Super code	Family code	Codes
Family embeddedness	Norms and values	Entrepreneurial background in family
		Entrepreneurship is desirable
		Entrepreneurship is not desirable
		Family awareness
		Support partner with children
		Work life balance mothers
		Family patience
		Family supports starting up
		Understanding for entrepreneur in family
	Transitions	Effects childbirth
		Effects marriage
		Occurance lifetime event
	Opportunity recognition	Awareness business opportunities through family
		Human resources in family
	Resource access	Entrepreneurial background in family
		Family first
		Family supports starting up
		Human resources in family
		Access to funding via family
		Access to personnel resources via family
	Legitimacy	Advice from family
		Gaining legitimacy through family
	Network structure	Gathering new contacts through family