

Radboud Universiteit Nijmegen

Work, work, work. Is it a founders' way to success?

To what extent does length of work experience influence the success of a spin-off and to what extent does diversity of work experience moderate this relation?

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1. Introduction

This master thesis addresses the impact of prior work experience upon the performance of new businesses founded by university educated entrepreneurs. These start-up businesses initiated by the university are so-called university spin-offs (USO's) (Fryges & Wright, 2014). Increasingly entrepreneurship education programs are implemented worldwide at universities to encourage and support young entrepreneurs (Fretschner & Weber, 2013). Also in the Netherlands, the Dutch government created attention for entrepreneurial education and implemented policies, like Erasmus for young entrepreneurs, to encourage young entrepreneurs to start their own business (www.ikgastarten.nl). Due to the focus on entrepreneurial education, the contribution of work experience is neglected, thus gaining tacit knowledge and skills which education cannot teach, such as commercial knowledge.

The spin-off businesses contribute significantly to the development and innovation of industries (Muendler, Rauch & Tocoian, 2012). Especially USO's have a unique role in innovation and knowledge spill-overs (Lejpras, 2014). An example is the development of the heart of technology development city of Silicon Valley, where the Stanford University played an important role (Wennberg, Wiklund & Wright, 2011). The innovative knowledge captured in USO's gives them a competitive advantage in the market.

Thus, the focus of the Dutch government is mainly towards start-up businesses, but more attention is needed for the next stage of start-up businesses: fast growing businesses (van Noort, 2015), since fast growing businesses are more important in contributing to the economy and creating jobs than solely start-up businesses, which often stay very small or do not survive at all (Simsek, Jansen, Minichilli & Escriba-Esteve, 2015; Colombelli, Krafft & Vivarelli, 2016). For example, 2.800 fast growing businesses in the Netherlands created more than 70.000 jobs over three years. At the same time, the number of fast growing businesses in the Netherlands declined from 11% to 5,4% due to lacking policies and support of the government (van Noort, 2015). Thus, since attention for start-up businesses is major to fast growing businesses, while fast growing businesses are more important for the economy, more research is needed to clarify what fast growing businesses need in terms of education and prior work experience (Delfmann, Koster & Pellenbarg, 2011). Then, the Dutch government can create policies to support businesses that have substantial potential to grow fast in better ways. This research can contribute to that matter by clarifying what support is needed in terms of education and prior work experience for success of new businesses for these kinds of businesses. This research also contributes to the discussion of the lacking consensus existing in theory about what conditions are needed in terms of education and prior work experience.

Prior research showed no consensus on the impact of work experience on start-up success. Suggested is that the level and length of education is an important predictor of success of start-ups, hence higher and more years of education leads to higher probability of success (Delfmann, et al., 2011). Though, Wennberg, Wiklund & Wright (2011) stated that spin-offs of corporations perform better than USO's due to prior work experience. Even no clarity exists in theory about the contribution of prior work experience to the performance spin-off businesses (Dahl & Reichstein, 2007). While Dahlgqvist, Davidsson, and Wiklund (2000) found that industry experience has no

importance, Merz, Schroeter, & Witt (2010) refuted this as they researched the relationship between different kinds of experience of entrepreneurs (for example, management, technical, industry, entrepreneurial) and the success of new ventures. On top of that, Reuber & Fisher (1999) argue that the accumulated impact of work experience is what is relevant.

Fact is that founders of spin-off business, as entrepreneurs, need specific human capabilities to bring their business to success (Ucbasaran, Westhead & Wright, 2008) and key indicators of human capital are education and work experience (Castanias & Helfat, 2001). Since founders of USO's have similar levels of education, differences in prior work experience form a plausible explanation for differences in business performance (Hatch & Dyer, 2004). The role and importance of different kinds of work experiences often had been the object of research (Dahlqvist, et al., 2000; Merz et al., 2010), but lack a deeper understanding of the importance of work experience for explaining the differences in performance of businesses, referring to the differences of the combination, types and levels of capabilities of entrepreneurs, hence, diversity of work experience (Bailey & Helfat, 2003). The different paths taken by founders account for the differences in length of work experience (Hatch & Dyer, 2004), the diversity of work experience (Mom, Fourné & Jansen, 2015), and also for the different combinations of tenure and diversity, hence tenure combined with diversity amplify each other (Reuber & Fisher, 1999). These heterogeneous paths are an explanation for the different capabilities they obtained and the heterogeneity of their capabilities provides them potential competitive advantages (Alvarez & Busenitz, 2001).

Therefore, the goal of this research is to contribute to theory about spin-offs and fast growing businesses and to provide insight into the importance of diversity of work experience as a human capability for the benefit of self-employment. This research is part of an overarching research about spin-offs (Vaessen, 2001, 2005, 2016) and aims to contribute to the theoretical gap within the overarching research about the role of work experience in the performance of spin-off businesses. Furthermore, as said before, theory until now shows no consensus on the role of work experience for performance of businesses. A deeper understanding of the role of work experience in the performance of businesses is needed in terms of length and breadth (Mom, et al., 2015). In particular, this research elaborates on the different aspects of breadth of work experience such as diversity of industries. This research aims to contribute to literature about human capabilities, in particular work experience and spin-offs.

The results of this research can be used to make recommendations to students and just-graduated who are planning on creating a spin-off business in terms of how to deal with human capital, in particular the gaining of work experience. That means whether or not their chances of succeeding are improved by first making a career or not before starting up a spin-off business and how that career should look like in terms of length, diversity and their combinations. The results also can be useful for the Dutch government in terms of learning how to support human capital for start-up businesses in terms of for example spin-off policies or adjustments in entrepreneurship education.

Therefore, this research aims to answer the research question:

“To what extent does length of work experience influence the success of a spin-off and to what extent does diversity of work experience moderate this relation?”

This master thesis is structured as follows. The next chapter elaborates on theory about diversity of work experience and measurements of success for spin-offs. Also testable hypotheses are derived from the theory section. In chapter three the research method is explained and chapter four discusses the results of the analysis. Chapter five draws conclusions from the results and answers the research question.

2. Theory

2.1 Introduction

To understand the way in which prior work experience affects performance of USO's, this research draws on the resource-based view (RBV) and human capital theory (HCT) (¶2.3). Explained is how human capital contributes to business performance and how human capital can be gained. In particular, elaborated is on the role of work experience in gaining and using human capital as a means to business performance. To be able to examine the influence of prior work experience on performance of a university spin-off, the concept of performance is elaborated on first.

2.2 Performance of university spin-offs

University spin-offs are specifically important for the economy and society because of their innovativeness. As said before, one of the characteristics of university spin-offs is their goal to commercialize academic knowledge, research results and technologies (Fryges & Wright, 2014). Such knowledge spill-overs are important for innovation and the economy (Muendler, et al., 2012; Lejpras, 2014). Furthermore, growth is often used as a performance indicator of start-up businesses and is measured by employee growth and sales (Clarysse, Wright & Van de Velde, 2011; Unger, Rauch, Frese, & Rosenbusch, 2011; Scholten, Omta, Kemp & Elfring, 2015). University spin-offs have a "performance premium" as so-called by Czarnitzki, Rammer and Toole (2014) by providing employment to society, and therefore, performing better in employee growth than industry-start-ups. Employee growth, a non-financial performance indicator, covers for distortions in using sales as a performance indicator, such as lacking sales at the time of founding (Scholten, et al., 2015). Also spin-off businesses value resources and employee growth prior to generating revenues or profit (Clarysse, et al., 2011). Though, to enlarge trustworthiness of growth performance, also sales is included as an indicator of growth. Often sales is used as an indicator of start-up success and therefore is an established measurement (Miettinen & Littunen, 2013; Unger et al., 2011). Furthermore, entrepreneurs tend to look at sales as an indicator of their start-up success themselves (Witt, Schroeter & Merz, 2008). To illustrate performance of university spin-offs: Google and Facebook are both examples of university spin-offs with high performance. Google contributes to society by providing highly innovative products such as the Google glasses, Facebook has grown to employing 13,598 people in 2016 from founding in 2004 (<http://newsroom.fb.com/company-info/>) and both companies are highly profitable. Thus, in this research performance of university spin-offs is measured by innovativeness and growth, and growth is indicated by employee growth and sales.

2.3 Resource-based view & Human Capital Theory

The Resource-based view originally is used in strategic management, but is also applicable in other organizational context, such as entrepreneurship. The essence of the RBV holds that organizations are able to gain competitive advantages, and therefore survival and profitability (Merz et al., 2010), by means of particular resources that are not available to competitors, both tangible and intangible (Wernerfelt, 1984; Barney, 1991; Amit & Schoemaker, 1993). To provide superior value, these resources should meet the criteria of being valuable, rare, imperfect to imitate and sustainable. The heterogeneity of resources thus is central in the RBV (Peteraf, 1993). These resources not only include the assets of a business but also the capabilities (Helfat & Peteraf, 2003; Miller, Xu & Mehrotra, 2015).

The human capital theory compliments the RBV by elaborating on capabilities by defining them as a resource (Hatch & Dyer, 2004; Castanias & Helfat, 2001; Merz et al., 2010). Human capital includes the knowledge and skills generated through learning. Thus, human capital is the outcome of a cumulative process and build through education, work experience, trainings, learning by doing and other activities that enhance knowledge and skills (Merz et al., 2010; Unger, et al., 2011; Becker, 1964). Investments in human capital can be divided in mainly education and experience (Becker 1964; Unger, et al. 2011). Education provides general human capital, whereas experience provides more specific human capital related to jobs and industries. In practice the focus is on the educational investments (Delfmann, et al., 2011), but as founders of USO's are already university educated and therefore possess general human capital, work experience should not be neglected, as experience provides human capital that goes beyond education. This is supported by the fact that entrepreneurs with work experience are provided with knowledge and skills that are distinctive from outcomes of educational investments (Ng & Feldman, 2010; Jayawarna, Jones & Macpherson, 2014), for example commercial knowledge (Wennberg et al., 2011).

2.4 Resources & capabilities for successful entrepreneurship

Thus, according to the RBV and HTC, organizations need heterogeneous resources to gain competitive advantages to increase the probability of survival and profitability. The characteristics of USO's provide superior resources compared to start-up businesses without a parent organization at the time of start-up due to the fact that the founders of the USO's are related to the parent university, as often researchers and graduated students are part of the founders team and thus have benefits as access to the resources of the parent university. USO's further are characterized by their goal to commercialize academic knowledge, research results and technologies (Fryges & Wright, 2014).

However, besides superior resources due to USO characteristics, the founders of USO's themselves need capabilities to be able to manage and deal with the resources bring their businesses to success (Ucbasaran, et al., 2008; Baptista, Karaöz & Mendonca, 2014). For example, founders with more human capital generally have greater certainty about their efficiency and have greater abilities to learn fast about market conditions (Baptista, et al., 2014). Literature specifies that human capital contributes to performance due to several reasons. First, human capital increases capabilities to identify opportunities for creating new businesses. By exploiting these opportunities, spill-over of knowledge from university to society is enhanced (Smith, Matthews & Schenkel, 2009; Unger, et al., 2011). Examples of such capabilities are cognitive capabilities to create new ideas and capabilities of knowing where to get access to resources like financial capital (Bishop & Brand, 2014). Second, human capital has a positive impact on planning and strategy and therefore a positive impact on success by providing capabilities like memorizing complex tasks and being able to make decisions fast (Unger, et al., 2011; Frese, Krauss, Keith, Escher, Grabarkiewicz, Luneng, Heers, Unger, Friedrich, 2007). Third, human capital contributes to acquiring resources or substitutions, since capabilities provide knowledge about what, where and how to get particular resources. Fourth, human capital is necessary for further learning and accumulation of knowledge and skills (Unger, et al., 2011).

2.5 Origin of resources & capabilities for entrepreneurship

The HCT makes a distinction between human capital generated through education and human capital generated through work experience. This distinction is referred to as respectively general human capital and specific human capital (Colombo & Grilli, 2005; Ng & Feldman, 2010). Education and work

experience offer different resources for knowledge development (Clarysse, et al., 2011). Dependent on the different paths that entrepreneurs take, they develop different knowledge bases due to their ability to learn and understanding of how things work. That accounts for heterogeneity, hence diversity, of capabilities and potentially provides competitive advantages (Alvarez & Busenitz, 2001).

2.5.1 Education, resources and capabilities

Entrepreneurial education is based on providing new generations knowledge that has been accumulated by previous generations (Olaniyan & Okemakinde, 2008). Research showed that human capital obtained by education increases productivity and efficiency of individuals by increasing the level of cognitive capabilities (Hatch & Dyer, 2004; Olaniyan & Okemakinde, 2008). The level of cognitive capabilities is the base for further learning and generating capabilities (Hatch & Dyer, 2004). That is done by providing students *codified knowledge*: tangible and documentable knowledge, e.g. courses, lectures, seminars, theories and case studies. The focus of entrepreneurial education has been on creating general awareness of what entrepreneurship entails and encouraging intentional entrepreneurship of students (Maritz & Brown, 2013; Morris, Webb, Fu & Singhal, 2013).

However, more practical skills like out-of-the-box thinking, acquiring and leveraging resources, network and organization building, sales and effective team work are often not provided by education (Rideout & Gray, 2013). Also human capital obtained by educational investments becomes obsolete due to the fact that new generations will provide new knowledge which is cumulated to the existing body of knowledge. Even consecutive school years can differ in what and how is educated. Furthermore, general human capital is homogeneously distributed and other human resources often have the same amount of general human capital and also are available to rivals (Hatch & Dyer, 2004). That is, students at universities obtain similar knowledge and skills due to similar education programs. That does not comply to the guidelines for heterogeneity of resources prescribed by the RBV and HCT. Thus, although education increases cognitive capabilities, and therefore is the base for generating abilities to acquire specific human capital, human capital generated by education will not guarantee competitive advantages.

2.5.2 Work experience, resources and capabilities

Work experience provides knowledge and skills that in general are not provided by educational investments due to the fact that work experience provides *tacit knowledge*. Tacit knowledge consists of knowledge and skills obtained through learning by doing (Hatch & Dyer, 2004). It is embedded in routines, skills and relationships and firm or industry specific and hard to make explicit (Ng & Feldman, 2010). Due to the fact that this tacit knowledge is embedded within the organization, rivals cannot use that knowledge the same way and therefore it potentially provides a competitive advantage. The downside is that specific human capital is only partially transferrable due to its firm-specificity.

2.5.2.1 Tenure of work experience

Specific human capital obtained by work experience provides founders competences for their (new) organization (Datta, Guthrie & Wright, 2005). The most used indicator of work experience is length of work experience (in years). Length of prior work experience can provide founders increased learning performance, abilities to think on a more complex level, and facilitate problem-solving processes by providing cognitive capabilities (Hatch & Dyer, 2004), due to experiencing a variety of organizational challenges and solutions (Mantzavinos, North & Shariq, 2004). For example, experience provides

individuals with new perceptions and new ways to assess environmental aspects of problems or situations and enables them to deal with problems in new ways. Furthermore, staying in the same job for a longer time increases depth of human capital provided by that job, which is needed to improve learning performance (Hatch & Dyer, 2004). These conclusions were found by empirical research, for example Hatch & Dyer (2004) surveyed 25 organizations in the United States, Asia and Europe, combined with follow-up interviews. Contrary, Mantzavinos et al. (2004) based their research on mainly literature. Both researches concluded in favor of tenure of work experience having a positive influence on human capital and, following the RBV and HCT an expected positive influence on performance of university spin-offs. Length of work experience does not only provide knowledge, but also opportunities for building networks and gaining professional and social contacts (Baptista, et al., 2014). Having established relationships in certain industries can provide founders competitive advantages by increasing access to human resources and information about stakeholders such as suppliers, customers or other stakeholders, which allow for growth (Seibert, Kraimer, Liden, 2001).

Thus, tenure of work experience provides founders with industry-specific knowledge, such as customer demand, products, technologies, suppliers and competitors, and with social connections to both customers and professionals. Having that knowledge helps founders to deal with identifying and exploiting new opportunities and leading to new knowledge creation and innovation (Smith, et al., 2009; Unger, et al., 2011; Bishop & Brand, 2014) Therefore, it is expected that:

Hypothesis 1a: Length of work experience has a positive effect on innovativeness of USO's.

Furthermore, having the right contacts through employment in the industry, such as customer demand, suppliers, competitors and other stakeholders, increases opportunities for growth by providing access to human resources, other resources and knowledge about the industry, such as customer demand (Seibert, et al., 2001; Unger, et al., 2011). Therefore, it is expected that:

Hypothesis 1b&c: Length of work experience has a positive effect on growth in terms of (b) size and (c) sales.

2.5.2.2 Diversity of work experience

Mom, et al. (2015) found that tenure limits variety and diversity of experience, by surveying 377 managers with substantially different kinds of experience. Diversity refers to the breadth of work experience, which is another aspect and indicator of work experience. Prior research namely stated that founders need to be multi-skilled and have sufficient knowledge of a variety of areas to achieve success of their business (Lazear, 2005), while founders of university spin-offs, in particularly students or just graduated, often lack business experience (Siegel, Waldman & Link, 2003; Wright, Hmieleski, Siegel & Ensley, 2007). For example, research experience and education provides different knowledge and skills than work experience in manufacturing, service organizations or governmental organizations. Various researches support the fact that different industries matter for heterogeneity (Bishop & Brand, 2014; Hu & Liu, 2015). For example, Hu & Liu (2015) empirically investigated the heterogeneity of career experiences of 1332 CEOs in Asia, defined as number of former employers and types of industries like manufacturing and government, and found a strong significant heterogeneous impact of diversity of work experience on corporate decision making. Gaining knowledge from different industries thus helps founders being able to operate profitable. The effect was explained by the fact that heterogeneous employment history helps accumulating social

connections which provide access to resources (Nguyen, Allen & Godkin, 2006; Hu & Liu, 2015). Employment in diverse industries exposes founders to different kinds of business environments (Custódio, Ferreira & Matos, 2013). Successful CEOs of large organizations indicated themselves that diversity of work experience has learned them to, for example, deal with a variety of people and setbacks, as (Reuber & Fisher, 1999). Also gaining knowledge from multiple sources, hence different employers or different jobs, allows for learning from successful employers about profitable competing, increases the social network and different kinds of knowledge, such as industry-specific knowledge or know-how allows for creation of new ideas and innovation (Agarwal, Echambadi, Franco & Sarkar, 2004; Smith, et al., 2009; Klepper & Thompson, 2010; Unger, et al., 2011).

Contrary, literature stated that work experience from one industry can be considered relevant if it is the same industry of the founding business, (Dahlqvist, et al., 2000; Dahl & Reichstein, 2007; Merz, et al., 2010), but the homogeneity of the knowledge and skills from that industry also lessens the thoughts of founders about how their prior work experience is relevant in new contexts (Hamori & Koyuncu, 2015).

In conclusion, such diverse human capital is a possible explanation for success of new businesses, due to the fact that diversity of work experience accounts for gaining knowledge from different sources, which allows for creation of new ideas, insights, knowledge and thus innovation (Agarwal, et al., 2004; Smith, et al., 2009; Klepper & Thompson, 2010; Unger, et al., 2011). Therefore, it is expected that:

Hypothesis 2a: Diversity of work experience has a positive effect on innovativeness.

Also different sources of employment allow for expanding the social network, increasing access to human resources and providing industry-specific knowledge on a broader level than tenure of work experience in one industry does. Thus, having industry-specific knowledge of multiple industries increases human capital and networks which allow for growth (Seibert, et al., 2001; Nguyen, Allen & Godkin, 2006; Hu & Liu, 2015). Therefore, it is expected that:

Hypothesis 2b&c: Diversity of work experience has a positive effect on growth in terms of (b) size and (c) sales.

2.5.2.3 Moderating role of diversity of work experience

The question thus arises to what extent length or breadth of prior work experience is more important for founders of USO's. Established is that both tenure and diversity of work experience of founders have a relationship with performance of businesses by enhancing human capital of founders. Tenure relates to time, and diversity relates to amount and type of industry. Quiñones, Ford & Teachout (1995) researched different aspects of work experience such as amount, time, type and task, job and organizational levels of specificity and found the effect of tenure to be smaller than the effect of diversity. As both tenure and diversity are dimensions of work experience, a combined effect is implied to exist. Also Reuber and Fisher (1999) affirm this by explaining in a literature based research that the relationship between tenure and diversity means that events are occurring over time and they argue that the accumulated impact over time is what is relevant. That means that diversity and tenure amplify each other and the accumulated impact is bigger than the impact of only diversity of work experience or tenure of work experience. Thus combinations of *Hypotheses 1a & 2a (3a)*, *Hypotheses 1b & 2b (3b)* and *Hypotheses 1c & 2c (3c)* are expected:

Hypothesis 3a: Diversity of work experience positively moderates the relationship between length of work experience and innovativeness.

Hypothesis 3b&c: Diversity of work experience positively moderates the relationship between length of work experience and growth in terms of (b) size and (c) sales.

2.6 Conceptual model

The following conceptual model is derived from the theory discussed above (see Figure 1). The variable 'Work experience' refers to the length in years of work experience obtained by founders of spin-offs. The variable 'Diversity' refers to the breadth of work experience, which referring to theory includes the number of jobs and number of diverse industries. The variable 'Performance' refers to the degree of success of spin-off businesses defined by theory as innovativeness and growth in terms of size and sales.

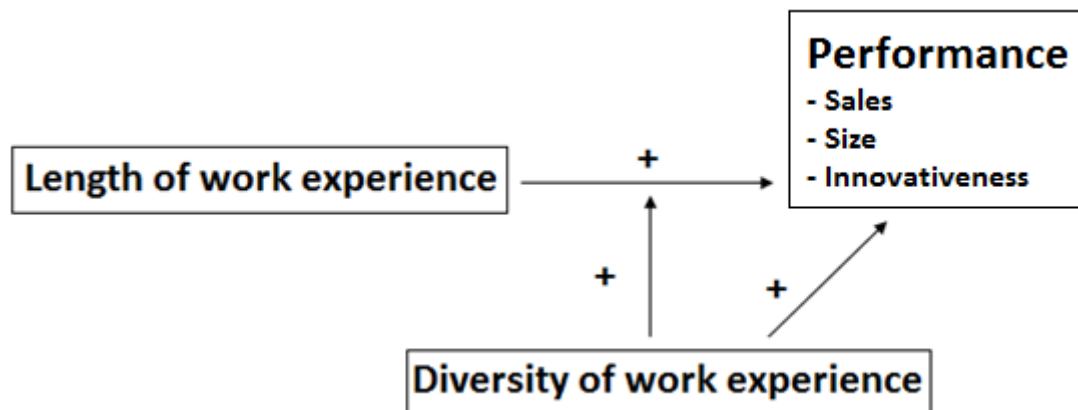


Figure 1. Conceptual model

Since greater human capital leads to greater performance, it is expected that the length of work experience of founders has a positive influence on the performance of their spin-off businesses (*hypothesis 1*). Furthermore, due to the fact that heterogeneity of resources is key to superior resources, which in this research refers to human capital obtained by work experience, breadth, hence diversity, of work experience of founders is also expected to have a positive influence on the performance of spin-off businesses (*hypothesis 2*). Finally, a combined effect of length and breadth of work experience is expected, where diversity has a moderating role in the relationship between (length of) work experience and performance of spin-off businesses (*hypothesis 3*).

3. Methodology

3.1 Introduction

This chapter describes the methods used to answer the research question:

“To what extent does work experience influence the success of a start-up and to what extent does diversity of work experience moderates this relation?”

In order to answer the research question, the conceptual model constructed in the theory section need to be tested. Therefore, the research context and the research unit need to be clear and indicators for the measurement of the variables need to be established. Furthermore, risks of the methods will be discussed and the method of analysis.

3.2 Research method & context

The conceptual model will be tested by quantitative methods using the statistical program SPSS. Conditions of prior work experience in terms of length and breadth (diversity) need to be clarified as well as success indicators for spin-off businesses. Since this master thesis is part of an overarching research about spin-offs of the Radboud University Nijmegen (Vaessen, 2001; Vaessen, 2005; Vaessen, 2016 (forthcoming)), the data obtained by that overarching research is analyzed to answer the research question. The data was collected by four surveys, obtained in 2000, 2004, 2008 and 2011 from spin-off businesses from the Radboud University Nijmegen. The spin-offs were found by address guides, so-called *Wie-is-Wie gidsen* that registered data and functions of alumni, by databases of the *Universitair Bedrijven Centrum*, by connections of employees of the faculties of the university and by databases from *Mercator Incubator (MI)/Mercator Science Park (MSP)*. All surveys had a different focus, but some questions remained to add a control option. Items of the survey that are relevant for this research are included in the 2011 survey, namely performance items (number of employees, sales, innovativeness) and employment history items (tenure and number of industries). In this research, data of the 2011 survey is used. Though, some founders participated in previous surveys and more data on the independent and/or dependent variables of this research is available for use. Table 1 shows the frequencies of participation of the founders in the surveys between 2000 and 2011.

Participation frequency	Founders
1	272
2	86
3	27
4	17

Table 1. Participation in surveys.

3.3 Research unit

The unit of research are the spin-offs that are connected to the Radboud University Nijmegen. The unit of observation are the founders of these spin-off businesses. The founders are students, graduated students, employees or former employees of the university. Not included were hospitals, dentists and law firms.

3.4 Operationalization

The variables are made measureable by assigning indicators from the survey of 2011 of the overarching research. Table 2 shows the indicators used for the variables, corresponding questions and answer possibilities of the survey.

Based on theory discussed in the previous chapter the dependent variable *Performance* will be measured by innovativeness and growth of the organization in terms of sales and size. The survey used to obtain the data allowed for measuring these variables by sales, number of employees and the percentage of sales allocated to the new products or services. The construction of the variables is explained in paragraph 4.3.

Based on theory discussed in the previous chapter the independent variable *Work experience* will be measured by length and breadth, hence diversity. The survey used to obtain the data allowed for measuring these variables by respectively the number of years of work experience and number of different industries the founders had been employed in. The construction of the variables is explained in paragraph 4.3.

Some control variables are included to exclude external explanations for the influence of work experience on performance. Control variables include the age of the spin-off firm, since age is expected to have a relationship with the dependent variables, for example older spin-offs tend to grow less fast than younger firms (Scholten, et al., 2015). Age is measured by years from founding. Innovativeness of a spin-off business is partially dependent on the R&D activities of a business (Clarysse, et al., 2011; Lejpras, 2014), therefore R&D also has to be controlled for. Then, the number of founders of the start-up needs to be controlled for, since the number of founders have a relationship with the independent variables. Namely the more founders, the greater the stock of human capital and different kinds of knowledge at the time of start-up (Agarwal, et al., 2004). The construction of the variables is explained in paragraph 4.3.

Variable type	Dimension	Variable	Item	Minimum answer possibility	Maximum answer possibility	Corresponding question (see Appendix A)
Dependent Variable	Performance	Sales	Sales	0	infinite	13
		Size	Number of employees	1	infinite	15
		Innovativeness	% sales of new prod./ser.	0	100	7b
Independent Variable	Work experience	Length	Years of work experience	0	Infinite	18
		Breadth/diversity	Employment in different kinds of industries	0	7	18
Control Variable	Age	age	Founding year	-	2011	1
	R&D	R&D	Years of R&D labor	0	infinite	7
	Team/start-up	Team/sole start-up	Number of founders	1	More than one	1

Table 2. Operationalization of dependent, independent and control variables.

3.5 Validity & reliability

The context of the overarching research does not correspond one on one with the context of this research. The overarching research has a longitudinal nature and touched upon subjects of, for example, the influence of the university on their spin-offs or the meaning of the spin-offs for the local environment. Also the history of employment of founders has been subject of the overarching research. All indicators of the variables of this research were included in the surveys and therefore the data obtained by the surveys is applicable to this research. The use of the existing survey enlarges the validity of this research.

A problem is that the population is not known. The participating spin-off businesses, are only those businesses that are known by the Radboud University and which have been kept track on by the overarching research. There might be other spin-off businesses from the Radboud University that are not known or traceable and thus did not participate in the data collection. Furthermore, spin-offs in the region of Arnhem and Nijmegen are overrepresented in the surveys of 2008 and 2011, relative to spin-offs in other regions. Hence, no conclusions can be made referring to representativeness of the conclusions of this research for the total population of spin-offs of the Radboud University Nijmegen.

3.6 Analysis method

For testing the conceptual model of this research, three hypotheses need to be tested. The conceptual model can be split up in two testable models, which require two different methods of analysis.

First the effect of tenure of work experience on performance and the effect of diversity of work experience on performance can be distracted from the conceptual model (*hypothesis 1* and *hypothesis 2*). These models can be tested by using a *Regression* method by testing the influence of the independent variables on the three performance indicators separately.

Second, a moderation model can be distracted from the conceptual model. This model includes the combined effect of length and diversity of work experience on performance (*hypothesis 3*). For testing the moderation effect, a specific procedure by SPSS is used rather than a *Regression method* due to some advantages of the program. SPSS provides a specific procedure for testing moderation effects, namely: *PROCESS, Model 1* by Andrew F. Hayes. The *PROCESS* analysis uses a bootstrapping procedure, which lessens biased estimations of effects and confidence intervals and it eliminates violations of assumptions needed for quantitative testing, for example heteroscedasticity.

3.7 Research ethics

In conducting this research, the author acted ethically. For example, the privacy of the participants is protected since none of the names of founders or businesses is named in the process. Also sensitive information like exact sales are carefully handled and only means of the sample are mentioned. Furthermore, the participants voluntarily participated in the surveys sent by the overarching research by Vaessen (2001; 2005; 2016). The intentions of this research are in line with the intentions of the overarching research. Lastly, the author handled the data and results as objective as possible. Measures for increasing validity and reliability discussed in paragraph 3.5 also contribute to acting ethically while conducting this research.

4. Results

4.1 Introduction

This chapter discusses the results from the SPSS analysis used to test the hypotheses mentioned in chapter two. First the response is discussed. Then the construction of the variables of the model in SPSS are discussed and subsequently univariate, bivariate and multivariate analyses are done. Finally, a summary of the results and possible explanations for the results are given.

4.2 Response

In 2011 the survey was sent to 703 spin-offs, of which 183 (27,5%) returned a valid completed survey. Though, as said before, some founders also participated in the previous surveys in 2000 and/or 2004 and/or 2008. In the case of availability of data of more founders on performance indicators and employment history indicators, due to multiple participation, these data also are included in the analyses. In case of several scores on a particular item due to multiple participation, means of the scores are used in the analyses.

4.3 Variable construction

The independent variable of diversity of work experience is based on the number of different kinds of industries of employment. Based on the NACE-codebook provided by the Dutch tax authorities, prior jobs are categorized into general industries. The NACE-codes are presented by four numbers. Though, in this research only the first number of the NACE-code is used to categorize the spin-offs, which represents a general industry, to limit dispersion. Therefore, some industries are accounted for by multiple NACE-codes. In categorizing, the total NACE-codes are taken into account. The categories are shown in table 3. Since the categories were based on the Dutch tax authorities, the industries are presented in Dutch to prevent errors due to translation. Not all businesses were traceable due to for example bankruptcy in the past or organizations out of the country. Most of the prior jobs were classified in education, health care and government, which are combined in one sector: category code 8. A logical explanation is that the participants are founders of spin-off businesses with academic parent businesses and thus were connected to academic institutions before starting their spin-off. Also a lot of hospitals are connected to academic institutions, for example UMC St. Radboud.

NACE-code	Industry	Frequency
0	Landbouw, bosbouw en visserij; Winning van Delfstoffen	2
1	Industrie (vervaardiging van materialen, bijvoorbeeld papier, voedsel, textiel, etc.)	10
2	Industrie (vervaardiging van materialen, bijvoorbeeld metalen, elektrische apparatuur, machines voor verdere productie, etc.)	5
3	Industrie (vervaardiging van bijvoorbeeld meubelen, vervoersmiddelen, sportartikelen, etc.); Productie en distributie van elektriciteit, gas, stoom en gekoelde lucht; Distributie van water: afval- en afvalwaterbeheer en sanering Landbouw, bosbouw en visserij	0
4	Bouwnijverheid; Groot- en detailhandel; reparatie van auto's en motorfietsen; Vervoer en opslag	47
5	Verschaffen van accommodatie en maaltijden; Informatie en communicatie	37

6	Financiële activiteiten en verzekeringen; Exploitatie van en handel in onroerend goed; Vrije beroepen en wetenschappelijke en technische activiteiten (gerelateerd aan recht, bijvoorbeeld advocatenkantoren, accountants, belastingconsulenten)	25
7	Vrije beroepen en wetenschappelijke en technische activiteiten; Administratieve en ondersteunende diensten (gerelateerd aan techniek en wetenschap, bijvoorbeeld technische ontwerp- en adviesbureaus, wetenschappelijke activiteiten, reclamebureaus)	104
8	Administratieve en ondersteunende diensten; Openbaar bestuur en defensie; verplichte sociale verzekeringen; Onderwijs; Menselijke gezondheidszorg en maatschappelijke dienstverlening	323
9	Kunst, amusement en recreatie; Overige diensten; Huishoudens als werkgever: niet-gedifferentieerde productie van goederen en diensten door huishoudens voor eigen gebruik; Extraterritoriale organisaties en lichamen	49

Table 3. Industry codes and frequencies.

Thus, the independent variable diversity of work experience is computed by the number of different industries of prior work experience. The independent variable length of work experience is computed by the difference between the first year of the first job and the last year of the last job. Furthermore, only work experience after graduation and before founding the spin-off business is taken into account. Data on work experience is available from the 2000, 2004, 2008 and 2011 survey.

The dependent variable innovativeness is computed by the percentage of sales that is accounted for by new products or services. Data on innovativeness is available from the 2004, 2008 and 2011 survey. In case percentages of other than the 2011 survey are available, the mean is used. The dependent variable growth, accounted for by sales and size, is computed by respectively sales and number of employees. Data on both growth indicators are available from the 2000, 2004, 2008 and 2011 surveys. In case values are available of other than the 2011 survey, the mean is used. In computing the means, accounted is for the missing values due to lack of participation in all four surveys.

The control variable team or sole start-up is translated from a nominal variable to a scale variable in order to be able to integrate them into the regression and process models. The variable team or sole start-up is coded as following: score 1=sole start-up and score 2=team start-up. For control variable 'R&D' also a dummy variable is constructed and is coded as following: score 1=no R&D activities and score 2=R&D activities. Also data on the control variables are taken from the 2011 survey. If data on the control variables is available from other surveys, that data is also taken into account.

4.4 Univariate analysis

4.4.1. Independent variables

Table 4 shows the descriptives of the independent variables. The descriptives of length of work experience show that the founders of the spin-offs had an average 7,80 years of work experience before founding their business. Furthermore, descriptives of diversity of work experience show that the average founder had work experience in 1,45 industries. Hence, an average founder worked in one or two industries within a timeframe of 7,80 years.

Variable	Tenure	Diversity
Mean	7,80	1,45
Median	6	1
St. deviation	7,442	1,613
Skewness	1,195	1,083
Kurtosis	1,373	0,616
Min.-Max.	0-34	0-4
N.	317	457

Table 4. Independent variables descriptives for the average founder.

4.4.2. Dependent variables

Table 5 shows the descriptives of the dependent variables. The spin-offs had average sales of € 1 931 038 per year, an average of 11 employees and an average of 21,62% of sales that is accounted for by new products or services produced by the spin-offs. Though, high values of skewness and kurtosis show that variables sales and size are not normally distributed. The lack of normal distribution can increase the probability of rejecting the hypotheses while actually an effect exists. Therefore, the variables sales and size are logarithmically transformed.

Variable	Sales (log.) (€ per year)	Sales (original)	Size (log.) (number of employees)	Size (original)	Innovativeness (% of sales)
Mean	5,254	1.931.038	1,138	10,656	21,62
Median	5,114	130.000	0,693	2	10
St. deviation	0,748	16.672.962	1,211	56,365	28,134
Skewness	0,761	16,397	1,198	17,429	1,397
Kurtosis	1,166	279,724	1,601	331,647	1,079
Min.-Max.	3,34-8,46	2.167-286.913.667	0-6,99	1-1.089,33	0-100
N.	309	309	408	408	286

Table 5. Dependent variables descriptives.

4.4.3. Control variables

The descriptives of the control variables are shown in Tables 6a and 6b. The descriptives show that the spin-offs have an average age of 10,36 years at the time of their last participation in the surveys. Furthermore, majority of the founders indicated to have had no R&D activities while participating in one or more surveys. Lastly, the frequencies show that majority of the university spin-offs is founded by a single person.

Variable	Age
Mean	10,36
Median	8,5
St. deviation	8,096
Skewness	1,195
Kurtosis	2,152
Min.-Max.	0-50
N.	466

Table 6a. Control variables descriptives.

frequencies	R&D	Team/sole start-up
No	174	Team start-up 161
Yes	149	Sole start-up 272

Table 6b. Control variables descriptives

4.5 Bivariate analysis

To test whether there are any correlations between variables, a bivariate analysis is conducted. The correlations table can be found in table 7. A first observation is that the independent variables length of work experience and diversity of work experience show a significant correlation ($r=0,572$). Which can be logically explained, since persons who have longer work experience are more likely to have switched jobs, thus have greater diversity. Notable is that diversity shows no significant correlations with the performance indicators and tenure only shows a significant negative correlation with performance indicator size of the spin-offs.

Furthermore, dependent variables size and sales show a high significant correlation ($r=0,773$). This correlation can be explained by logic, since sales is coherent with size of a business: a large business by definition has bigger sales than a small business (keep in mind the difference between sales and profitability). Also dependent variables innovativeness and size show correlations with each other. Since the dependent variables show significant correlations, the dependent variables concerning the significant relationships are also included in the regression and process models as control variables to account for effects that can be explained by other dependent variables.

A last observation is that the control variables age, R&D and team or sole start-up have significant correlations with the success indicators and thus account for the effects on the success indicators as is discussed in chapter 3.4.

		1	2	3	4	5	6	7
1. Tenure	r	1						
	N							
2. Diversity	r	0,572**	1					
	N	316						
3. Sales (log.)	r	-0,098	-0,085	1				
	N	308	198					
4. Size (log.)	r	-0,158**	0,002	0,773**	1			
	N	406	257	208				
5. Innovative-ness	r	-0,056	0,107	0,112	0,222**	1		
	N	285	154	200	245			
6. Age	r	-0,033	0,149*	0,259**	0,229**	-0,133*	1	
	N	444	257	301	396	283		
7. R&D	r	-0,041	0,066	0,058	0,162**	0,280**	-0,175**	1
	N	321	167	221	274	286	319	
8. team/sole start-up	r	-0,160**	0,057	0,338**	0,471**	0,187**	-0,112*	0,071
	N	431	255	293	385	275	430	311

Table 7. Bivariate analysis Pearson's correlations. *significant on level $p < .05$, **significant on level $p < .01$

4.6 Multivariate analysis

To test whether there are any correlations between independent and dependent variables, regression and process analyses are conducted.

4.6.1. Tenure of work experience and performance

First the effect of length of work experience on the success variables is tested. Therefore, three models are created to test the effect of length of work experience on the three success indicators individually.

First, the assumptions for testing *hypothesis 1a: Length of work experience has a positive effect on innovativeness of USO's* are checked. This model shows VIF values greater than one and therefore meets the assumption of no perfect multicollinearity. Furthermore, the assumption of independent errors is met by having a Durbin-Watson value close to two: 2,045. The assumption of homoscedasticity is also met since the scatter plot is roughly randomly dotted. The results of the linear regression models show that tenure only has a significant effect on the performance variable innovation ($r = -0,61$, $p < .05$). Thus, a founder with a short period of prior work experience has a larger amount of sales that is allocated to innovative products and services than a founder with a long period of prior work experience. Hypothesis 1a suggested a positive relationship between the independent and dependent variables, however a negative relationship is found. Therefore, hypothesis 1a is rejected. The results are shown in table 8.

Then the assumptions for *Hypothesis 1b: Length of work experience has a positive effect on employee growth* are checked. This model also meets the assumption of no perfect multicollinearity by showing VIF values greater than one. The assumption of independent errors is also met by having a Durbin-Watson value of 1,777. Also the assumption of homoscedasticity is met since the scatterplot is randomly dotted. The results in table 8 show that tenure practically has no effect on employment growth ($r = 0,002$) and the correlation also is non-significant. Since hypothesis 1b predicted a positive effect of length of work experience on employee growth, hypothesis 1b is rejected.

Finally testing *Hypothesis 1c: Length of work experience has a positive effect on sales*. This model meets both the assumptions of no perfect multicollinearity ($VIF > 1$) and independent errors (Durbin-Watson 1,799). Also the assumption of homoscedasticity is met, since the scatterplot showed all dots randomly. The results in table 8 show that tenure has practically no effect on sales ($r = -0,004$) and the correlation also is non-significant. Hypotheses 1c predicted positive impacts of tenure on employment growth and sales, therefore, also hypothesis 1c is rejected.

Other outstanding observations are that a team start-up positively affects growth indicators size and sales but not innovativeness (respectively $r = 1,238$ and $r = 0,560$).

		Innovativeness	Growth (Size)	Growth (Sales)
Explanatory variable Control variables	Constant	4,202	-5,842**	4,532**
	Tenure	-0,610(0,262)*	0,004(0,007)	-0,001(-0,006)
	Age business	-0,563(0,261)*	0,019(0,125)**	0,016(0,200)**
	R&D (1=no)	12,953(3,963)**	0,243(0,100)*	-0,081(0,060)
	Team start-up (1=yes)	3,085(4,634)	0,613(0,245)**	0,064(0,047)**
	Size	4,263(0,183)*	-	0,413(0,727)**
	Sales	-	1,041(0,643)**	-
	Innovativeness	-	0,004(0,096)*	-
Model information	Statistical test	Linear regression	Linear regression	Linear regression
	F-value	6,930**	64,146**	49,766**
	R2	.158	.677	.673
	Adjusted R2	.135	.666	.659
	N	188	204	123

Table 8. Coefficients and standardized coefficients regression analyses. *significant on level $p < .05$, **significant on level $p < .01$

4.6.2. Diversity of work experience and performance

Second the effect of diversity of work experience on the success variables is tested. Also the effects of diversity of work experience on the three success indicators are tested individually. Since the bivariate analysis showed a substantial correlation between length and diversity of work experience ($r = 0,57$), length of work experience is added as a control variable in testing the effect of diversity on the performance indicators. By controlling for length of work experience, the effect of length of work experience is ruled out as an explanation in the results. Only the effect of diversity of work experience then is accounted for.

The model testing *Hypothesis 2a: Diversity of work experience has a positive effect on innovativeness* shows VIF values greater than one and thus meets the assumption of no perfect multicollinearity. The assumption of independent errors is met by having Durbin-Watson value 2,074. The assumption of homoscedasticity is met by having a random scatterplot. The results can be found in table 9. The results show that diversity has a positive correlation coefficient with reference to innovativeness ($r = 1,254$), though, this relationship appears to be non-significant, which is in contrast with the significant negative effect of tenure of work experience on innovativeness ($r = -0,812$). Thus, the results support an indication for an existing positive effect of diversity of work experience on innovativeness as predicted by the theory, such that a founder with work experience in different kinds of industries will be likely to have a more innovative business than a founder with work experience in only one kind of industry having the same length of work experience. However, since

the effect is non-significant effect, the results are inconclusive and this research rejects hypothesis 2a.

Checking assumptions for testing *Hypothesis 2b: Diversity of work experience has a positive effect on employment growth* shows VIF values greater than one, a Durbin-Watson value of 1,789 and a randomly dotted scatterplot. The assumptions of no perfect multicollinearity, independent errors and homoscedasticity are met. The results of the regression analysis (table 9) show that diversity of work experience barely affects employment growth ($r=-0,054$). Also the correlation is not significant. Concluded can be that the results do not support hypothesis 2b, which is therefore rejected.

Finally, the model for testing *Hypothesis 2c: Diversity of work experience has a positive effect on sales*, shows VIF values greater than one and a Durbin-Watson value of 1,840, which means that assumptions of no perfect multicollinearity and independent errors are met. The assumption of homoscedasticity is also met by having a randomly dotted scatterplot. The effect of diversity of work experience on sales is barely of importance and also non-significant (table 9).

		Innovativeness	Growth (Size)	Growth (Sales)
Explanatory variable Control variables	Constant	5,208	-5,293**	4,511**
	Diversity	1,254(0,064)	-0,036(-0,047)	-0,012(-0,032)
	Tenure	-0,812(-0,209)*	0,010(0,66)	0(-0,003)
	Age business	-0,583(-0,157)*	0,016(0,110)	0,018(0,247)**
	R&D (1=no)	13,770(0,248)**	0,068(0,031)	0,002(0,001)*
	Team startup (1=yes)	-0,530(-0,009)	0,499(0,208)**	0,016(0,014)
	Size	6,698(0,266)**	-	0,384(0,682)**
	Sales	-	1,002(0,628)**	-
	Innovativeness	-	0,006(0,154)*	-
Model information	Statistical test	Linear regression	Linear regression	Linear regression
	F-value	6,210**	29,043*	21,980**
	R2	.204	.619	.589
	Adjusted R2	.172	.598	.2562
	N	152	165	98

Table 9. Coefficients and standardized coefficients regression analyses. *significant on level $p<.05$, **significant on level $p<.01$

4.6.3. Tenure & diversity of work experience and performance.

The moderating effect of diversity on the relationship between tenure of work experience and performance is tested by using PROCESS model 1 by Andrew F. Hayes.

For testing the *Hypothesis 3a: Diversity of work experience positively moderates the relationship between length of work experience and innovativeness*, PROCESS model 1 is conducted in SPSS. The overall model is significant on level $p<.01$, $R^2=.1888$, $F(7)=5,6837$. Though, the interaction effect of tenure and diversity is non-significant, $b=-0,3208$, $p=.0645$. The interaction effect is not significant on level $p<.05$, though, it is significant on level $p<.10$. Though, the direct effect has a correlation coefficient of -0,610, whereas the combined effect only has a correlation coefficient of -0,3208. Thus, diversity attenuates the effect of length of work experience on innovativeness, rather than substitute the effect. No positive moderation effect was found, but by finding a moderation effect in

the opposite direction than predicted, concluded can be that the results partially support hypothesis 3a. Though, the support is less strong than the effect found in testing hypothesis 1a.

For testing the *Hypothesis 3b: Diversity of work experience positively moderates the relationship between length of work experience and employee growth*, PROCESS model 1 is conducted in SPSS. The overall model is significant, $R^2=.6560$, $F(8)=35,9915$, $p<.001$. Though, the interaction effect of tenure and diversity is non-significant $b=-0,0003$, $p=.9484$. The non-significant interaction effect does not support the hypothesis of diversity of work experience moderating the relationship between length of work experience and employee growth. Thus, hypothesis 3b is rejected.

For testing the *Hypothesis 3c: Diversity of work experience positively moderates the relationship between length of work experience and sales growth*, PROCESS model 1 is conducted in SPSS. The overall model is significant. $R^2=.6114$, $F(7)=36,6301$, $p<.01$. Though, the interaction effect is non-significant, $b=-0,0027$, $p=.3995$. That means that the results do not support the moderation effect of diversity of work experience on the relationship between length of work experience and sales growth. Therefore, hypothesis 3c is rejected.

4.7 Additional analysis

The multivariate analyses confirmed the bivariate analysis. Interestingly, hypothesis 1a predicted a positive influence. However, a negative influence was found in the results: $b=-0,610$, $p<.05$. The P-P Plot conducted in the regression analysis showed inconclusive results and the Standard Error for the relationship between length of work experience and innovativeness was substantially larger compared to the Standard Error for the relationship between length of work experience and the performance indicators of growth. That indicates that the relationship between length of work experience and innovativeness is less linear than the relationship between the growth indicators and innovativeness. Therefore, an additional analysis is conducted to test to what extent that relationship is actually linear. The additional analysis contained a regression analysis including dummy variables of length of work experience: (1) founders having no work experience (1=yes), (2) founders having work experience, but less than three years (1=yes) (3) founders having work experience more than three years (1=yes). The group of founders having work experience more than three years (3) is accounted for as the baseline, which the effects of the other groups are compared to.

The assumptions for regression are met by having VIF values greater than 1, a Durbin-Watson value of 2,077 and a randomly dotted scatterplot. The results are shown in table 10. The results are interpreted as follows: the group of founders with work experience, but less than three years have more innovative businesses than the group of founders with more than three years of work experience. That means, the group of founders with work experience, but less than three years have a greater part of sales accounted for by innovative products or services. Though, the group of founders without work experience do not have a significant relationship with innovativeness with respect to the group of founders with more than three years of work experience. Since the overall effect is negative and significant, but between one and three years of work experience has a positive significant effect, the relationship between work experience and innovativeness is indicated to be inverted parabolic. Thus, length of work experience turns out to have a positive effect on innovativeness, but only work experience between one and three years. After three years the effect turns negative and non-significant. Hypothesis 1a predicting length of work experience having a positive effect on innovativeness of spin-offs thus is partially supported.

		Innovativeness
Explanatory variable	Constant	-4,627
	No work experience	5,720(0,084)
Control variables	One to three years of work experience	13,440(0,164)*
	Age	-0,478(-0,138)
	R&D (1=no)	12,709(0,226)**
	Team startup (1=yes)	3,568(0,061)
	Size	4,105(0,177)*
Model information	Statistical test	Linear regression
	F-value	5,883**
	R2	.161
	Adjusted R2	.134
	N	188

Table 10. Coefficients additional regression analysis. *significant on level $p < .05$, **significant on level $p < .01$

4.8 Summary

All of the regression and PROCESS models appeared to be significant. Though, only significant effects were found for the relationship between length of work experience and innovativeness and for diversity of work experience attenuating that relationship on a lower confidential level. Conclusive, work experience does affect performance in terms of innovativeness, but not performance in terms of growth (size and sales). The reader should bear in mind that innovativeness is represented by the percentage of sales that is accounted for by new products or services, thus, the businesses' success in selling new products or services. The interpretation of these results by the author is that innovative products and services are often developed by student or just graduated founders, who due to education are provided with accumulated knowledge and the newest insights. By gaining work experience, their networks are expanded and relationships can be built with stakeholders, such as suppliers and customers. These networks increase opportunities to successfully sell innovative products and services, as discussed in chapter two. The negative direction of the overall effect of work experience on innovativeness can be interpreted as the end of an innovative products' or services' lifecycle. At one moment in time, the society is provided with the innovative product or service and sales will go down. At that moment, new innovative products should be developed. Though, older businesses often produce less innovative products or services due to established products or services they sell and therefore will have decreasing percentages of sales accounted for by new products or services.

An interpretation of the lacking effect of work experience on growth in terms of size and sales is that start-up business have difficulties in growing, as mentioned in the introduction of this research. Start-up businesses that want to grow lack government support and opportunities that allow for growing.

5. Conclusion

5.1 Introduction

This final chapter discusses the research and gives an answer to the research question. First a summary is given of the research process. Second the research question is answered. Furthermore, the research is reflected on based on the conclusions of the research and limitations of the research are discussed. Finally, recommendations are given for policies in practice and for future research.

5.2 Summary

This research examined the relationship between work experience and success of start-ups, more particularly university spin-offs, and is based on the reasoning of the resource-based view and the human capital theory. The RBV states that organizations need valuable, rare, imperfect to imitate and sustainable resources relative to competitors to gain competitive advantages which in turn lead to survival and profitability. The HCT compliments the RBV by elaborating on capabilities as a resource. The resource of human capital includes knowledge and skills obtained through education and work experience. Argued is that length of work experience (in years) and even more diversity of work experience (prior work experience in different kinds of industries) provide founders human capital, which leads to competitive advantages and thus to success. The success of university spin-offs is measured in terms of innovativeness, size of the organization in numbers of employees and profitability. The models presenting the relationship between the work experience indicators and the success indicators each test the effect of tenure of work experience on the success indicators individually, the effect of diversity of work experience on the success indicators individually and the combined effect of tenure and diversity of work experience on the success indicators individually. The models are tested by linear regressions and model 1 analysis' by Andrew Hayes in SPSS. Expected was that tenure and diversity of work experience would positively affect the performance of the spin-offs and that diversity moderated the relationship between tenure of work experience and performance of the spin-offs. However, the results only showed support for a negative overall effect of length of work experience on innovativeness of the spin-offs and diversity to attenuate this relationship. An additional analysis showed that tenure of work experience and innovativeness are indicated to have an inverted parabolic relationship, where between one and three years of work experience, a positive correlation exists.

5.3 Answering the research question

This master thesis aimed to answer the question to what extent length of work experience influences the success of a start-up and to what extent diversity of work experience moderates that relation. This research focused on a particular kind of start-up businesses, namely spin-off businesses from the Radboud University Nijmegen. The results show that none of the models testing the influence of length, diversity or a combined effect of tenure and diversity of work experience on the performance indicators innovativeness and growth in terms of size and sales of spin-offs showed significant positive effects. Conflicting with the presented theory, a significant negative effect was found for length of work experience influencing the success indicator innovativeness: $b = -0,610$, $p < .05$. To illustrate that effect: someone who founds a business directly after graduation will have a more innovative business than someone who first gains work experience before founding a business. Furthermore, diversity of work experience appears to attenuate the correlation between tenure and

innovativeness. Though, the correlation represented the overall effect of tenure of work experience on innovativeness. An additional analysis specified that relationship to a possible inverted parabolic relationship, as work experience between one and three years affects innovativeness of a business positively, but having more than three years of work experience is indicated to affect innovativeness negatively (the negative effect appeared to be non-significant). Thus, the final conclusion is that neither tenure nor diversity of work experience is necessary for success of spin-off businesses, except for tenure in between one and three years. Work experience up to three years contributes to having more success in selling innovative products or services by the spin-off.

5.4 Reflection

The results are not in line with the presented theory. Expected was that length of work experience would influence the success indicators innovativeness, size of the businesses and profitability and diversity of work experience moderates that relation by increasing human capabilities. Fact is, that two persons having the same tenure of work experience, can differ in human capital due to different experiences (Mom, et al., 2015). A possible explanation might be that the distinction of industries of prior work experience is not key to heterogeneity of human capital, as is suggested by various researchers in chapter two (Custódio, et al., 2013; Bishop & Brand, 2014; Hu & Liu, 2015), but rather diversity of work experience on a more detailed level, such as the distinction between task-related human capital and non-task-related human capital gained by prior work experience (Iversen, Malchow-Møller & Sørensen, 2016).

An explanation for finding indications of an inverted parabolic relationship between length of work experience and innovativeness of a spin-off, is not discussed in previous scientific work to the best of the authors' knowledge. Though, Limbach, Schmid and Scholz (2015) argue that CEO's are becoming entrenched over tenure. That means that their willingness to adapt to changes decreases over time. Also Pierce & Aguinis (2013) argue the existing of a 'To-Much-of-a-Good-Thing-Effect, which is supported by, for example, Sturman (2003) who also found an inverted parabolic relationship between work experience and job performance moderated by job complexity. Then it is likely that a decrease in willingness to adapt to changes or complexities, limits the increase of human capital by a decreased willingness to gain new knowledge and skills, whether consciously or not.

5.5 Limitations

The reader should bear in mind that this research is based on data gathered from only spin-off businesses from the Radboud University Nijmegen. As mentioned before, the data collected by the overarching research is not representative for the total population. Therefore, generalizing conclusions for the total population is not possible. Second, since the reviewed literature indicated the existence of an effect of diversity on performance of start-up businesses, the variable diversity of work experience could have been operationalized on a too general level in this research. Diversity of work experience also might have other indicators that are not included in this research, for example the number of prior jobs.

5.6 Recommendations

Referring to the practical matter of this research, it is concluded that entrepreneurs find benefits in gaining work experience in terms of tenure up to three years for bringing their (future) business to success in terms of innovativeness. However, diversity of work experience within those three years is

not necessary. Innovativeness of university spin-offs is what makes them important for the economy and development of innovation (Muendler, et al., 2012; Lejpras, 2014). University spin-offs are also important to society by providing employment (Czarnitzki, et al., 2014). The results of this research thus are important to the economy and society. Based on the conclusions of this research, it is recommended to future founders to gain up to three years of work experience after graduation before founding a business. Also, from conversations with founders who did not participate in the surveys, the author learned that more is needed than just education to bring a start-up business to a fast growing business. Since at the moment internships are not mandatory in most university studies, the Dutch government could contribute to students with entrepreneurial interests or in entrepreneurial education by providing policies or tools to enhance practical experiences such as internships or traineeships after graduation. The Dutch government could also contribute to businesses that want to grow fast by not only having policies for start-up businesses, but also making policies that allow for learning knowledge and skills from different disciplines needed for successful entrepreneurship. For example, premiums for trainings or traineeships which include development of these knowledge and skills.

This research examined whether there is a relationship between work experience and success of start-up businesses. Since, to the best knowledge of the author, no other research addressed the topic of an inverted parabolic relationship between length of work experience and innovativeness of spin-offs, a new insight into literature about work experience is created. While not all parts of the relationship were significant in this research, the question remains to what extent this inverted parabolic relationship exists. Furthermore, this research leaves the question whether diversity of work experience attenuates or amplifies the positive effect of tenure on innovativeness. Thus, if the relationship between tenure and innovation is perceived as non-linear. Lastly, since other studies found that diversity of work experience matter for performance, contrary to the results of this research, future research could examine what indicators of diversity of work experience matters for performance.

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Appendix A

Operationalisation independent variable: 'work experience'

16. Persoonsgegevens en achtergrond ondernemer

a. Wat is uw geboortedatum?

b. Wat is uw geslacht? ☐ vrouw ☐ man

c. Bent u student aan de RU Nijmegen/UMC St. Radboud of bent u dat in het verleden geweest?

nee, nooit geweest ☐

ja, geweest ☐ afgestudeerd in: (laatste studiejaar)

aan faculteit (naam)

ja, nog ☐ aan faculteit (naam)

18. Werkgevers					
Vermeld per bedrijf of organisatie waar u na beëindiging van uw opleiding aan RU/UMC werkzaam bent geweest:					
1	2	3	4	5	
naam organisatie/ werkgever	plaats	Jaartal in dienst	Jaartal uit dienst (mits van toepassing)	profit	non-profit
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>

Operationalisation dependent variable: 'success'

7. Nieuwe en/of verbeterde producten/diensten

Nieuw voor uw bedrijf: Heeft uw bedrijf de laatste drie jaar nieuwe of verbeterde producten of diensten op de markt gebracht?

a. ☐ nee ☐ ja % van de omzet uit nieuwe of verbeterde producten of diensten

Nieuw voor uw afzetmarkt: Heeft uw bedrijf de laatste drie jaar producten/diensten verkocht die voor uw afzetmarkt nieuw of duidelijk verbeterd waren? (d.w.z. niet eerder door concurrenten op de markt gebracht!)

b. ☐ nee ☐ ja: % van de omzet uit producten of diensten nieuw voor de markt

13. Omzet

Geef aan hoeveel de totale omzet van uw bedrijf bedroeg over de jaren 2008, 2009 en 2010 (exclusief btw).

	Jaar 2008	Jaar 2009	Jaar 2010
€	<input type="text"/>	<input type="text"/>	<input type="text"/>
n.v.t. we hadden nog geen omzet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. Medewerkers (u zelf inbegrepen)

Geef het gemiddelde aantal medewerkers in uw bedrijf in achtereenvolgens de jaren 2008, 2009 en 2010 (u zelf inclusief)

	Jaar 2008	Jaar 2009	Jaar 2010
Totaal aantal medewerkers	<input type="text"/>	<input type="text"/>	<input type="text"/>
Aantal medewerkers op basis van fulltime eenheden	<input type="text"/>	<input type="text"/>	<input type="text"/>
n.v.t. het bedrijf was nog niet opgericht	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Operationalisation control variables

1. De start

- a. Bent u oprichter of betrokken geweest bij de oprichting van het op het voorblad ingevulde bedrijf?
- ☐ nee
☐ Ja, en ik was enige oprichter
☐ Ja, tezamen met nog andere oprichters (aantal)
- b. In welk jaar is het bedrijf opgericht?
- Oprichtingsjaar

7. Hoger opgeleiden, octrooien en R&D

- a. Welk deel van de medewerkers van uw bedrijf heeft onderwijs op HBO- of WO-niveau genoten? % van het totaal aantal medewerkers (u zelf inbegrepen)
- b. Beschikt uw bedrijf over één of meerdere geregistreerde octrooien (incl. lopende octrooiaanvragen)?
- ☐ nee ☐ ja, namelijk aantal
- c. Zijn in uw bedrijf bepaalde medewerkers (u zelf inclusief) specifiek belast met het ontwikkelen van nieuwe of het verbeteren van bestaande producten en processen (R&D)?
- nee ☐ ja ☐ Aantal R&D-arbeidsjaren
- Indien ja, hoeveel arbeidsjaren* zijn daarmee gemoeid?

*een voltijdmedewerker die alle werktijd besteedt aan R&D telt voor één arbeidsjaar. Een medewerker die in deeltijd werkt of niet alle werktijd besteedt aan R&D slechts meetellen voor een gedeelte van een arbeidsjaar. Bijvoorbeeld een medewerker die twee dagen per week besteedt aan R&D telt voor 0,4 arbeidsjaar.

7. Nieuwe en/of verbeterde producten/diensten

- a. Nieuw voor uw bedrijf: Heeft uw bedrijf de laatste drie jaar nieuwe of verbeterde producten of diensten op de markt gebracht?
- nee ☐
 ja ☐ % van de omzet uit nieuwe of verbeterde producten of diensten
- b. Nieuw voor uw afzetmarkt: Heeft uw bedrijf de laatste drie jaar producten/diensten verkocht die voor uw afzetmarkt nieuw of duidelijk verbeterd waren? (d.w.z. niet eerder door concurrenten op de markt gebracht!)
- nee ☐
 ja: ☐ % van de omzet uit producten of diensten nieuw voor de markt

18.	Werkgevers				
Vermeld per bedrijf of organisatie waar u na beëindiging van uw opleiding aan RU/UMC werkzaam bent geweest:					
1	2	3	4	5	
naam organisatie/ werkgever	plaats	Jaartal in dienst	Jaartal uit dienst <i>(mits van toepassing)</i>	type organisatie profit	non-profit
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>
				<input type="checkbox"/>	<input type="checkbox"/>