

Determining success factors for the acquisition of government funding and spinoff survival in early stages of university spinoffs

Author: Matthijs te Dorsthorst

University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands

ABSTRACT

The importance of University spinoffs (USOs) is captured in the commercialization of academic research and the impact that they generate within their industry. Despite the knowledge on the great impact that USOs can generate, the available literature on the determinants of USO success is minor. The available literature indicates that a USO must cross certain junctures in their lifetime in order to be successful. The acquisition of funding is an important subject in crossing the credibility juncture. In this research paper, the goal was to find success factors that contribute to the likelihood of acquiring funding and finding the relationship between the acquisition of funding and company survival amongst university spinoffs. This paper analyses a dataset, where the evaluation results from the applicants of the Valorisation Grant Programme of the Dutch Research Council (NWO) are displayed. The dataset was analysed with open coding content analysis and binary logistic regression. Results of the analysis shows that the entrepreneurial competencies of business planning, the marketing competency and the organizational championing competency have a significant positive effect with the likelihood of acquiring government funding. Furthermore, the acquisition of funding has a significant positive effect on the survival of the USO. These results contribute to the current literature, by establishing the validity of the success factors in an early stage USO. In addition, the USOs can use these results to develop specific areas of their company, to provide a better situation to acquire government funding and to have a future with more certainty of survival.

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Keywords

University Spinoff – USO – USO Success Factors – USO Survival – USO Funding – Business Planning – Marketing Competency – Organizational Championing Competency.

1. INTRODUCTION

1.1 Background on rationale

In the last 50 years, many university spinoffs (USOs) have become prominent companies in the technological-economic landscape (Shane, 2004, pp. 1-3). An example of an impactful USO is the biotech company IntroGene, which was a spinoff from Leiden University. The spinoff was acquired by Johnson & Johnson and rebranded as Jansen Pharmaceuticals. (Joep Engels, 2021).

The number of USOs accelerate, mainly due to government guidance and government funding in the first phases of the start-up process (Grimaldi et al., 2011). The government involvement has increased, due to different acts and institutions, such as the Dayh-Dole act in the United States and the Dutch Research Council in the Netherlands (Grimaldi et al., 2011; NWO, 2021d). USOs are an important result for creating value from scientific research and inventions (Thomas et al., 2020).

Many USOs have the potential to compete directly with established companies within the industry. (Nejabat & Van Geenhuizen, 2019) In addition, when a USO is successful, it can act as accelerator to the economic growth within the operating environment of the USO (Fernández-López et al., 2020). It is in the best interest of the consumer that as much scientific research is successfully being translated into market services or products, in order to provide a counterpart in competition and to drive the innovation to a maximum. The successful commercialization of research increases the competition from a scientific-academic source, in contrast to the R&D departments from the established companies.

Prior literature has found a wide range of criteria determining USO performance. However, research commercialization remains overly complex and require different configurations for every specific USO (Belitski & Aginskaya, 2018). The main determinants that play a role in USO success are: The acquisition of capital (Prohorovs et al., 2018; Bednár & Tarišková, 2017), Entrepreneurial competencies (Huynh et al., 2017; Gümüşay & Bohné, 2018; Vega-Gómez et al., 2020; Danneels 2016), University USO policies (Berbegal-Mirabent et al., 2015) and Government involvement & policies (Sternberg, 2014; Grimaldi et al., 2011).

In practice, the majority of the USOs are able to produce a long-term company. Between 80 and 90 percent of all the spinoffs are able to survive the first 5 years (Prokop et al., 2019; Bolzani, Fini, Grimaldi, et al., 2014; Bolzani, Fini, Sobrero, et al., 2014). However, the high success rate does not necessarily result in a high percentage of thriving companies. According to Hesse & Sternberg (2016), 68% of the USOs have low growth rates and 41% have no explicit desire to grow. Suggesting that the USOs have a difficult time with expanding their operation (Hesse & Sternberg, 2016). In addition, only a small percentage (0.25-2%) of all the start-ups seeking finance, will acquire venture capital to be able to grow (Prohorovs et al., 2018). The level of successfulness is not only determined by the ability to survive, but the growth of the USO also plays a role.

USOs are also important, argued from an Intellectual Property (IP) perspective. Many USOs are created specifically for the commercialization of IP, therefore the number of USOs is positively correlated with the expenditures on IP protection (Lockett et al., 2003). Universities have taken an active approach, with Technology Transfer Offices (TTOs), towards guiding the USOs to overcome the complicated challenges that a USO faces. For example: the TTOs can help the USOs with

IP protection and the corporate structure of the USO (ACE, 2019).

Despite the potential successes that USOs can create, Vohora et al. (2004) argues that there are certain critical junctures that a USO must cross in their lifetime, in order to progress to the next start-up phase. These junctures can be crossed with entrepreneurial competencies. Only a minority of the start-ups will cross these junctures successfully, confirming the challenging nature of entrepreneurial competencies (Vohora et al., 2004). The USO's overall ability to overcome challenges decreases after four years. Therefore, it is important to know what factors contribute to crossing the critical junctures to allow USOs to be effective from the start (van Geenhuizen & Soetanto, 2009).

This paper analyses USOs which are in the first stages of their research commercialization. As mentioned before, the literature suggests that there are certain determinants for USOs success. However, the research is based on USOs, who already crossed the credibility threshold, presented in Vohora et al. (2004). Very little research has been conducted regarding USOs, who have not passed that threshold.

The USOs that will be researched are part of the Valorisation Grant of the NWO. This is a funding programme, where early-stage USOs can apply for funding. The NWO is financed with tax money and therefore the urgency exists that the funding is spent successfully. In this situation, successful spending means that the USOs who receive the funding have a great chance to develop into a stable market player.

1.2 Research Objective

This research's objective is to determine success factors in early stages of a university spinoff. The determination of success factors contributes to the literature of USO performance, which currently is not conclusive on success factors. This leads to the following main research question:

RQ: *“What success factors contribute to success in the early stages of a university spinoff?”*

To be able to answer the main research question, the definition of success is defined as the combination between the following: the likelihood of the university spinoff to acquire governmental funding and the survival of the university spinoff. Due to the nature of the data-set the acquisition of governmental funding is considered a success in the early stages of the university spinoff. To complement USO's success, the relationship between the acquisition of government funding and USO survival must be examined. Therefore, the objectives of this research are to find the factors that contribute to this definition of success. Formulating the following research questions:

RQ1: *“What factors contribute to the university spinoffs likelihood to acquire government funding?”*

RQ2: *“What is the relationship between the acquisition of government funding and company survival amongst university spinoffs?”*

In this paper I refer to Danneels (2016), van Geenhuizen & Soetanto (2009) and reply to a call for further research. I investigate how entrepreneurial capabilities contribute to a firm's success and what factors overcome the credibility threshold for a USO in multiple universities.

This research contributes to the existing research, with the determination of success factors that help cross the credibility threshold (Vohora et al., 2004). In addition, it contributes to Danneels (2016). This research confirms that marketing competencies are also determinants for success in a less stable

environment. In previous studies the marketing competency was tested for success in established companies (Danneels, 2016). The academic entrepreneurs can derive the success factors from this paper, that contribute to the likelihood of receiving government funding. The success factors also signal specific areas, where the USO must excel in order to secure government funding. The academic entrepreneurs can shift their focus towards the development of these specific areas and therefore have a better aim for their USO.

For the policy makers this paper provides a better understanding of which USO factors influence real-world performance. The policy makers can use this research as a reference point for their internal decision making. The policy makers can verify if the success factors are in fact representative for their vision of providing funding to USOs.

2. THEORETICAL FRAMEWORK

2.1 University Spinoffs

2.1.1 Definition of USOs

The term university spinoff covers a broad spectrum of definitions. Smilor et al. (1990) defines when a start-up classifies as an USO. A start-up classifies as a USO if one of the following characteristics are met: The start-up is founded by a faculty member, staff member or student who left the university to start a company. The entrepreneurs are affiliated with the university, when the company was started. Lastly, the start-up is founded around a technology or technology-based idea developed within the university (Smilor et al., 1990).

The second definition is presented by Bellini et al. (1999). This paper suggests that companies that were founded by university teachers, researchers, or student and graduates, to commercially exploit the results of the research in which they might have been involved at the university, classifies as USO (Bellini et al., 1999). The third definition that is highlighted is the more simplistic of Klofsten et al., (1988): A start-up classifies as a USO, when the organization exploit the results of university research (Klofsten et al., 1988, pp. 430–443). Another look at USOs is that they are founded by one or more academics and that they have chosen to work in the private sector and they transfer knowledge or technology from the parent company into the private sector (Walter et al., 2006).

A few characteristics can be drawn from the given definitions of USOs: 1. The parent organization, where the spinoff is derived from, needs to be an academic institution. 2. The spinoff needs to be a separate entity, which can be linked at the university, but not controlled by the university. 3. The spinoff must transfer knowledge, that was retrieved from academic activities. 4. The spinoff must be aiming for competition with the private sector, meaning that the spinoff needs to have a profit-oriented approach.

The definition of USOs for this paper includes that an USO is a private entity, who's business model contains the commercialization of a product or service derived from academic research, while the academic entrepreneurs have a connection with an academic institution.

2.1.2 Importance of USOs

The economic and technological importance of USOs is significant. The USOs are dominant in terms of transferring relevant academic research into the private sector, therefore they carry a high potential to generate impact on the private sector, the academic sector and the society (Bathelt et al., 2010; Meoli et al., 2012; Soetanto & van Geenhuizen, 2019). In addition, it can indirectly affect other organizations and

industries, due to the diffusion of the new technologies, such as new gene editing technology. The new technology can result in new treatments in the whole biotech industry (Clausen & Rasmussen, 2012; Criaco et al., 2014). Argued from a societal point of view, the USOs are important, since they are one of the few organizations who can commercialize academic research results. When academic research with huge commercial potential is left undiscovered, it negatively effects society. Because of the lower competition and fewer innovations, which results in a less competitive landscape (Mason & Brown, 2014).

Both the number of USOs as the literature regarding the USOs expanded rapidly in the last decades, with growing numbers own both topics. However, research on the commercialization topic still remains complex (Mathisen & Rasmussen, 2019). University policies have been improved, with the advent of the Technology Transfer Offices (TTOs). With the TTOs, young academic entrepreneurs are guided from an idea to a USOs. With university policies improving, the entry threshold for academics who want to commercialize their idea is decreased, which result in an increase in the number of USOs. In addition, this increase is positively correlated to an increase in the survival rate, with the help of the TTOs (Prokop et al., 2019; Fernandez-Alles et al., 2019).

There are many hurdles and difficulties in the process of an USO to evolve to a full-fledged company. In order to overcome these hurdles, acquiring funding in the early stages of an USO is crucial. (Díaz-Santamaría & Bulchand-Gidumal, 2021; Prokop et al., 2019; Bednár & Tarišková, 2017; Castillo Holley & Watson, 2017). There are some guidelines available to increase the likelihood of acquiring funding. For example, understanding of the nature of the funding and bringing in equity will increase the likelihood of receiving funding (Pattnaik & Pandey, 2014). However, there still exist a grey area in which factors play a key role to acquire funding.

2.2 Critical Junctures

Vohora et al. (2004) formulated four critical junctures and five organizational phases, that every USO has to cross in order to grow to a mature organization. These five organizational phases for an USO are: 1. Research 2. Opportunity Framing 3. Pre-organization 4. Re-orientation 5. Sustainable Returns. A juncture that needs to be crossed is the barrier for the evolution to the next phase. In this chapter the critical junctures are discussed.

2.2.1 Opportunity recognition

According to Vohora et al. (2004), opportunity recognition is finding the solution for market needs in academic research that are not satisfied in the market. The specific juncture is described as the skillset that is required, to make the connection between specific knowledge and a commercial opportunity. The way of crossing this juncture is one's ability to synthesize scientific knowledge in combination with a proper understanding of the market and market partnerships.

2.2.2 Entrepreneurial commitment

Entrepreneurial commitment is critical for an USO in the first phases, to realize a business vision to an operational business. The difficulty that needs to be solved in order to cross the entrepreneurial commitment juncture, is the conflict between the need for a committed venture champion and the inability to find an individual with the right entrepreneurial skillset. Four reasons that arise with this conflict: 1. The lack of access to successful entrepreneurial role models for the academic entrepreneur. 2. The lack of prior business experience in combination with a lack of faith in the own abilities of the

academic entrepreneur 3. The lack of self-awareness of the own limitations of the academic entrepreneur. 4. The identification, accessibility and acquiring the services of a surrogate entrepreneur.

2.2.3 Credibility threshold

The main objective for this critical juncture is the academic entrepreneur's ability to gain access to capital. When the access to capital is provided, the USO can claim other necessary resources and is able to be productive. The second problem that is connected to the financial issues, is the identification of the right resources. This identification is crucial for the right spending of the acquired financial resources. The critical juncture is termed credibility threshold, due to the perceived lack of ability to gain access to key resources (Vohora et al., 2004). Prokop et al. (2019) argued, that the acquisition of financial resources by the USO signals credibility. Suggesting that with the acquisition of funding, the credibility threshold juncture is crossed (Prokop et al., 2019).

2.2.4 Sustainable returns

Sustainable returns can be seen as revenues from products or services, payments from collaborative agreements or an investment from new or existing investors. Achieving sustainable returns shows that the USO has the ability to create value from the developed capabilities and resources. The most important objective for the sustainable returns critical juncture is the requirement for the USO to continuously re-configure existing resources (Vohora et al., 2004).

2.3 The role of Business Planning

Individual entrepreneurial competencies are a critical factor in the value creation and the success of an USO (Dimitratos et al., 2014). One integral entrepreneurial competency that is considered as an important factor for success amongst almost all sectors, is the ability to take risks (Estay et al., 2013). Taking risks will allow the business to create value, however it also opens the door for failure (Baron & Markman, 2003). In different phases of the organisation, risks need to be balanced in order to be effective. A successful entrepreneur will be able to balance that risk in the different phases in the lifetime of the USO. In the early stages of the USO, prior to the credibility threshold, the risk must be minimized.

If the USO is putting themselves into consideration for the acquisition of funding, the organisation which provides the funding has no intention to lose their investment. Kyndt & Baert (2015) argue that a proper business plan minimizes risk and puts the USO in the best chance to receive funding. A business plan where the entrepreneur foresees future obstacles and is able to measure them, with a vision and minimizing risk on the long-term. The ability to business planning is an important entrepreneurial competency (Kyndt & Baert, 2015).

The entrepreneurial presence of the ability to plan ahead, in combination with the understanding of the future challenges and the way of measuring them, will be a more risk averse investment for an investor. Investors have, generally speaking, a risk averse attitude (Prokop et al., 2019). Suggesting that the likelihood of acquiring funding can be increased, if the USO has a high-level business plan. The entrepreneurial competency of business planning can help to cross the entrepreneurial commitment juncture, with the successful understanding of the entrepreneur's own ability, described in Vohora et al. (2004). The first hypothesis is formulated as:

H1: *The entrepreneurial competency of business planning has a positive effect on the likelihood of acquiring funding for a university spinoff.*

2.4 The role of Intellectual Property ownership

One of the most valuable intangible assets that any company can possess are intellectual property (IP) rights. There is no exception for USOs. Lockett et al. (2003) states that many USOs are dependent on the commercialization of the intellectual property rights from the university. Which also suggests that many USOs hold IP rights. The literature does confirm this statement, with finding a positive relationship between university's spending on intellectual property advice and the number of USOs (Lockett et al., 2003).

Owning an IP right does not mean that the road is paved for the USO. The commercial behaviour for the academics involved does not change, when IP ownership is present (Halilem et al., 2017). The intellectual property helps to secure innovation returns, secrecy and complementing assets (Singh, 2015). However, not every USO is in the position to secure IP protection. This does not correlate with bad USO performance. To further nuance the position of IP in USO context, it is important to differentiate industries. In some industries it is more difficult to secure an IP protection. Due to the complexity and the high industry value, it is difficult in the software industry to arrange IP protection (Hou & Zhang, 2021). A level of mistrust and secrecy between different academic entrepreneurs is also created, due to the focus on IP protection. It prevents different academic entrepreneurs from exchanging information and it complicates the development of entrepreneurial competencies (Gümüşay & Bohné, 2018).

The ownership of IP also signals to potential government funding parties and other potential backers, that the USO has an area of expertise. That the knowledge in their field and in their technology is excellent. Owing IP rights can certainly add value to the USO. However, it remains unclear if the ownership of IP rights gives a USO the edge in the likelihood to receive funding and helps the USO to overcome the credibility threshold. Therefore, the second hypothesis is formulated as:

H2: *The ownership presence of intellectual property has a positive effect on the likelihood of acquiring funding for a university spinoff.*

2.5 The role of Marketing Competence

The success of a USO depends on many variables. Entrepreneurial skills and competence are of high significance for a successful USO, but they are also complicated variables in the performance of an USO (Vega-Gómez et al., 2020). Not every USO is in need of the same competencies. Danneels (2016), highlight four main subjects in competencies, to tackle the credibility threshold. 1. Customer competence 2. marketing competence 3. R&D competence 4. Technological competence.

Part of the short-term performance of a USO is the marketing competence. Marketing competencies are necessary for a USO to be successful (Buratti et al., 2020). Furthermore, a USO with great marketing competence is able to identify and build relationships with customers is currently does not have. To acquire and serve those relationships, the USO have to build new resources. In addition, the marketing competence involves assessing the potential and building relationships in new markets. Setting up new channels for sales and distribution (Danneels, 2016).

Danneels (2016) concludes that USOs with higher marketing competence have the ability to conduct a more comprehensive assessment of their potential segments, have more capabilities to connect and form relationships with other businesses in new

markets, are able to successfully leverage their brand reputation and company image in new markets and have the ability to gain correct information about their potential customers and competitors when entering the new market (Danneels, 2016).

In the current literature, it is unclear how marketing competencies predict early USO success. Based on the characteristics of Danneels (2016), a positive relationship between the marketing competence and the acquisition of financial funds is expected. Therefore, the third hypothesis is formulated as:

H3: *The presence of marketing competence in a university spinoff has a positive effect on the likelihood of acquiring funding.*

2.6 The role of the Organizational Championing Competency

There are a lot of individual traits and competencies and it is not always clear what competencies can be grouped under entrepreneurial competencies. In fact, there is no consensus on the exact mix of competencies that contribute to entrepreneurial success (Gümüşay & Bohné, 2018). Gümüşay & Bohné (2018) introduced a framework with 26 entrepreneurial competencies with an individual or an organisational locus. These competencies were extracted from different papers. The entrepreneurial competencies of Rasmussen et al. (2011) were introduced as organizational locus by the framework of Gümüşay & Bohné (2018).

Rasmussen et al. (2011) researched three organizational entrepreneurial competencies that contribute to the credibility of a new venture. These three competencies can help to cross the credibility threshold critical juncture, as presented by Vohora et al. (2004). The entrepreneurial competency that gives an indication to entrepreneurial commitment, is the *organizational championing competency* (Rasmussen et al., 2011). The organizational championing competency can be defined as: “the ability to identify with the venture and to convince others to contribute to its development” (Rasmussen et al., 2011, p.25) This competency is not static and can change a number of times during a USO’s lifetime. In each stage the type of championing can differ. In the research phase, technology championing predominates. While in the later stages a more commercial championing is preferred (Clarysse & Moray, 2004).

The focus for this hypothesis is on the entrepreneurial commitment of the organization, rather than the broader focus on technology and commercial championing. A high-level motivation and effectiveness in the USOs team acts as an indicator of the *organizational championing competency*. Other indicators are the ability to create a network of industry partners, investors and customers to establish external credibility, the ability as entrepreneur to motivate your employees and lead them behind the company’s vision (Rasmussen et al., 2011).

Based on the characteristics of the *organizational championing competency*, a positive relationship is expected with the competency and the likelihood of acquiring funding. Therefore, the hypothesis is formulated as:

H4: *The presence of the organizational championing competency has a positive influence on the likelihood of acquiring funding.*

2.7 The relationship between USO Funding and USO Survival

The intangible assets of financial funds are crucial for every company to survive. Also, in the technical start-up industry, capital carries an important role in the growth and performance of start-ups (Singh & Bala Subrahmanya, 2020). In addition, the absence of securing financial funds is one of the main indicators of start-up failure (Bednár & Tarišková, 2017).

Start-ups and USOs can receive financial capital via different sources. In the very first stages the entrepreneurs may rely on Friends, Family & Fools (FFFs) and (governmental) grants. In a more mature stage, they can approach Venture Capitalists to access capital. However, the accessibility of those funds is minor. Very little USOs qualify for financial capital to proceed to commercialize their business plan. As stated before, only 0.25-2% of all the start-ups seeking capital, will receive the funding (Prohorovs et al., 2018). However, there are also USOs, who do not need financial capital from FFFs, VCs or grants, for success.

The main focus of this paper is on finding success factors that contribute to the likelihood of acquiring funding, with the expectation that the funding directly led to higher survival rates. The literature indicates that start-ups need capital for survival, but the question arises if this situation also applies for USOs in an earlier stage in their lifetime. The NWO is a government organisation who funds USOs with tax money, to provide a better argument that tax money is well distributed, the influence on the USO survival must also be researched. To provide better robustness for the research, the fifth hypothesis is formulated as:

H5: *The accessibility of financial funds via governmental grants positively influences the survival of a university spinoff.*

3. RESEARCH DESIGN

3.1 Subjects of study

This study analyses 239 anonymized and aggregated university spin-off (USO) grant proposals submitted for evaluation in the Valorisation Grant (VG) programme (between 2007 and 2014) managed by the Dutch Research Council (NWO). NWO is “.. one of the most important science funding bodies in the Netherlands and realises quality and innovation in science. Each year, NWO invests almost 1 billion euros in curiosity-driven research, research related to societal challenges and research infrastructure” (NWO, 2021b). NWO mission is to advance world-class scientific research that is generating scientific and societal impact by means of excellent, curiosity-driven disciplinary, interdisciplinary and multidisciplinary research (NWO, 2021b). NWO additionally selects and funds “... the personnel and material cost for scientific research and knowledge exchange and impact activities of Dutch universities and public research institutes. NWO invites partners from industry, the government and societal organisations to contribute with their own knowledge agendas and questions to the programming, realisation and co-funding of research” (NWO, 2021c). Hence, Valorisation Grant programme (now, Take-off) was one of the financing instruments targeted at academic entrepreneurs from Dutch research institutions to help further develop knowledge innovations within high-tech domain into new activity and entrepreneurship. It may concern product, process, care or service innovations in the broadest sense of the word (NWO, 2021a).

The VG has two phases: Phase 1 is the feasibility study with a maximum funding of 25,000 Euro that has to be completed within 6 months. Projects that successfully complete Phase 1

could submit their applications for Phase 2 - the valorisation phase with a maximum subsidy amount of 200,000 Euro (NWO, 2015). Phase 2 projects which received the funding have to be completed within two years, including an interim evaluation (NWO, 2015). In this study, we focus on USO proposals submitted to Phase 2 of the programme and therefore reflecting active preparation for valorisation phase.

3.2 Measurements

3.2.1 Dependent variables

The main dependent variable is the success of the USO. The success of the USO is subjective, however it can be transformed into measurable sub-variables. The success of a USO can be split into the acquisition of funding and USO survival. Those two sub-variables are indicating the success of an USO.

The acquisition of funding: This variable is treated as a binary variable. The USO either receives the funding or they do not receive the funding. The value '0' is assigned when the USO does not receive the funding. The value '1' is assigned when the USO does receive the funding.

USO Survival: The survival of an USO is also treated as a binary variable. The value '1' is assigned if the USO is still generating revenue after 5 years of receiving the government funding. The value '0' is assigned if the USO is not able to do so.

3.2.2 Independent variables

The entrepreneurial competency of business planning can help to reduce risk in the long term and the creation of a vision. Therefore, business planning can create more attractiveness for potential funding (Kyndt & Baert, 2015). This independent variable will be coded on a categorical level, with Neutral ability (0), Moderate ability (1), Sufficient ability (2) and a Strong ability (3).

Intellectual Property signals an excellent technological understanding in the chosen field of the USO and creates innovation returns, secrecy and complementing assets (Singh, 2015). This independent variable will also be defined on a categorical level, with Difficult IP position (-1), Neutral position (0), Moderate IP position (1) and Strong IP position (2).

The marketing competency: The full independent variable consists of three sub-variables.

- MComp1, the ability to assess the potential of new markets.
- MComp2, the ability to leverage its brand reputation or company image to new markets.
- MComp3, the ability to research new competitors and new customers.

All these sub-categories will be coded individually in the dataset. With the following categorical coding: Strong ability (1), Neutral ability (0), Weak ability (-1). The sub-variables combined determines the level of the *marketing competency*.

Organizational championing competency: The full independent variable is built with three sub-variables:

- OCC1: The USO has an effective and motivated founding team.
- OCC2: The ability to develop external support and credibility towards industry partners, customers, and potential investors.
- OCC3: The ability to motivate groups and individuals within the USO

All these sub-categories will be coded individually in the dataset. With the following categorical coding: Strong ability (1), Neutral ability (0), Weak ability (-1). The sub-variables combined determines the level of the *organizational championing competency*.

The accessibility of financial funds via government funding: A binary variable. From the NWO dataset, assigning '0' or '1' when the USO did or did not received the government funding.

The neutral ability / position that is used in coding is defined as being better than '-1', but not as good as '1'. If the ability / position is neutral or even absent, this will not have an effect on *the acquisition of funding* dependent variable. An overview of the independent variables, definition, coding definition and assessment scale can be found in Appendix A.

3.2.3 Control variables

In this research the following control variables are used:

University: All the USOs are located and operating from the Netherlands. However, the university where the USO is originating from can differ. All the USOs do originate from Dutch technical universities. So that potential advantages through the university is eliminated (Appendix B).

USO industry: All the USOs will be categorized according to the sector of the USO. The USOs will be grouped according the NACE industry codes (European Commission, 2021), to prevent that one industry with higher funding rates influences the results (Appendix C).

Number of citations: Each USO is accompanied with an academic entrepreneur. Due to the commercialization of research, almost all academic entrepreneurs have conducted prior research. The number of citations of this research can influence the ability of the entrepreneur of developing a better USO. In addition, the number of citations does indicate the relevance of the conducted research, with recognition by the scientific community included. The number of citations is therefore representative for the level of tech degree of the academic entrepreneurs. The number of citations will act as a control variable to remove this possible advantage.

3.3 Data collection

To conduct a comprehensive analysis and test the proposed hypotheses, this study builds on a fully aggregated and anonymized research dataset provided to the author of this study. To construct a part of the independent variables, content analysis is used on the aggregated evaluation results regarding feasibility and valorisation potential of selected USO proposals. To further enhance the research model, information regarding the performance of business incubators and technology transfer offices of the leading Dutch technical universities is retrieved from their websites and open-source reports. We also retrieved scient metric information about the scientific output and its impact (i.e., the number of peer-reviewed publications, citations, citation networks) in the past 20 years by the leading Dutch technical universities. We further matched the research fields of publications and USO grant proposals with the NACE industry codes (European Commission, 2021).

3.4 Data Analysis

This research will use *binary logistic regression analysis* to execute the analysis. With binary logistic regression, there is no assumption that the relationship between the dependent and the independent variable is linear. The model has to meet the assumptions of logistic regression, to be valid. 1. The dependent variable must be a binary variable. 2. The data must

be independent from each other (multicollinearity). 3. The independent variables must not be highly correlated. Every independent variable that has a correlation of 0.5 or more with another independent variable, is judged as too high (Midi et al., 2010). Also, the assumptions are made that the variables are normally distributed and that the relationship between the predictor variable and the log-odds is linear (Schreiber-Gregory & Foundation, 2018).

3.5 Data preparation

Every USO that was assessed by the NWO received four individual scores on four different topics, an aggregate score and 'strong' and 'weak' comments on their application. The different USOs received a two decimal places accurate score on a 5-point scale, for the USO's score on the technology, the commerce, the business planning and the motivation & commitment.

The review committee of the NWO also has the opportunity to make comments on the applicant. These comments are less standardized of nature and they can include everything what stand out to the applicant. The standard scores of the NWO were not sufficient to provide a test all the success factors, that were found in the literature. To tackle this situation, independent variables were developed and involved in this dataset. Open coding content analysis was used to code all the independent variables against these positive or negative comments. The independent variables were formulated as specific as possible, as mentioned in chapter 3.2.2. With the specific definitions all the comments for every USO were matched against the scales of the independent variables, through the open coding content analysis. The minimum and maximum scores for every independent variable can be found in Table 1.

The comments are interpreted and when possible, connected to an independent variable. For example, USO number 12 had the comment: "Good knowledge of and network in the market.", which resulted in a positive grading for the independent variables 'The ability to assess the potential of new markets (1)' and 'The ability to develop external support and credibility towards industry partners, customers, and potential investors (1)'. From the same USO the IP position was positively as well as negatively mentioned. "Unique IP position with regard to the shelf life of chemical probes." and "IP unclear, no patent pending (2x)". This is an example to demonstrate the interpretation that is needed to transfer this text into code. The potential for an IP is high, however there is no patent pending. Therefore, the IP ownership IV was coded with '-1'.

4. RESULTS

4.1 Elaboration of Descriptive Statistics

After the open coding content analysis of the 239 USOs, the complete dataset was transported into SPSS; The current statistical programme used by the University of Twente. Via SPSS the *binary logistic regression* was conducted. Multiple regressions with the dependent variables 'USO Funding Decision' and 'USO Survival' were conducted to accept or reject the different hypotheses.

The descriptive statistics are shown in Table 1. The correlations between all the independent variables of this paper are small, with the exception of the correlation between IV's [5] Leverage brand reputation and [8] Develop external support, which shows a stronger correlation ($r = 0.431$, $p < 0.001$). Other moderate correlations can be found between the IV's [7] Effective and motivated team and [9] Motivate groups and individuals ($r = 0.377$, $p < 0.01$). Secondly, [5] Leverage brand reputation and [7] Effective and motivated team ($r = 0.353$, $p <$

0.01). Thirdly, [1] USO funding decision and [7] Effective and motivated team ($r = 0.323$, $p < 0.01$). Fourthly, [1] USO funding decision and [2] Business Planning ($r = 0.309$, $p < 0.01$). Fifthly, [1] USO funding decision and [9] Motivate groups and individuals ($r = 0.274$, $p < 0.01$). Lastly, between [1] USO Funding Decision and [5] Leverage brand reputation ($r = 0,202$, $p < 0.01$).

Another way to measure multicollinearity is through the variance inflation factor (VIF). A VIF value between 5 and 10 indicates a high correlation and it is cause for concern. The statistics can report that all the VIF values are below the 1.5. The greatest value being detected by the [9] Motivate Groups and Individuals, with a VIF value of 1.405. VIF values between 1 and 5 are moderately correlated, so the VIF values of the independent variables causes no concern. The VIF values for all the variables can be found in Appendix D.

4.2 Regression Analysis

The binary logistic regression models are shown in Table 2. Each model in the regression analysis was analysed with a different configuration of independent variables in addition of the control variables. Three categorical control variables were used in all the models. These control variables are: 1. The industry of the USO, measured with the NACE L1 Codes of the European Union. 2. The parent university of the USO and 3. The number of citations of the academic entrepreneur involved. These control variables were chosen for the model, because these variables combined formed the strongest regression model. The control variables are categorical variables. For example: in one industry the environment is better suited for the acquisition of funding and therefore the USOs from that industry have a better position to receive funding. That does not provide any evidence that those USOs received their funding for their marketing competency, or for the IP ownership. The same case applies for university and number of citations. Therefore, the control variables will be treated as categorical.

The model with only the control variables is showed in Table 2, model 1. In the models 2-5 the impact of every independent variable is measured, while the control variables are kept into the model. In model 6, all the variables are tested for their relationship with the USO funding simultaneously. In Table 3 model 1 the relationship between USO funding and USO survival is tested.

4.2.1 The role of Business Planning

In the first hypothesis a positive relationship between the entrepreneurial competency of business planning and the likelihood of acquiring funding is expected. The independent variable was involved in model 2 and model 6. Table 2 shows the model with the isolated business planning variable and control variables in model 2 and the business planning variable in combination with every variable in model 6. Model 2 shows a significant positive effect on the likelihood of acquiring funding ($B = 0.801$, $p < 0.01$). Model 6 also shows a significant positive effect on the likelihood of acquiring funding ($B = 0.670$, $p < 0.01$). In both models we find a significant positive relationship between the entrepreneurial competency of business planning and the likelihood of acquiring government funding, therefore H_1 is confirmed.

4.2.2 The role of Intellectual Property Ownership

In the second hypothesis a positive relationship between the ownership of intellectual property and the likelihood of

Table 1. Range, means, standard deviations and correlations of the variables (N=242)

	Min	Max	Mean	S.D.	1	2	3	4	5	6	7	8	9	14	15	16
[1] USO Funding Decision	0	1	,41	,493	1											
[2] Business Planning	-1	3	,40	,892	,309**	1										
[3] IP Ownership	-1	2	-,06	,746	,035	-,007	1									
[4] Assessment New Markets (Dummy Variable)	0	1	,39	,489	,192**	,155*	-,058	1								
[5] Leverage Brand Reputation	-1	1	,08	,577	,202**	,113	-,075	,076	1							
[6] Research Competitors / Customers	-1	1	-,03	,502	,048	,053	,028	,165*	,051	1						
[7] Effective and Motivated Team	-1	1	,13	,660	,323**	,160*	-,001	,049	,353**	,074	1					
[8] Develop External Support	-1	1	,15	,616	,149*	,048	,120	,007	,431**	,055	,074	1				
[9] Motivate Groups and Individuals	-1	1	,31	,624	,274**	,121	-,030	,089	,228**	-,037	,377**	,060	1			
[10] NACE Code L1	0	19	8,49	6,210	-,086	,044	-,083	,002	-,107	-,018	-,101	-,077	-,019	1		
[11] USOs University	1	22	4,40	4,387	,027	-,070	,010	-,039	-,115	,109	-,008	,062	-,015	-,049	1	
[12] Number of Citations	0	36257	3620,9	5091,1	,018	-,029	,011	,025	-,045	,119	-,003	,110	-,064	,176**	,044	1
N of cases 239																

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed)

Table 2. Binary logistic regression results. Dependent variable: USO Funding decision

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	B	s.e.	B	s.e.	B	s.e.	B	s.e.	B	s.e.	B	s.e.
Constant	-.235	,267	-.577*	,291	-.236	,267	-.747*	,312	-.858**	,319	-1,291**	,360
Business Planning			,801**	,174							,670**	,184
IP Ownership					,076	,177					,144	,212
Assessment of Market Potential (Normalized)							,788**	,284			,735*	,319
Leverage Ability							,722**	,249			,161	,321
Research of Competitors and Customers							-.025	,278			-.123	,302
Founding Team									,980** ^a	,256	,803**	,269
Develop External Support									,493** ^a	,249	,360	,279
Motivation Championing									,702** ^a	,258	,587*	,268
NACE Code L1	-.030	,022	-.040	,023	-.029	,022	-.025	,023	-.023	,024	-.032	,026
USO's University	,017	,031	,028	,032	,017	,031	,036	,032	,025	,033	,038	,036
Number of Citations	,000	,000	,000	,000	,000	,000	,000	,000	,000	,000	,000	,000
-2 log likelihood	321,168		296,192		320,984		303,350		275,527		262,476	
Nagelkerke R-Square	,013		,146		,014		,109		,227		,304	
N = 239												
^a Reduced dataset n = 236												

*p < 0,05 ; **p < 0,01 ; Hosmer and Lemeshow is not significant (p>0,05)

acquiring funding is expected. In model 3 and in model 6 the IP ownership variable is involved in a model. Model 2 shows an insignificant neutral relationship between the independent and the dependent variable (B = 0.076, P > 0.05), while model 6 shows an insignificant moderate positive relationship between the independent and the dependent variable (B = 0.144, p > 0.05). Both the difference in relationship between the variable in an isolated state and involved in the full model and the lack of significance were not expected. An explanation may be that the IP ownership on itself holds no added value. However, an IP ownership in combination with other entrepreneurial competencies can add value to the overall proposal. Due to the insignificance of both models, **H₂** is rejected.

4.2.3 The role of the Marketing Competency

In the third hypothesis a positive relationship between the marketing competency and the likelihood of acquiring funding is expected. The marketing competency variable consists of three sub-variables, who were measured in model 4 and model 6. The independent variable of the assessment of market potential was converted into a dummy variable, due to the absence of a normal distribution. The values '-1' and '0', were converted into '0,' with the values '1' and '2' converted into '1'.

The ability to assess market potential shows in both models a significant positive relationship with the USO funding decision. Model 4 shows a higher positive relationship (B = 0.788, p < 0.01), in comparison with model 6 (B = 0.735, p < 0.05). Looking at the second sub-variable a severe difference can be found between the two models. It was expected that the ability to leverage its brand reputation or company image to new markets showed a positive relationship with the likelihood of acquiring funding. In model 4, in isolated form, this relation is significant (B = 0.722, p < 0.01). However, in the full model we found an insignificant neutral relationship (B = 0.161, p > 0.05). An explanation may be that the effect of this independent variable is captured in other independent variables in the full model. The last sub-variable in model 4 shows an insignificant neutral relationship with the likelihood of acquiring funding

(B = -0.025, p > 0.05), while model 6 showed an insignificant moderate negative relationship with the likelihood of acquiring funding (B = -0.123, p > 0.05). Based on the results with the most significance, the results show a positive relationship between the marketing competency and the likelihood of acquiring funding. Based on the full marketing competency model, where two of the sub-variables show a significant positive relationship with the USO funding decision, **H₃** is confirmed.

4.2.4 Organizational Championing Competency

In model 5 the regression model works with a reduced dataset. Outlier cases 17, 73 and 224 were deleted from the dataset to improve the model. The fourth hypothesis also consists of three sub-variables. In the main hypothesis it is expected that the organizational championing competency has a positive effect on the likelihood of acquiring funding. Model 5, where the independent variables are isolated, shows three significant positive relationships. Effective and motivated founding team (B = 0.980, p < 0.01), Develop External Support (B = 0.493, p < 0.05) and Motivation Championing (B = 0.702, p < 0.01). In the full model 6, only two significant relationships remain. Effective and motivated founding team (B = 0.803, p < 0.01) and Motivation Championing (B = 0.587, p < 0.05). The Develop External Support independent variable showed an insignificant positive relationship (B = 0.360, p > 0.05). Based on the results of the full models, a positive effect between the organizational championing competency and the likelihood of acquiring funding is perceived. Therefore, **H₄** is confirmed.

4.2.5 The relationship between the acquisition of funding and USO survival

In the last hypothesis, the role of funding is investigated. The independent variable is the USO Funding Decision and USO Survival is used as dependent variable. The regression model is showed in Table 3. A positive relationship between the USO Funding Decision and the USO survival is expected. A significant positive relationship is perceived in the regression model (B = 1.186, p < 0.01). Therefore, **H₅** is confirmed.

Table 3. Binary logistic regression results. Dependent variable: USO Survival

	Model 1	
	B	s.e.
Constant	-0,438	0,483
USO Funding Decision	1,186**	0,454
NACE Code L1	-0,016	0,034
USO's University	-0,017	0,047
Number of Citations	0,000	0,000
-2 log likelihood	128,230	
Nagelkerke R-Square	0,132	
N = 100		

*p < 0,05 ; **p < 0,01 ; Hosmer and Lemeshow is not significant (p>0,05)

5. DISCUSSION

The objective for this study was to establish a better understanding of success factors for early stage USOs who seek government funding. This study uses a unique dataset of the NWO, where the USOs who apply for funding have not crossed the credibility threshold as presented by Vohora et al. (2004). This paper will handle two definitions for success: firstly, the acquisition of government funding and secondly, the survival of the USO. The main research question of this paper is formulated as: *“What success factors contribute to success in the early stages of a university spinoff?”* With more specifically defined research questions: *“What factors contribute to the university spinoffs likelihood to acquire government funding?”* and *“What is the relationship between the acquisition of government funding and company survival amongst university spinoffs?”*. From a literature perspective, the field of the USO is narrow. Little research is conducted on this topic and the academic landscape is developing at the moment.

This study has derived four success factors from literature, that contribute to the likelihood of acquiring government funding and one success factor that contribute to the USO's survival. The results show that there are entrepreneurial competencies, which significantly contribute to the success of a USO. The entrepreneurial competency of business planning was positively correlated with the acquisition of government funding, which confirms the available literature on this topic. Minimizing risk on the long term, the creation of a vision and understanding future challenges contributes to the confidence of the review committee that the USO is able to overcome those future challenges.

Other entrepreneurial competencies that were significantly contributing to the acquisition of government funding were the marketing competency (Danneels, 2016) and the organizational championing competency (Rasmussen et al., 2011). Both competencies were derived from the literature and covered other dimensions of the USO's general operations. The marketing competency has more focus on penetrating the future market of the USO. In the results the ability to assess the potential of new markets and the ability to leverage their brand reputation or company image to new markets had the most positive influence on the funding decision. The sub-variable of the ability to research new competitors and customers, showed no significant impact towards the funding decision by the NWO. These results are representative for the current literature and are fitting in the government funding landscape. If a USO

can successfully assess the potential of the new markets, they can better position themselves in the market and they can assess future opportunities. With leveraging their brand reputation or company image they have the potential to successfully penetrate that market.

With the organizational championing competency, the focus shifts more towards the people and entrepreneurs behind the USO. In the regression analysis, all the characteristics of the competency were positively correlated with the funding decision. The strongest relationship showed when the USO has an effective and motivated founding team and the ability of the academic entrepreneurs to motivate groups and individuals within the USO. From a funding standpoint this result is logical. When the employees of the USOs are highly motivated and effective, the better the chance that obstacles are tackled, which results in higher competitiveness of the USO. The positive results of the regression analysis with the organizational championing competency as the independent variable and the USO funding decision as the dependent variable confirms what Rasmussen et al (2011) and Gümüşay & Bohné (2018) indicated.

The neutral insignificant relationship of the IP ownership with the acquisition of funding was not expected. Not only gives the IP ownership the USO a unique position to exploit specific research, but it also shows that the USO is highly educated in their field of expertise. The regression results showed no significant relationship, what can indicate that IP ownership is of secondary importance. It is an additional selling point, but not a fundamental one. Looking at every important aspect of a USO, the IP ownership is not part of the most important aspects, regarding the funding decision. It can complement the entrepreneurial competencies that are positively correlated with the USO funding decision, to provide a better position for government funding. It cannot act as an individual success factor.

For the last independent variable, the role of the funding, is of great importance of the USO. When you receive the government funding, does that mean that you are more likely to develop yourself into a stable market player? In the regression analysis it showed a strong relationship in favour of that. Also adding value to the other hypothesis, that the contribution to success is made. Because, if certain variables are helping you to receive funding, you have also a higher chance of survival. Which is in line with the available literature.

From a broader view towards the whole application process at the Valorisation Grant at the NWO and the regression results, three important areas can be distinguished. Firstly, what kind of people are part of the USO's team and can they get the job done. Secondly, what are the ambitions of this team and how are they going to conquer their market, with a medium to long term view. Lastly, on the short term, how is this team going to kickstart their USO with penetrating the market. The Valorisation Grant is €200.000, which the USO likely spends in the first years of their existence, in combination with the decrease in problem solving abilities after four years (van Geenhuizen & Soetanto, 2009), makes the short-term view more dominant. If these three aspects are in order the IP ownership is less prominent, in comparison to the execution of the total plan.

To conclude, different factors are necessary to increase the likelihood of acquiring government funding. In general, there is not one factor that has the upper hand in the USO funding decision of the NWO. A USO must have a proper business planning, the marketing competence and the organizational championing competency in order to secure funding. With the

funding, the USO has a higher chance to survive for 5 years, but this does not mean that it certainly will lead to USO success over a longer period of time. All the competencies must be used and developed continuously to successfully offer their product or service to the market.

5.1 Theoretical Implications

The results of this paper have an effect on the underlying literature. The unique position of this study is represented by the USOs, who are in very early stages in their lifetime. The application for the Valorisation Grant is for most USOs the first funding that they apply for. All of the parts of the USO may not be fully developed and therefore it may be a greater test to secure the funding. Placed in the Vohora et al. (2004) framework most USOs are in the opportunity recognition or the entrepreneurial commitment phase. This paper has established a clearer picture for the crossing of the credibility threshold, to establish success factors that increase the likelihood of the acquisition of government funding (Vohora et al., 2004).

Danneels (2016) conducted a study about which marketing competencies would help a firm to serve new markets. Danneels (2016) focused on stable market players who wanted to penetrate a new market. The companies were stable players, meaning that certain processes inside the company were developed. This paper contributes to Danneels (2016) by expanding the scope to the early stage USOs. In addition, the marketing competency, that was introduced does apply as a success factor in the USO context.

5.2 Managerial and Policy Implications

Academic entrepreneurs who find themselves in the situation that they have the opportunity to apply for a government funding programme, can learn from this paper. The first thing that is shown in the results is that multiple dimensions of the USO have a positive relationship with the funding decision. It can be a strategy to bet only on one competency and hope to receive the funding, but this paper would suggest to focus on all the success factors. The academic entrepreneur should adopt a broader approach of looking towards the USO, instead only seeing a technological innovation. All the aspects of the USO matter, also business planning, marketing competencies or a proper founding team. Make sure that the academic entrepreneur present a full package to the review committee and properly sell the potential that your USO can unlock.

The government institutions want to prevent one clear undesired outcome, when assessing the proposals. The outcome that funding is granted, but the USO does not develop towards a stable market player. The USO failed to successfully commercialize the research. In this situation tax-payer money is wasted on a project, which is obviously undesirable. To tackle that situation, this paper advises to also look at the whole USO-package, but with a more practical approach. Where in some cases only one developed competency can be enough to receive the funding, it is desirable to look at multiple competencies combined. Look at the proposals with a short-term approach. Because the funding that the USOs can spend, is spend in the short term. Next to the short-term vision on spending money, the evaluators should conduct a medium- to long term vision, on the goals and ambitions of the USO.

5.3 Limitations & Future Research

In this paper, a dataset of the NWO formed the basis of the research. This dataset did consist of the evaluation results of 239 USOs. The validation of this research would be more robust if the dataset covered more USO's. Another concern for this research is that the regression models are based on two three of judgement. Firstly, the proposals that were submitted

to the NWO, where the academic entrepreneurs had to determine their own abilities. Secondly, the evaluation committee evaluated each proposal and placed their own comments in the dataset. The perceived abilities of the USOs in the application could differ from the actual abilities in practice. Thirdly, during the open coding content analysis the text is also judged when transformed into code. Furthermore, the USOs that are part of the dataset only are connected to Dutch universities. The results of the analysis can therefore only be applied to the Dutch academic landscape. The results do not provide a solid argument for the success factors in other academic landscapes.

For future research I would suggest expanding this research to other countries in Europe, who have a similar educational climate as the Netherlands. Determining if the same success factors for acquisition of funding are also applicable in a different country. In addition, it is important to investigate the judgemental influences that the review committee of the NWO has. A future study, where the researchers are more involved in the evaluation process and where they can establish more measurable and rational ways to evaluate. Furthermore, a future research recommendation would be to try and understand certain patterns for successful funding. Which success factors are connected together and which ones are not. Try to understand a broader picture of the success factors, rather than only having single factors that you measure against the USO Funding decision. Lastly, the Valorisation Grant programme has an open application for USOs to put themselves into consideration for funding. This does not limit the USO to seek for funding elsewhere. USOs are able to acquire funding from other sources and potentially received additional commercial and financial advice from other application processes. Therefore, I would suggest that a qualitative study of the success factors in the Valorisation Grant programme, such as case studies or interviews, might provide additional insights and new success factors that are not yet discovered in theory.

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8. APPENDIX

8.1 Appendix A: Overview of the Independent Variables in the Analysis

Independent Variable	Item Label	IV name in Analysis	Definition	Definition of Scale
Business Planning	-	Business Planning	The entrepreneurial ability of business planning, minimize risk on the long term and create a vision	Measured by Neutral ability (0), Moderate ability (1), Sufficient ability (2) and a Strong ability (3)
IP Ownership	-	IP Ownership	The Intellectual Property position of the USO	Measured by difficult IP position (-1), Neutral IP position (0), Moderate IP position (1) and Strong IP position (2)
Marketing Competencies	MComp1	Assessment of Market Potential	The ability to assess the potential of new markets	Measured by strong ability (1), neutral ability (0), weak ability (-1)
	MComp2	Leverage Ability	The ability to leverage its brand reputation or company image to new markets	Measured by strong ability (1), neutral ability (0), weak ability (-1)
	MComp3	Research of Competitors and Customers	The ability to research new competitors and new customers	Measured by strong ability (1), neutral ability (0), weak ability (-1)
Organizational Championing Competency	OCC1	Founding Team	The USO has an effective and motivated founding team	Measured by strong ability (1), neutral ability (0), weak ability (-1)
	OCC2	Develop External Support	The ability to develop external support and credibility towards industry partners, customers, and potential investors	Measured by strong ability (1), neutral ability (0), weak ability (-1)
	OCC3	Motivation Championing	The ability to motivate groups and individuals within the USO	Measured by strong ability (1), neutral ability (0), weak ability (-1).
USO Funding Decision	-	USO Funding Decision	The accessibility of financial funds via government funding	Dichotomously measured. USO did receive the government funding (1) or USO did not receive the government funding (0)

8.2 Appendix B: University Coding

Table 4. University Codes

Coding Value	University
0	Not Specified
1	University of Twente
2	Technical University Delft
3	Technical University Eindhoven
4	Radboud University
5	University of Amsterdam
6	University of Leiden
7	University of Utrecht
8	Erasmus Medical Center
9	Leiden University Medical Center
10	Vrije Universiteit Medisch Centrum
11	Radboud University Medical Center
12	University Medical Center Groningen
13	University Medical Center Utrecht
14	Vrije Universiteit Amsterdam
15	Rijksuniversiteit Groningen
16	Biomade
17	University of Maastricht
18	NKI
19	STRON*
20	Wageningen University
21	AMOLF
22	NIKHEF

8.3 Appendix C: NACE L1 Industry coding

Industry	Industry Code	Coding value
Agriculture, forestry and fishing	A	1
Mining and quarrying	B	2
Manufacturing	C	3
Electricity, gas, steam and air conditioning supply	D	4
Water supply; sewerage; waste management and remediation activities	E	5
Construction	F	6
Wholesale and retail trade; repair of motor vehicles and motorcycles	G	7
Transporting and storage	H	8
Accommodation and food service activities	I	9
Information and communication	J	10
Financial and insurance activities	K	11
Real estate activities	L	12
Professional, scientific and technical activities	M	13
Administrative and support service activities	N	14
Public administration and defence; compulsory social security	O	15
Education	P	16
Human health and social work activities	Q	17
Arts, entertainment and recreation	R	18
Other services activities	S	19
Activities of households as employers; undifferentiated goods - and services - producing activities of households for own use	T	20
Activities of extraterritorial organisations and bodies	U	21
No information	Z	0

8.4 Appendix D: VIF-values of the Independent Variables

Independent Variable	VIF-value
Business Planning	1.071
IP Ownership	1.050
Assessment of Market Potential	1.076
Leverage Ability	1.538
Research Competitors and Customers	1.075
Founding Team	1.336
Develop External Support	1.342
Motivation Championing	1.203
NACE Code L1	1.068
USO's University	1.056
Number of Citations	1.081