Dutch University Spin-Offs and the probability to receive governmental funding: a study of entrepreneurial orientation and human capital key determinants

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Abstract: This dissertation analyses the relationship between academic entrepreneurship and the funding of Dutch based University Spin-offs (USO's) by utilizing a sample of 111 business proposals submitted to a Dutch governmental funding programme. By using the theoretical concepts of entrepreneurial orientation and human capital derived from the prior studies, I develop six hypotheses that relate entrepreneurial orientation and human capital to the likelihood of receiving funding. Binary logistic regressions indicate that USO's with extensive dynamic capabilities and USO's that define their project risks and uncertainties are more likely to receive funding. Contrary to my hypothesis the regression analysis also indicate that, USO's that are non-internationalized and USO's that show reactive market behaviour, are more likely to receive governmental funding.

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1. Introduction

In the wake of the 1980 USA Bayh-Dole act, academic entrepreneurship (AE) and University spinoffs (USO's) have received a considerable amount of attention in different fields of research (van Dierdonck & Debackere, 1988; McMullan & Melnyk, 1988; Rogers, 1986). The reason for this is that the commercialization of academic research through USO's is beneficial to the (local) economy as it bridges the gap between academics and industry and so creates societal value (Abramson et al., 1997; Ayoub, Gottschalk & Müller, 2017; Perkmann et al., 2013). Amongst other fields, it contributes a great deal to high value jobs, innovation and leading edge research (Etzkowitz, 2002 as cited in O'Shea et al., 2005). The value of promoting commercialization of knowledge and research has globally been recognized and therefore, in recent years, universities have obtained the new role of facilitating and exploiting the research with commercial value. In the US, Europe and Asia different legislations have been adopted in an attempt to *"enhance public-private research interaction, university patenting and, more generally, increase awareness of opportunities for commercialization of research"* (Grimaldi et al., 2011). Nowadays universities are expected to be *'entrepreneurial'* (Muscio, Quaglione & Vallanti, 2013) which, apart from the infrastructure itself, directly and indirectly affects people who work for or at universities. Instead of only transferring knowledge, these people are now also allowed and able to commercialize this knowledge, termed academic entrepreneurship. So called contract research, collaborative research, patenting and licensing options are available and scholars have the freedom to establish USO's (Grimaldi et al. 2011; Muscio, Quaglione & Vallanti, 2013; Perkmann et al., 2013), the latter option being our field of study for this article.

In order to be able to start a USO there should be incentives for scholars to engage in such ventures (O'Shea et al., 2005; Grimaldi et al., 2011). One of those incentives is that appropriate start-up funding is available as internal financial resources are often lacking in the early stages of commercialization (Wright et al., 2004).

There are multiple reasons why this funding is important. First a considerable amount of risk is involved in creating a USO and, as researchers have discovered, commercial success is not guaranteed (Rasmussen & Sørheim, 2012). Although strong policies have forced research institutions to promote venture creation, results are still argued to be somewhat disappointing (Ayoub, Gottschalk & Müller, 2017; Harrison & Leitch 2010, Mustar, Wright & Clarysse, 2008 as cited in Rasmussen et al., 2015).

Secondly, further development of a new technology, manufacturing feasibility studies and drawing up a comprehensive business plan require time and capital to execute (Savva & Taneri, 2013).

Lastly USO's need a substantial amount of external capital as they often go through long development paths (Rasmussen & Sørheim, 2012). This long development phase causes an absence of revenue which in combination with the needed investments, results in a negative cashflow.

Because of the reasons mentioned, many academic entrepreneurs apply to national governmental funding programmes that fund USO's. A considerable amount of these applications receive this early phase funding (Ayoub, Gottschalk & Müller, 2017), however it still seems that a considerable amount of the applicants get rejected but still manage to attract other sources of (governmental) funding. Because the success factors of the business proposals that do get funded are not clear, this leaves academic entrepreneurs unaware on how to increase their chances to receive governmental funding. In order to clarify on this matter, this paper tries to identify which elements of entrepreneurial orientation (EO; Lumpkin & Dess, 1996) will give academic entrepreneurs increased chances of governmental funding. Also I will research if human capital (HC; Becker, 1975) present within a USO increases its chances to receive governmental funding. In both cases, governmental funding is depicted by a Dutch valorisation grant programme for academic entrepreneurship.

Finally then, from the research problem as described above, the following research question emerges:

RQ: Which elements of entrepreneurial orientation and human capital offer USO's increased chances to successfully receive governmental funding?

The results of the research show that USO's should be aware of their dynamic capabilities and extend these capabilities where possible to meet changing market demands. Contrary to the hypotheses, there is an indication that before getting funded it is better for these firms to remain in their domestic market as for highly internationalized USO's, it seems to decrease their funding likelihood. Another indication suggests that reacting to a market need instead of creating a market need increases the likelihood to receive funding. Results do not show significant outcomes for the patent ability, project risks and uncertainties and the team composition of a USO's business proposals and its funding chances.

The insights gained from these results is valuable for academics, policy makers and future academic entrepreneurs. For academics the research can offer new views on how to better support academic entrepreneurship and thereby returning value to the society at large. In a broader sense, policy makers can better understand how to set up their selection criteria and thereby better support the goal of their funding programmes. Future academic entrepreneurs can gain knowledge on which aspects to focus on when trying to bring in funding for their businesses.

The remainder of this paper is structured as follows: In the following section the theoretical framework is presented and the hypotheses are introduced. In section 3 the

methodology is presented, where focus is data measurements, collection and analysis. Next the results are discussed in section 4 followed by concluding remarks in section 5. Finally in section 6 I devote some words on the theoretical/managerial implications, the limitations of this research and the suggestions for future research.

2. Theoretical Framework

2.1 Academic Entrepreneurship and University Spin-off's

As a result of multiple governmental policy changes in the 1980's, starting with the introduction of the Bayh-Dole act in the USA, there has been a dramatic increase in the commercialization of science and academic research, otherwise known as academic entrepreneurship (AE; Grimaldi et al., 2011). AE is defined by Siegel & Wright (2015) as "*efforts undertaken by universities to promote commercialization on campus and in surrounding regions of the university"*. The changing policies provided universities around the world with the opportunity to adopt a so called 'third mission', which adds commercializing knowledge to the teaching and research function of universities (Ayoub, Gottschalk, & Müller, 2017). Since the late 20th century, many studies have identified this trend in Europe, Asia and Australia (Kodama, 2008; Wright et al., 2007), and therefore AE is now a widely accepted concept in the fields of entrepreneurship and strategic management.

As a consequence to the emergence of AE, and supported by universities technology transfer offices (O'Shea et al., 2005; Philips, 2002) different modes of commercialization have been formed. These modes have been identified in the research of Siegel & Wright(2015). Examples on how universities can shape their commercial efforts are *patenting and licensing* (Grimaldi et al., 2011; Klofsten & Jones-Evans, 2000; Siegel, Veugelers & Wright, 2007; Siegel & Wright, 2015) *sponsored research*, (Grimaldi et al., 2011; Klofsten & Jones-Evans, 2000; Siegel, Veugelers & Wright, 2007) *university-industry partnerships* (Grimaldi et al., 2011) and, *university spin-offs/start-ups* (USO; Grimaldi et al., 2011; O'Shea et al., 2005; Shane, 2004)

USO's will be the unit of analysis in this study. A USO can best be defined as a new company that was established by a person who is, or was, affiliated with the university (e.g. student, staff member, faculty employee), and where the main business idea, technology or patent is transferred from the university this person is/was affiliated with (e.g. Fini et al., 2011; Shane, 2004; Steffensen, Rogers, & Speakman, 2000).

The benefits of university spin-offs are multiple in that they can play an important role in developing and supporting regional economic and social wealth. One of these roles is the notion that USO's can be great sources of employment if they experience accelerated growth in the early phases (Hayter, 2013; Shane, 2004). This effect will not only have an internal impact but also an external impact. Growing spin-offs will require products and services from suppliers, who in their turn will be required to hire extra employees. Therefore the successful establishment of one USO can have an extended effect on employment. Another role is the generation of new innovations. This role is practiced when USO's start interacting with other firms or institutions especially in early phases (Perez & Sánchez, 2003). Knowledge that might otherwise be separated is brought together and new innovations are created. Consequently to these innovations, productivity will be accelerated which will increase the competitive advantage on both the level of an individual firm as well as a regional level. Lastly USO's can serve as mediators between basic and applied research (Hayter, 2013). In their study, van Geenhuizen, Ye and Taheri (2016) find that among 105 young USO's, 25% to 30% act as mediators employing *"different partners, connect with large firms as well as governments (outside the university), and have inserted a majority of strangers (outsiders) in their network"*. Considering the different benefits USO's offer the regional economy, one could state that USO's are a promising mode of commercializing academic knowledge.

Still, in the early phase there are some critical junctures described by Mustar, Wright and Clarysse (2008) and in accordance with the extensively described findings of Vohora et al. (2004). The first juncture is described as opportunity recognition. The stumbling block here is that the spin-off fails to understand the commercial market in which their innovation might be applied. Connections outside of the scientific world are believed to prevent such failure (Mustar, Wright, & Clarysse, 2008).

Failures in the second juncture are caused by a lack of entrepreneurial commitment. The lack of commitment is caused by an absence of proper incentives, resources of network contacts (Mustar, Wright, & Clarysse, 2008). Without a committed founding team, USO's fail to grow.

In the last juncture failure is caused by a lack of credibility. Reasons for not having credibility in the early phase of a USO are a lack of *"commercial track record; the often intangible nature of the spin-off's resources at this early stage; and the non-commercial environment from which the spin-off emerged"* (Mustar, Wright, & Clarysse, 2008). Without credibility spin-offs are unable to attract customers, and most crucially external funding from VC-investors and angel investors.

As a result of the reluctance of private investors to foresee academic entrepreneurs of appropriate funding, there has been an increase in public funds (Munari, Pasquini, & Toschi, 2015; Rasmussen & Sørheim, 2012). These funds should prevent academic entrepreneurs from bailing out because of insufficient capital.

In the Netherlands one way of such kind of funding is offered to USO's in the form of the NWO valorisation grant, by the Dutch Organization for Scientific Research. This grant *"stimulates business and entrepreneurship of*

Dutch research institutions" and by doing so bridges the gap between research and the market.[1]

2.2 Entrepreneurial Orientation

As a result of growth and increasing complexity of firms, in the past couple of decades the need for continuous organizational renewal, innovative behaviour, productive risk-taking and capitalization of new opportunities has increased (Miller, 1983). In light of this development the concept of entrepreneurial orientation (EO) has emerged. EO has since gained considerable attention from scholars interested in the effects of EO on a firms performance.
A definition of EO is given by Wiklund & Sheperd (2005) as *"a firm's strategic orientation, capturing specific entrepreneurial aspects of decision-making styles, methods, and practices.* (Hermann, Fink & Kessler, 2010; Wiklund & Shepherd, 2005).
The importance of EO is also stressed by Wiklund and Sheperd (2005) by their conclusion that firms with a high degree of EO (in the right context) are more likely to find and/or create new business opportunities and can therefore outperform the competition. This finding is supported by an earlier article of Lumpkin and Dess (1996) who in their conceptual research on EO, also construct a framework of five dimensions that they believe to be important for EO. These dimensions are; *"propensity to act* ***autonomously****, a willingness to* ***innovate*** *and* ***take risks****, and a tendency to be* ***aggressive toward competitors****, and* ***proactive*** *with regard to marketplace opportunities"* (Hermann, Fink & Kessler, 2010). Still some of these dimensions seems to be more relevant than others in terms of their contribution to the performance of businesses. The general consensus here is that innovativeness, risk taking and proactiveness are the main dimensions influencing a firms performance (Covin & Wales, 2012; Hermann Fink & Kessler, 2010; Hughes & Morgan, 2007; Miller, 1983). Because of this, in the remaining part of this article only these three dimensions will be part of the research.

2.2.1 Innovativeness

Innovativeness as dimensions of EO is defined by Hormiga et al. (2017, p13) as *"a tendency to engage in and support new ideas, novelty, experimentation, and creative processes"*. By doing so firms are *"departing from established practices and technologies"* (Wiklund & Shepherd, 2005, p.75). By engaging in this kind of behaviour firms are creating new products and services (Walter, Auer & Ritter, 2006). In case of USO's, technological research is translated into products and services that serve a commercial use and therefore possess a certain (future) value. To measure the degree of innovativeness of a USO the following indicators are used:

2.2.1.1 Project patents

One of the aspects through which indicates the innovativeness of a USO is its patent activity. Although patents are considered to be expensive and difficult to obtain (De Nicola, Prencipe & Corsi, 2018), it is in most cases, one of the important assets that young spin-offs possess. Many authors stress the importance of patents in the early growth phase of organizations because it protects them against imitation of their technology by competitors and offer a monopolistic like market right, which prove to be valuable for a USO's early performance (Clarysse et al., 2007; Löfsten, 2016; Niosi, 2006).
Creating a protected environment in which USO's are able to commercialize their inventions, gives a positive signal to stakeholders that evaluate the organizations when considering to offer financing (De Nicola, Prencipe, & Corsi, 2018; Ferri et al., 2018; Häussler, Harhoff, & Mueller, 2009). From the above theory the following hypothesis can be formulated:

H1: USO's that patent their inventions are more likely to get governmental funding than USO's who do not patent their inventions.

2.2.1.2 Dynamic capabilities
According to Eisenhardt and Martin (2000) dynamic capabilities are capabilities that allow a company to alter its resource base by (1) adding resources and competences, (2) recombining/reconfiguring these resources and competences and (3) drop existing resources/competences. Being able to do so will allow a company to foresee and respond to changes in the environment in which it is operating.
The dynamic capabilities within a USO and its link with external funding can best explained by the difference between *first* and *second* order competencies as explained by Daneels (2016, 2008, 2002) First order competences can be seen as competences that allow a USO to "*serve its* ***current*** *customers using its* ***current*** *technologies"* (Danneels, 2016, p.2176). These competences are useful because it allows organizations to produce goods/services (technological competence) and exchange these for money with their customers (customer competence). First order competences are necessary for a company to continue operating but will not serve to generate new technologies or customers. Metaphorically speaking first order competences only provide a static picture of how a firm is at that specific moment (Danneels, 2012).
Second order competences on the other hand, can be thought of as competences that give the company the ability to innovate (Danneels, 2016). This is done though the R&D and marketing competences, in which "*marketing second-order competence reflects how good a firm is at accessing* ***new*** *markets and R&D second-order competence reflects how good the firm is at mastering* ***new*** *technologies"* (Danneels, 2016, p.2176).

[1] https://www.nwo.nl/onderzoek-en-resultaten/programmas/take-off

A strong base of second order competences, and therefore the ability to innovate will likely give USO's better chances to receive funding. The metaphor for second-order competences is different in that it provides a dynamic video of the firm (Danneels, 2012).
There are at least two reasons for this as Aspelund and his colleagues (2005) find in their study among Norwegian and Swedish USO's.
The first advantage that innovations offer is that the newness of the technology makes it harder for the competition to imitate the product/service. From this first advantage follows the second advantage which suggest that radical innovations are associated with stronger entry barriers for competitors (Bock, Huber, & Jarchow, 2018).
As a result of these advantages, USO's will benefit from extended time of a 'first-mover' advantage (Streletzki & Schulte, 2012) and therefore increase their chances of survival. Increased chances of survival will make it more interesting for stakeholders who are considering to offer financing to USO's.

H2: The more dynamic capabilities a USO possesses the higher the chance for a USO to receive governmental funding.

2.2.2 Risk Taking

The second dimension of EO to research is risk taking. This dimension is *"associated with a willingness to commit more resources to projects where the cost of failure*
may be high" (Wiklund & Shepherd, 2005, p.75; Horminga et al., 2017; Miller & Friesen, 1978) Next to this, Walter, Auer & Ritter (2006) add to this definition by stating that risk taking reflects the degree to which USO's are willing to support undertakings in which the returns are unknown but expected to be high. It can therefore be said that the degree of risk taking is about committing a certain amount of (financial) resources in an, for a USO, unknown territory with high failure costs. The following indicators are used to identify the degree of risk taking:

2.2.2.1 Internationalization ambition
The internationalization of high tech SME's is described by van Geenhuizen, Ye & Au-Yong-Oliveira (2015) as the process of extending business operations across the national border of the country in which it was established. In a more sophisticated definition, McDougall & Oviatt extend this with their by describing internationalization as *"a combination of innovative, proactive, and risk-seeking behavior that crosses national borders and is intended to create value in organizations"* (McDougall & Oviatt, 2000).
The intention of high technology SME's to internationalize, in particular born-globals, has received a considerable amount of attention. These born globals, or International New Venture (INV) as termed by Oviatt and McDougall (1994), are organizations that immediately after their establishment try to derive competitive advantage from operations and sales abroad.
USO's that seek to internationalize, are one of the specific subgroups of born-globals. Although they generally lack important resources that go beyond their technology field, of which one is access to investment capital (van Geenhuizen & Soetanto, 2009; Soetanto & van Geenhuizen, 2010). Still the majority of them are still found to be engaged in international entrepreneurship and seem to attract more external funding than their peers who are not involved (Bolzani, Fini, & Grimaldi, 2017; Taheri & van Geenhuizen, 2014). An orientation towards international entrepreneurship therefore seems to benefit these companies in a positive way when trying to find funding, which leads to the following hypothesis:

H3: USO's that orientate themselves towards international business are more likely to get governmental funding than USO's who do not conduct international business.

2.2.2.2 Project uncertainty and risk
The tendency to invest in USO's is mostly a trade-off between projects uncertainty and the amount of risk involved. From renowned finance literature we know that project investments with higher risk will yield higher economic return (Fama & MacBeth, 1973), making it more interesting for future investors (Covin & Slevin, 1989; Wiklund & Shepherd, 2005). Private as well as governmental investors consequently tend to invest in projects where the uncertainty is low and the risks are known (Rasmussen & Sørheim, 2012).
This is caused by the fundamental difference between risk and uncertainty as already identified in a study by Knight (1921). With decisions that involve a certain amount of risk, investors know the possible outcomes and returns and also have an idea on the probability of them. In cases of uncertainty, notion of possible outcomes, returns and probabilities are lacking. The former is known by scholars under the term of *non-entrepreneurial decision making* in which the investors rationale is predominant (Alvarez & Barney, 2005; Alvarez & Busenitz, 2001) The latter is known as entrepreneurial decision making, in which the founders of a USO act under great uncertainty (Alvarez & Barney, 2007; Busenitz & Barney, 1997). Because of this, it is important that academic entrepreneurs of USO's translate the *entrepreneurial* situation they are in into a *non-entrepreneurial* rational financing proposal.
If they succeed in this I expect chances to receive financing to be higher for USO's that show a clear vision towards the risks of their projects and undertake projects with higher risks

H4: The more a USO defines its risks and uncertainties the higher the chance for a USO to receive governmental funding.

2.2.3 Proactiveness

The third variable of EO is proactiveness. Proactiveness refers to "*a posture of anticipating and acting on future wants and needs in the marketplace"* (Wiklund & Shepherd, 2005, p.75; Horminga et al., 2017; Lumpkin & Dess, 1996). Especially pursuing new business opportunities and promptly responding to emerging markets are examples of proactive behaviour of an organization (Walter, Auer & Ritter, 2006). A USO that shows proactive behaviour will in most cases react to opportunities in the market place faster and will therefore be more interesting from an investors point of view. Because of this the following indicator will be used to measure the degree of proactiveness:

2.2.3.1 Market orientation

It is important for businesses to have a certain market orientation. By adopting an orientation towards the market, a USO stays connected to its (future) customers and can adopt to their needs and wants. This orientation can be both responsive as well as proactive (Narver, Slater & MacLachlan, 2004). In a responsive market orientation, firms react to expressed needs and wants of customers. By adopting a proactive behaviour on the other hand, USO's can satisfy its customers latent needs (Narver, Slater & MacLachlan, 2004). This will more likely create a first-mover advantage leading to superior performance over competition (Devece, Llopis-Albert & Palacios-Marqués, 2017; Narver, Slater & MacLachlan, 2004). Superior performance over competitors will increase chances to receive funding.

Another reason for a USO to create a strong market orientation can be found in the literature of *'learning organizations'* (Slater & Narver, 1995). Slater and Narver argue that a learning organization is better in sharing and using information and can therefore better anticipate and react to market changes. The benefit of this is consistent with the benefit that Narver, Slater and MacLachhan (2004) also found; first-mover advantage and superior performance over competitors.

Lastly, in a more recent article, Devece et al. (2017) also take into account the power of the internet in adopting a market orientation. They find that in knowledge-based firms a strong market orientation positively affects the performance of an organization and that this effect can be enhanced by using crowdsourcing as a form of information gathering.

The studies mentioned above leads to the believe that USO's that show a proactive market orientation have better chances to receive funding.

H5: USO's that show a proactive market orientation are more likely to receive governmental funding that USO's that show a reactive market behaviour.

2.3 Human capital

One important aspect of the early stage resources of a USO's is its human capital (HC). The concept of HC can be explained as the set of skills, capabilities, and knowledge that a person obtains by receiving education, training and work experience (Becker, 1975; Shrader & Siegel, 2007). A strong base of HC within a USO can enhance the (future) performance of such venture. This increased performance is realized through multiple processes which include better business planning and a stronger strategy, superior exploitation of business opportunities and easier access to physical assets and financing (Bock, Huber & Jarchow, 2018).

Furthermore different studies have also found linkages between human capital and entrepreneurial orientation. In a study by Marvel and Lumpkin (2007), they find that a diverse human capital base has a positive effect on innovation radicalness. This suggest not only a link with entrepreneurial innovativeness but also link with entrepreneurial proactiveness (e.g. radical innovations are proactive of nature). In a more general fashion and in from a technological entrepreneurship view, Wright et al. (2007) also conclude from reviewing several articles that human capital and entrepreneurial orientation are interlinked.

Because of the beneficial effects of a strong HC base and its connection with entrepreneurial orientation, within the context of this research I will analyse this variable based on the composition of the founding team. By the composition of the founding team I mean the different educational and professional backgrounds of the members of such a team. Especially in the early growth phase of USO's there exists a large group of scholars who have found that a heterogenous founding team is beneficial for the performance of a USO. Heterogenous founding teams consist of people with an academic background as well as members who have experience in the field of commercial business.

Vanaelst et al. (2006) find that the changes of composition of a founding team is a very dynamic process. They research USO's under different phases and state that in the pre-founding phase the team composition is rather homogeneous. Once the initiators of a USO's move from an informal to a more formal venture, external members are added to the founding team as a different kind of experience is needed. It is stated by Clarysse and Moray (2004) that external management support is even vital for unexperienced USO's.

Next, in their inductive case study Knockaert et al. (2011) confirm the findings of Vanaelst et al. (2006). They find that a heterogenous founding team is indeed important for the performance and success of a USO. Commercial expertise and a business mindset are beneficial to receive external market clues, which in its turn is important to ensure that the product/service created meets market requirements. This statement is also strongly supported by Politis, Gabrielsson and Shveykina (2012) who find that *"entrepreneurs have a different mind-set that makes them*

better equipped to deal with opportunities and obstacles related to financing and developing USO's" (Politis, Gabrielsson & Shveykina, 2012, p.175).
Finally, in a more recent paper, Visintin and Pittino (2014) build on this finding by stating that a heterogenous founding team leads to a 'duality' in which the academic and business perspectives lead to fruitful debates. These debates stimulate the learning and problem solving abilities of a team and have beneficial effects in high uncertainty environments *''involving the application of new scientific concepts and the transformation of technologies and prototypes into viable products or services''* (Visintin & Pittino, 2014, p.38).
Taking into account these examples, it seems reasonable to expect the following hypothesis:

H6: USO's that consist of a heterogenous founding team are more likely to receive governmental funding than USO's that consist of a homogenous founding team.

3. Methodology

3.1 Unit of analysis

As already briefly mentioned in the introduction, the unit of analysis for this research will be business proposals that were submitted to the high tech valorisation grant phase 2 of the Dutch organization for scientific research (NWO). The grant is divided in two stages, whereby the second stage follows the first stage with a larger amount of capital in the form of a loan. This capital is not assigned randomly and thus requires well-founded motivation in the form of a 'business plan'. Within these business plans, which describe the USO, academic entrepreneurs elaborate on multiple subjects according to a fixed template. The business templates are reviewed and subsequently the decision is made whether or not the grant is assigned. The second phase of this program is meant for USO's that have already gone through a feasibility study (phase 1) and are in their start-up phase. The valorisation grant is especially designed to encourage commercialization of academic knowledge by facilitating as a financer and bridge the gap between research and the commercial market (NWO; De Nederlandse organisatie voor Wetenschappelijk Onderzoek, 2019). By taking on this role the NWO aims to create innovative high-tech entrepreneurship and allow the transfer of valuable research into the commercial marketplace. By doing so it indirectly contributes to the local Dutch economy and eventually the Dutch economic competitive position.
As a result of its vision, the valorisation grant is supported by different ministries of the Dutch government. The ministry of economic affairs and climate and the ministry of education, culture and science are among the sponsors of the grant. As one can see this creates a really broad scope of subjects that can be supported by the grant. This also shows in the business proposals which range from services to products in a fast amount of different industry sectors. The academic entrepreneurs of the USO's, as well as their business proposals are connected to Dutch universities.

3.2 Data measurement

3.2.1 Dependent variable

The dependent variable of this research is *governmental funding* as offered by the valorisation grant. After applying for this grant, the business proposals that are part of this research sample have received a letter stating whether or not the grant has been assigned. The measure for this outcome is binary and therefore assigned with a 0 (no funding assigned) or 1 (funding assigned)

3.2.2 Independent variables

For the independent variables the theories of entrepreneurial orientation (Lumpkin & Dess, 1996) and human capital (Becker, 1975) have been used.

First entrepreneurial orientation; Lumpkin and Dess (1996) find that there are five different dimensions. For the purpose of this research however, only innovativeness, risk taking and proactiveness are used.
Project patents is one of the indicators for innovativeness. The measurement of this indicator is based on the literature by Ferri et al. (2018) in which it is stated that USO's with patents are better able to survive. In the measurement I therefore suggest that the closer a USO is to obtaining a patent, the higher the chances to receive funding. This indicators measurement ranges from 0 to 3. A (0) indicates that the product or service is either not fit for patenting. A rating of (1) indicates that the USO's is in the progress of scrutiny to file a patent. Consequently a score of (2) tells that the USO has already filed a patent but the patent has not been granted yet (e.g. patent pending). A score of (3) is given when a USO already has a patent approved. In the situations described above, no distinction is made between the owner of the patent. In some cases the patent will have already been transferred from the university to the USO, in other cases the USO might have a license agreement or the transfer of IP still takes place.
Dynamic capabilities is another indicator for innovativeness. This variable has a measurement range from 0 to 3 based on the degree to which a USO can react to the market in a dynamic fashion. I use second-order competences as derived from two studies by Danneels (2008, 2012) to measure this variable. Danneels (2008, 2012) measures second-order competences as indicator for dynamic capabilities according to 8 items; [Marketing] assessing the potential of new markets, building relationships in new markets, researching competitors/new customers, developing new advertising and promotion strategies, [R&D] setting up new types of manufacturing facilities and operations, identifying and learning about new technologies, assessing the feasibility of new technologies, and recruiting engineers in technical areas. When a score of (0) is given the business proposal of the USO does not contain second-order competences. A score of (1) is given when the proposal indicates 1 or 2 second-order competences. A USO's proposal is rated with a (2)

when it contains 3 to 5 second-order competences. Finally a score of (3) is awarded when the USO shows it has 6 or more second-order competences.

Next *Internationalization ambition* is used as an indicator for risk taking. USO's with a higher degrees of international entrepreneurship seem to attract more external funding (Bolzani, Fini & Grimaldi, 2017) and therefore I develop a measurement scale based on the widely used international sales (Coviello & Jones, 2004). A score of (0) That the USO has no intention on conducting foreign business. Next, a USO that considers foreign markets as possible target markets is rated with a (1). A score of (2) is given to USO's that clearly indicate that part of the business is targeted outside the Netherlands. Lastly, when a USO indicates that the majority of its target markets are outside of the Netherlands, it is rated with a (3).

Table 1: measurement overview of independent variables

EO	**Innovativeness**
Project patents	*Product or service has the potential to be patented* 0: Not fit for patenting 1: In scrutiny (not filed yet) 2: Filed (Pending) 3: Granted
Dynamic capabilties	*Dynamic capabilties within a USO have a…* 0: Not present 1: Low presence 2: Moderate presence 3: High presence
EO	**Risk taking**
Internationalization	*The business of a USO has the potential to be internationalized* 0: No internationalization 1: Considers internationalization 2: Internationalized
Project uncertainty and risk	*The USO is able to define the uncertainties and risk of its project* 0: No definition 1: Vague definition 2: Clear definition
EO	**Pro-activeness**
Market Orientation	*The market orientation of a USO is…* -1: Reactive 0: Balanced 1: Proactive
Human Capital	
Composition of founding team	*The founding team of the USO consists of…* -1: Solely academics 0: Perfect balance between academics and commercial people 1: Solely commercial people

Another indicator for risk taking is the *project uncertainty and risk.* This indicator is based on literature by Rasmussen and Sørheim (2012) who state that investors tend to invest in projects where risks are defined and thus uncertainty is limited. I use a measurement range from 0 to 2 here. The coding is based on presence of the following components: *business form mentioned, activity plan, risk analysis, growth scenario, financial plan, (customer) letters of intent.* From this a (0) therefore indicates that the proposal includes only a small description of risks involved and leaves uncertainty. With a score of (1) a proposal clearly states the risks involved but does not mention anything about (financial) returns and misses 1 or 2 other components. When risks are clearly defined and (financial) returns are also discussed, uncertainty is diminished and a score of (2) is rewarded.

The type of *market orientation* is the indicator for the proactiveness of a USO. The measurement of this indicator is based on the study of Narver et al. (2004). I expect that a more proactive market orientation leads to a higher chance to receive funding. The measurement ranges from -1 to 1. Business proposals with a (-1) show a responsive market orientation. Examples of a responsive market behaviour are found in sentences like "Our invention solves the need for…" or "The problem of current products is…". Business proposals where the market behaviour is balanced are coded with a (0). In these business proposals there is no clear distinction between either a reactive or proactive behaviour. Business proposals that clearly indicate proactive market behaviour are rated with a (1). Examples of business proposals that are rated with a (1) are "This is a radical invention never seen before" or "Our invention is completely new to the market".

The second theory used is the human capital theory. For this theory I only use one indicator because this theory requires us to focus more on the personal aspects of the USO's founders, which is only available in the business proposals to a lesser extent. The indicator that used here is based on literature by Knockaert et al. (2011). A balanced mix between academic and commercial founding team members will increase chances to receive funding. The measurement scale for this variable is based on the Herfindahl-Hirschman Index (HHI) which is normally used to identify competitive relationships (Calkins, 1983). In this research the founding team members are categorized as either academic or commercial. Consequently the fractions are calculated by dividing the number of each category by the total amount of members. The results are squared where the square of the academic fraction is made negative. The results of both categories are added. The resulting number, the HHI, will range from -1.0 to 1.0, where 0 indicates a balanced mix (50%-50%) of academic and commercial members. A HHI of -1 will in this case indicate that the members are all academic whereas a score of 1 will indicate that all members are people with a commercial background.

3.2.3 Control variables

Different control variables are added to ensure the reliability of the research.

The first control variable is the year in which the business proposal was submitted to the programme. The
Another control variable is the industry in which the USO is operating. This variable is labelled based on the NACE codes as used within the European Union to categorize companies into different sectors (European Union, 2019). The European Union has identified 21 different industries to which companies can be assigned, therefore the variable is coded from 1 to 21. The list I have used to identify the industry in which the USO is operating and can be found as appendix 1 to this research.
Secondly the Dutch University names are a control variable as well. The source for this information has been the Vereniging van Samenwerkende Nederlandse Universiteiten (VSNU, 2019). This is the Dutch national organization that represents the interest of Dutch universities in multiple fields. They also produce data to support a transparent view on the functioning of Dutch universities. Within the Netherlands there are 14 universities. The list of the universities including their assigned numeric codes can be found as appendix 2 to this research.

3.3 Data collection

Data for this research is based on aggregated business proposals submitted to NOW between 2007 and 2014 for a valorisation grant consideration. All data used for the analysis was totally anonymized and aggregated. The total sample size for this study is 111 business proposals.
The proposals were all created following a fixed template as provide by the NWO. Information included in these proposals ranges from the innovative aspects of the product/service to a market and competition analysis. Also a project plan and timeline is included in order to get a comprehensive overview of the scope of the project/business of the USO's. To a lesser extent some of the proposals also included (extensive) risk analyses and anonymized background information on the founders.

From these proposals a data set has been created based on content-analysis results and constructs developed on the basis of validated scales. The coding categories have been pretested by two independent coders and discrepancies in coding have been removed. Subsequently the data has been entered into SPSS in order to analyse it. The analysis will be described next.

3.4 Data analysis

For the data analysis binary logistic regression was used as statistical test. This test is most suitable for cases in which the dichotomous dependent variable Y is predicted by multiple independent variables (Harrell Jr., 2015) The results of coding the business proposals is entered into SPSS after which the correct tests for each model is run. The outcome of the models are then processed into tables which can be found in the next section.

Table 2: Overview of hypotheses

Hypothesis		Support
1	USO's that patent their inventions are more likely to get second round funding than USO's who do not patent their inventions.	Not supported
2	The more dynamic capabilities a USO possesses the higher the chance for a USO to receive second round funding.	Supported ($p < 0,05$)
3	USO's that orientate themselves towards international business are more likely to get second round funding than USO's who do not conduct international business.	Not supported [A]
4	The more a USO defines its risks and uncertainties the higher the chance for a USO to receive second round funding.	Not Supported
5	USO's that show a proactive market orientation are more likely to receive second round funding that USO's that show a reactive market behaviour.	Not supported [A]
6	USO's that consist of a heterogenous founding team are more likely to receive second round funding than USO's that consist of a homogenous founding team.	Not supported

[A] The contrary hypothesis is supported ($p < 0,05$)

4. Results

In table 2 down below one can see the results of the correlation analysis of the variables used within the this study. The threshold for the correlation coefficient is set at 0.7 according to the literature provide by Cohen et al. (2014). All values of all the variables remain below this point. For that reason all the variables were included in the further analysis.

Table 3 shows the results of the binary logistic regression models. In the first run only the control variables are included in the model. The result of this is shown in model 1. Model 2 till 7 show the models where the individual independent variables are added. Finally in model 8, I show a model where all the control and independent variables are included in the analysis. Model 8 shows that there are 3 independent variables with a significant effect on the dependent variable funding. These variables are; internationalization, market orientation and dynamic capabilities. Of these variables market orientation and dynamic capabilities remain significant when tested individually. Internationalization on the other hand has no significant effect on the funding decision when tested individually.

Because this model 8 is tested as the model with the best fit and a the model explains a reasonable amount of variation, the results for the hypotheses are presented based on model 8.

Hypothesis 1 predicts that USO's who have patented their inventions are more likely to receive second round funding. From model 8 it can be concluded that this hypothesis has to be rejected.

Hypothesis 2 is about the effect of the dynamic capabilities of a USO and states that the more dynamic capabilities a USO possesses, the higher the chances of such a USO to receive funding. This hypothesis can be confirmed as one can see from the results. The model shows a strong positive relationship of $B = 0{,}782$; $p < 0{,}05$. Therefore hypothesis 2 can be *confirmed*.

Hypothesis 3 states that USO's that orientate themselves towards international business are more likely to receive second round funding. In model 8 one finds a result that shows a negative relationship between internationalization and funding. Although there is a significant moderate negative correlation of $B = -0{,}649$ ($p < 0{,}05$) hypothesis 3 still has to be *rejected* as it was formulated around a positive relationship.

Hypothesis 4 handles the risk and uncertainties and states that the more a USO's defines it risks and uncertainties the higher the chances to receive funding. From the results it can be seen that indeed there is a moderate positive relationship between project risk and funding of $B = 0{,}483$ but the relationship is not significant. Because of this hypothesis 4 has to be *rejected*.

Hypothesis 5 predicts that USO's that show a pro-active market behaviour are more likely to receive second round funding. Just as for hypothesis 3, again the results show a significant relationship but the relationship is a strong negative relationship of $B = -0{,}827$ ($p < 0{,}05$). A negative relationship in this case means that USO's with a reactive market behaviour are more likely to get funded, which is contradicting the hypothesis. Hypothesis 5 therefore also has to be *rejected*.

Hypothesis 6 is about the team composition and the expectation here was that a USO with a heterogenous founding team is more likely to receive second round funding. The results here show a moderate negative relationship ($B = -0{,}251$) but the relationship is insignificant. Because of this hypothesis 6 has to be *rejected*.

Table 3: correlations of the variables including range, mean and standard deviation

	N = 111	Range	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Funding	0-1	0,36	0,482	1												
2	Patent	0-3	1,77	0,921	0,021	1											
3	Dynamic Capabilities	0-3	1,77	0,642	**,264****	0,006	1										
4	Internationalization	0-2	1,38	0,763	-0,127	0,071	0,138	1									
5	Project Risk	0-2	0,68	0,753	**,225***	-0,015	**,280****	0,152	1								
6	Market Orientation	0-2	-0,33	0,813	**-,271****	0,020	-0,128	-0,073	-0,104	1							
7	Team Composition	-1 to 1	-0,1473	0,46684	-0,124	-0,093	-0,031	0,140	0,127	0,129	1						
8	Year	1-8	5,02	1,940	-0,153	-0,013	-0,077	-0,017	**-,407****	-0,065	0,058	1					
9	Manufacturing Industry	0-1	0,66	0,477	0,067	**,258****	0,073	**,234***	0,169	-0,110	0,041	-0,023	1				
10	University Eindhoven	0-1	0,24	0,431	0,143	0,048	**,200***	0,077	**,217***	-0,052	-0,063	**-,212***	-0,078	1			
11	University Twente	0-1	0,15	0,362	-0,007	-0,086	0,111	-0,047	0,017	-0,010	0,046	0,087	-0,009	**-,241***	1		
12	University Delft	0-1	0,29	0,455	-0,146	-0,169	-0,118	0,076	0,010	-0,008	**,299****	**,221***	0,124	**-,361****	**-,271****	1	
13	Other Universities	0-1	0,32	0,467	0,016	**,188***	-0,155	-0,108	**-,224***	0,064	**-,269****	-0,087	-0,042	**-,385****	**-,289****	**-,432****	1

**** Correlation is significant at the 0.01 level (2-tailed)**

*** Correlation is significant at the 0.05 level (2-tailed)**

Table 4: Binary logistic regression outcomes including control variables (model 1 to 8)

N = 111	1		2		3		4		5		6		7		8	
Variable Name	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
Patent			-0,068	0,240											-0,020	0,273
Dynamic Capabilities					**0,831***	0,347									**0,782***	0,376
Internationalization							-0,451	0,280							**-0,649***	0,321
Project Risk									0,568	0,315					0,483	0,361
Market Orientation											**-0,843****	0,300			**-0,827***	0,323
Team Composition													-0,455	0,467	-0,251	0,525
Year	-0,121	0,108	-0,119	0,108	-0,115	0,112	-0,124	0,109	-0,028	0,120	-0,161	0,115	-0,126	0,110	-0,078	0,134
Manufacturing Industry	0,395	0,440	0,433	0,461	0,338	0,457	0,552	0,455	0,276	0,453	0,336	0,466	0,394	0,441	0,368	0,534
University Eindhoven	0,414	0,528	0,407	0,529	0,139	0,558	0,541	0,542	0,157	0,555	0,293	0,552	0,478	0,536	0,074	0,625
University Twente	-0,020	0,628	-0,050	0,637	-0,265	0,656	-0,002	0,637	-0,252	0,654	-0,123	0,659	0,093	0,640	-0,411	0,742
University Delft	-0,520	0,554	-0,559	0,572	-0,552	0,572	-0,436	0,562	-0,762	0,581	-0,620	0,582	-0,336	0,587	-0,539	0,693
Constant	-0,260	0,686	-0,102	0,779	-1,593	0,911	0,257	0,751	-0,825	0,772	0,250	0,720	-0,338	0,701	-1,408	1,109
Nagelkerke R^2	0,068		0,069		0,138		0,099		0,106		0,171		0,079		0,286	
Hosmer and Lemeshow Test	0,708		0,520		0,934		0,929		0,805		0,336		0,698		0,700	
-2 Log Likelihood	139,455		139,376		133,325		136,820		136,131		130,279		138,502		119,161	

**** Correlation is significant at the 0.01 level (2-tailed)**

*** Correlation is significant at the 0.05 level (2-tailed)**

5. Discussion and Conclusion

In the past 30 years there has been a considerable amount of research dedicated to finding out success factors of university spin-offs. Different research perspectives have been adopted and the stream of literature has increased in recent years. Miranda et al. (2018) clearly summarize these perspectives in their literature review. They classify the existing research into three categories;
The *individual level* (Hayter, 2015; Fernandez-Alles et al., 2014) , the institutional level (Munari et al., 2015; Rasmussen et al., 2015; Soetanto & van Geenhuizen, 2010) and, most relevant for this study, the *firm level* (Hayter, 2013; Rasmussen et al., 2015; Visintin & Pittino, 2014) This research has focused on USO's on a firm level by reviewing and coding a set of business proposals based on academic entrepreneurship literature and dimensions of entrepreneurial orientation as developed by Lumpkin and Dess (1996). From this analysis it shows that there is one key component within the business proposals as it came to successful feasibility funding. The component that is found to have a statistically significant influence on funding are the dynamic capabilities present within a USO. The analysis also indicates that two other variables have a statistically significant effect on funding of a USO, however these two components were negatively correlated.

The amount of dynamic capabilities of a USO showed a positive significant relationship with the funding decision and supports the findings of Aspelund et al. (2005). This outcome can be explained by how today's economy in functioning. The changes within industries nowadays are very rapid and firms that show the ability to quickly respond to these changes, by having market and R&D second order competences in place as explained by Daneels (2016), will have better chances of being funded. The marketing second order competence reflects a USO's ability to access a new market, on the other hand, the R&D second order competence reflects the ability to master new technologies. By being able to capitalize on both competences, USO's are better able to respond to the industry they are in and create a gap between them and competitors because (radical) product/service changes make it harder for competitors to copy the technology (Aspelund et al., 2005). This also results in the additional benefit of high cost for the competitors to enter the market, leaving a USO more time and space to utilize their first-mover advantage.

Contrary to what I expected the presence of internationalization in the USO did not have a positive effect on the likelihood of getting funded. However the opposite hypothesis is supported here, meaning that a lower degree of internationalization has a positive effect on the funding decision. Although the results are of quantitative nature I cannot draw any sound conclusions on this point because theoretical reference is missing. However there are multiple assumption to why the internationalization has a negative impact on the funding likelihood. Internationalization bears with it the extra costs of running affiliates outside the domestic market which may deteriorate the USO's (short-term) performance (Cheng, 2009). Also Andersson and Berggren (2016) state that instead of internationalization, *"a strategy built on customer focus and an ability to adapt to different customer demands lead to growth, and the location of growth is dependent on the size of the home market"* (Andersson & Berggren, 2016, p.296). Finally, strategies that prove valuable in a domestic market might not be valuable in a foreign market. Combining the above three assumptions creates a great deal of uncertainty which will not positively influence funding likelihood.

The above assumption is backed by the analysis on defined risk and uncertainties. The results do not support the hypothesis that USO's who clearly define their risk and uncertainties have a higher likelihood to get funded. This then does not support earlier findings of Rasmussen & Sørheim (2012) that actors "*prefer to invest where uncertainty is relatively low and the risk can be managed"* (Rasmussen & Sørheim, 2012, p.665). The reason for this could be twofold. First it could imply that governmental funding programme's do not take into account the degree of risk and uncertainty that a project holds. This could be a result of dealing with public funds and having a certain amount of budget to spent. No matter the quality of the proposals, a fixed amount of budget is available. In years where proposals are of lesser quality, judgement of risk and uncertainties within a proposal could be less strict as resulting in sub-optimal investments. Another reason for risk and uncertainties not to have an effect on the funding decision might come from the (lacking) ability of a USO's to capture risk and uncertainties in their proposals. In a considerable amount of business proposals a risk-analysis could be found. This is where the USO's show whether they are capable to go from an entrepreneurial idea into a non-entrepreneurial rational proposal (Alvarez & Barney, 2005 & 2007). However it was clear that some of the USO's were superficial in expressing their risk and uncertainty. When the overall quality of the information documented in the proposals increases, the risk and uncertainty variable might become more valuable for funding programme's to base their decisions on.

Just as for the internationalization variable, another variable that shows a result that is contrary to the hypothesis is the market orientation variable. The binary logistic regression did show a significant relationship with funding of the USO, however, the direction was negative instead of positive. This means that a USO that has a market orientation that is more reactive does have a higher chance to receive funding. Just as for the internationalization variable I cannot draw any sound conclusions on this because the theoretical backing is not present. Still there are two reasonable assumptions to be

made here. First of all the outcome could be a result of the nature of the funding programme. The NWO take-off grant does attract high-tech USO's that, as experienced from coding the proposals, do often times find solutions for existing problems. This is by nature a reactive approach towards business, therefore creating a bias in the sample. Secondly, and following the first point, is the fact that reactive business proposals can be created in more detail as the industry, target-market and customers are already known. This second assumption is also coherent with the former finding that USO's that define project risk and uncertainty having a higher likelihood to receive funding.

Finally, contradicting the findings of (Knockaert et al., 2011; Politis et al., 2012; Visintin & Pittino, 2014) a heterogenous founding team does not seem to have a significant influence on the funding decision. The reason for this could be twofold and lies partly in the nature of the proposals and partly in the measurement of the variable. The information in the business proposals oftentimes lacked clear background information of the founding team members. Because of this the measurement method for grouping a USO as having either as heterogenous or homogenous could only be made in a very narrow fashion. As a result of this the difference between the two opposites might not be large enough resulting in an insignificant outcome of the logistic regression. A more qualitative approach towards this variable might create a more valid outcome in line with the existing literature.

6. Implications

The results of this study will have implications on multiple stakeholders. Within the research three groups for which the results are interesting were identified. These are policymakers, academics and founders.

For policymakers the results are valuable as the outcomes of the research will give them renewed insights on which factors influence the funding of USO's. Through these insights they can check whether or not these factors align with the goal and vision of their organization. When taking NWO as an example; their goal is to create *"innovative business"* (De Nederlandse organisatie voor Wetenschappelijk Onderzoek, 2019). By taking into account the results of this research for for market orientation, a future step for them could be to investigate if funding reactive market orientation USO's is indeed contributing to their goal in an effective way. Also combining the information of this research with information on USO survival will allow them to check if the programmes are effectively designed. In the next chapter this is further explained.

For academics, their knowledge on academic characteristics and entrepreneurial orientation is deepened in a sense that they now have more knowledge on how academic entrepreneurs are able to receive funding of a governmental organisation. This is important because these academics stand at the heart of where academic entrepreneurship originates. They can either use this extended knowledge for future research, their own entrepreneurial undertakings or to mentor future academic entrepreneurs. In the curriculum on entrepreneurship, academics could for example integrate more knowledge about dynamic capabilities, internationalization and market orientation as these variables seem to influence the governmental funding decisions of their future undertaking.

Future academic entrepreneurs, the founders of USO's, are the last group where implications can be found. The results of the study are interesting to them as it becomes clear what information is positively and, in a more indicative wat, negatively contributing to governmental funding programme's decision to fund a USO. Future applicants can take this information into account and adjust their business proposals in such a way that they maximize their chances to receive funding. A USO that is applying for a second round of funding would in this case not have to spent a great amount of time on explaining its patents. On the other hand, the dynamic capabilities of a USO should be extensively described as this will most probably significantly raise their chances of successful governmental funding. Of course this study does not give a complete overview of all the information that should be included, but it will at least guide applicants in the right direction.

7. Limitations and future research

Of course there were several limitations during the course of this study. The most important limitations are discussed below and (improvement) opportunities for future researchers will be given.

The first limitation encountered was the fact that the measurement of certain variables did not include enough qualitative information. For example, the variable team-composition. This variable was measured on a -1 to 1 range and therefore provided information on the ratio of team members with an academic background versus team member with a commercial background. However, what the measurement did not take into account was information of qualitative nature such as age, gender, years of experience of a team member, position of the team member within the team and ownership of the team member. Because of the lack of qualitative enrichment the variable remains very shallow. When in future research this variable is researched in a richer/broader sense it could very well be that the outcome supports the theoretical backing as stated in this article.

Another limitation of this research was the fact that the measurement operationalization of dynamic capabilities proved to be challenging. Dynamic capabilities are, when present, actual actions taken by a USO. Therefore the dynamic capabilities of a USO are only really encountered when empirically researching a USO. In this way one can see how the USO runs its business and thus comment on the degree of dynamic capabilities present. For this research however, the dynamic capabilities were researched based on business proposals (non-empirical).

Judging whether or not a USO possesses dynamic capabilities based on text rather than the actual actions limits the amount to which one can draw conclusions. For future research a better way to research the effect of dynamic capabilities on funding decisions is to combine field- and desk-research.

The fact that a great amount of USO's projects were set-up as one-off projects proved to be another limitation of this research. As a result of this set-up, the business proposals were very limited in explaining how the USO was established and what the future scenarios would be. In future studies it could be valuable to distinguish between one-off projects USO's and USO's that operate with a long-term vision. One of the hypotheses that one could form is that long-term USO's show more commitment and therefore are more likely to get funded.

In line with the former limitations, the fixed proposal template as provided by the NWO has created difficulty in retrieving the information for some variables. Future research might benefit from richer data in a sense that next to the business proposals there could also be observations, interviews and questionnaires with the founders/employees of the actual USO's. This combination of quantitative and qualitative data will probably result in more elaborate research. In combination with the rapid technological changes it might prove interesting for the NOW also as it would give them more information on what variables should be taken into account when funding decisions are made.

Lastly it would be interesting for future research to investigate whether or not the USO's survive (in the long-term). In this research I can only conclude on which factors are important to receive governmental funding, survival of the USO's was outside the scope of this research. Funding a USO however, does not guarantee any future success or automatically supports regional economic and social wealth. Policy makers are therefore left unaware if their decision criteria are yielding the best returns for society at large. Also academic entrepreneurs that focus on the factors that are important to receive funding, do not know if this will increase their business success in the future. The suggestion here would be to better align the funding and survival criteria.

8. Acknowledgements

Although sometimes difficult and complex, working on this thesis has given me new intellectual insights and taught me new business practices and especially knowledge of the university spin-offs and the surrounding environment.

The research itself has proven to be challenging at times, but above all useful for putting into practice all the theoretical knowledge gained through lectures. Fortunately, my thesis is complete and a new challenge already lies ahead.

Firstly I would like to express my special thanks of gratitude to my supervisor, Igors Skute, for his opportunity to conduct this research and his infinite support throughout the process. Without his dedication and attention to detail, this thesis would not have been possible.

Also I would like to thank some fellow students with whom I worked together during my master business administration. Whilst working on my master thesis, giving each other feedback and support has helped a great deal in making it all come together.

Lastly gratitude goes to my family. Especially they have pushed me back to work when at times I did not have the motivation to do so. Their wise words have definitely served me well in finishing my thesis and completing my master study.

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10. Appendices

10.1 Appendix 1

Numeric code	***Official NACE code***	***Industry***
1	A	Agricultre, Forestry and Fishing
2	B	Mining and Quarrying
3	C	Manufacturing
4	D	Electricity, Gas, Steam and Air Conditioning Supply
5	E	Water Supply; Sewerage, Waste Management and Remediation Activities
6	F	Construction
7	G	Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
8	H	Transportation and Storage
9	I	Accommodation and Food Service Activities
10	J	Information and Communication
11	K	Financial and Insurance Activities
12	L	Real Estate Activities
13	M	Professional, Scientific and Technical Activities
14	N	Administrative and Support Service Activities
15	O	Public Administration and Defence; Compulsory Social Security
16	P	Education
17	Q	Human Health and Social Work Activities
18	R	Arts, Entertainment and Recreation
19	S	Other Service Activities
20	T	Activities of Households as Employers; Undifferentiated Goods- and Services-Producing Activities of Households for own use.
21	U	Activities of Extra Territorial Organisations and Bodies

Table 5: Industry categorizations as applied by the European Union (2006)

10.2 Appendix 2

Numeric code	***University code***	***University name***	***Number of dissertations (2007-2014)***	***% of total***
1	TUE	Technische Universiteit Eindhoven	1653	5,4%
2	UM	Maastricht University	1756	5,7%
3	UT	University of Twente	1573	5,1%
4	RU	Radboud Universiteit	2456	8,0%
5	RUG	Rijksuniversiteit Groningen	3080	10,0%
6	TiU	Tilburg University	919	3,0%
7	TUD	TU Delft	2408	7,8%
8	EUR	Erasmus University Rotterdam	2403	7,8%
9	LEI	Universiteit Leiden	2743	8,9%
10	VU	Vrije Universiteit Amsterdam	2521	8,2%
11	WU	Wageningen University and Research	1836	6,0%
12	UU	Universiteit Utrecht	3921	12,8%
13	UVA	Universiteit van Amsterdam	3336	10,9%
14	OU	Open Universiteit	86	0,3%
Total			***30691***	***100,0%***

Table 6: Overview of Dutch Universities and the absolute and relative amount of dissertations between 2007-2014 (VNSU, 2019)