Money well-spent – What university spin-off characteristics lead to early-stage governmental funding acquisition?

Author: Whitney Verplak
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands

ABSTRACT

University spin-offs (USOs) are entrepreneurial start-ups that have grown to be of great importance for academic institutions as a way to commercialize their innovations. Even though these innovative ventures became of this importance, there was still not much knowledge on what actually influences their success. One thing that was apparent from previous studies was that access to financial resources, specifically governmental funding in the earlier stages of development, was crucial for USOs to be able to make progress. In this research paper, the goal was to find factors that influence the acquisition of early-stage governmental funding. This was done by analysing a dataset based on information from the Dutch Research Council (NWO), which included USO grant proposals submitted for evaluation of the Valorisation Grant programme. The analysis was done by content analysis and binary logistic regression analysis. Results from this analysis showed that both having a balanced founders' team of the USO and the entrepreneurs' possession over the opportunity refinement competency had a significant positive effect on the USOs ability to obtain governmental funding. These two factors were identified as factors that had a positive influence on the university spin-off's ability to obtain early-stage governmental funding, which is crucial for USOs in order to build their venture credibility and eventually grow into a successful business.

Graduation Committee members **Dr. Igors Skute**
Dr. Tim G. Schweisfurth

Keywords

University spin-off; Governmental funding; Early-stage funding; Entrepreneurial characteristics; Academic entrepreneurship; Venture creation

1. INTRODUCTION

The creation of university spin-offs happens for a variety of reasons, one of them being that via these spin-offs, university research and technologies can be brought to market, as an alternative to intellectual property protection (IP), such as patents and copyrights. This alternative is often very expensive for start-ups and they often lack the proper knowledge on how to successfully implement IPR, also because start-ups have low access to the legal counselling needed for IPR (Lima & Santos, 2018). One of the more indirect reasons for spin-off creation is that USOs create business opportunities, done by translating the outcomes of certain research into "workable technologies", which lead to market solutions (Pattnaik & Pandey, 2014). Additionally, USOs contribute to the economic growth in the area by job creation and the clustering of firms, since most activities of these new ventures take place on a local scale (Rasmussen & Wright, 2015; Pattnaik & Pandey, 2014). Although these are justifiable reasons for universities to be involved in this type of venture creation, why is it that the amount of successful university start-ups is still considerably low? These academic ventures often fail to develop into stable market players with lacking economic and societal impact. Nevertheless, spin-offs do have huge potential to generate such impacts because USOs often apply their innovation and technologies to efforts that try and solve different grand global challenges, such as climate change and health-related issues (Compagnucci & Spigarelli, 2020). According to Rasmussen and Wright, even if USOs do not grow to be giant businesses but stay rather small, they "*… can be seen as an important 'lubricant' in the innovation ecosystem that introduces and disseminates new science-based innovations*" (Rasmussen & Wright, 2015). However, previous studies have been able to identify factors that either 'make or break' university start-ups, but until now, they have been lacking to provide a list with specific criteria that are needed for spin-off success.

To be able to identify these specific criteria, it is important to pinpoint both positive and negative factors on the success rate of these start-ups. As stated above, previous studies have mentioned some of the factors that impact the development of start-ups. For example, Locket and Wright (2005) pointed out that university start-ups that can acquire proper funding and access to venture capital finance through the technology transfer offices (TTOs) the university offers are more likely to be able to continue their business (Lockett & Wright, 2005). Bednár and Tarisková add to this that not only access to sufficient financial resources, such as loans, are important to start-up success, but that also money from (individual) investors is important for a start-up to grow to be successful (Bednár & Tarisková, 2017). The funding USOs can receive can thus come from various resources. TTOs are one way for universities to support their start-ups in their development, but there are also other ways. For example, crowdfunding is very useful when entrepreneurs are facing difficulties with receiving venture capital finance, but crowdfunding is not a very reliable source, and it is important for USOs to have more reliable funding (Böckel, Hörisch, & Tenner, 2020). In The Netherlands, one important financing institute is the Dutch Research Council (NWO), which funds research based on recommendations from scientists and other experts in the Netherlands and other countries (NWO, 2021). The NWO can only give very limited firms access to their funding, and although this funding is often quite small, this governmental funding often takes place in the very early (and critical) stages of these spin-offs, which helps these new companies survive the beginning phases. This makes it even more important for entrepreneurs to possess knowledge on how to receive the proper funding, especially in these beginning stages of their start-ups, when they are not yet generating profits (Bednár & Tarisková, 2017). Previous research was mostly about several factors and different aspects to why USOs become successful (or why not), but not about which of these factors were playing a role in obtaining that much-needed funding in these critical stages of USOs. This study wants to find these factors that lead to a successful funding acquisition for USOs. This funding could assist the USOs introduce their innovations to the market and finding new customers, but also with overcoming all the obstacles they face in order to move through the beginning phases, as said before. This research gap leads to the main research question of this study: "*What kind of entrepreneurial characteristics lead to the acquisition of early-stage governmental funding for USOs?*"

Next to funding being one of the factors that are most talked about by researchers, others have studied the stages of development, adding critical junctures that university spin-offs need to overcome in order to be successful (Vohora, Wright, & Lockett, 2004). Here, it was concluded that USOs must make a successful transition between the several development phases and properly deal with the critical junctures in order to turn out successful. This framework will be discussed in its entirety in the second chapter. Another study by Van Geenhuizen and Soetanto suggested that there are several problematic stages in development models on USOs, all with their own segments and trends in obstacles to growth (Van Geenhuizen & Soetanto, 2009). This paper builds on the research by Vohora et al. (2004) and Van Geenhuizen and Soetanto (2009) by adding entrepreneurial characteristics USOs need to be able to overcome the important obstacles towards venture credibility and thus being able to obtain early-stage governmental funding. This is done by contributing new insights to these studies on the development of university spin-offs by examining which factors influence the entrepreneurs' ability of funding acquisition for their new ventures. Adding these criteria makes these development models more complete, which is useful for USOs to build on in the future and increase their chance of success. Furthermore, this paper will try to add to the competency framework made by Rasmussen et al. (2010) and the one made by Danneels (2016) by researching if the possession of these competencies is favourable when USOs try to acquire funding. By identifying these characteristics that are needed for proper funding acquisition, this research findings can help both academic entrepreneurs with their venture realization and creditors of funding, which can better evaluate the USOs and thus achieve the best outcome of their investments.

2. THEORETICAL FRAMEWORK

There have been multiple definitions of USOs proposed in previous research, but there has yet to be one, clear definition to these innovative start-ups. USOs have been defined as *"[...] independent ventures established by graduates or university staff, with the mission to bring novel university knowledge to market."* (Nejabat & Van Geenhuizen, 2019) or *"[...] a new company founded to exploit a piece of intellectual property created in an academic institution."* (Shane, 2004). Additionally, van Geenhuizen & Soetanto defined USOs in their paper as *"[...] a particular set of spin-offs created for the purpose of commercially exploiting a new technology or research results developed within a university."* (Van Geenhuizen & Soetanto, 2009). Following these definitions, this paper defines USOs as entrepreneurial start-ups, which are founded by an academic institution, with the purpose of commercialization of an innovative technology that is created by a university. University spin-offs are commercialization-engines for academic institutions, with several benefits which were also mentioned in the previous section (Pattnaik & Pandey, 2014). Another

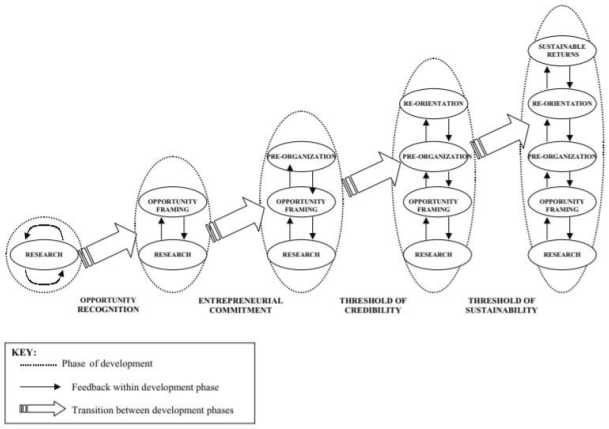

Figure 1: The critical junctures in the development of university spinout companies (Vohora, Wright, & Lockett, 2004)

commercialization technique for university technology is licensing, which is an option when a certain technology is not fit for a spin-off company. However, it has been proven that USOs provide significantly higher revenue to these universities compared to licensing, due to the equity partnerships between the universities and their spin-offs (Bray & Lee, 2000).

2.1 Phases of development for USOs

In section 1.1, it was mentioned that next to funding, there is also a lot of research done into the several stages or phases of development that university spin-offs go through, of which the Vohora et al. (2004) framework with five different phases is the most known. Before moving on to the next development phase, USOs encounter "critical junctures" (Vohora, Wright, & Lockett, 2004). These critical junctures are about the lack of the USO's key resources and/or capabilities that the USO requires for further development. The assets can be either tangible, such as the acquiring of finance, or more intangible, such as the motivation of the entrepreneurs to continue with the USO (Warren, 2006). Figure 1 shows the proposed framework by Vohora et al.

2.1.1 Research phase

During this foundation phase, intellectual property is created for commercialization and the entrepreneurs involved with the creation of the USO acquired valuable knowledge and technological assets in their field of expertise (Vohora, Wright, & Lockett, 2004). As mentioned above, before a USO can move from this first phase onto the second, it has to overcome its first critical juncture. Vohora et al. define the critical junctures as "*[...] a complex problem that occurs at a point along a new high-tech venture's expansion path preventing it from achieving the transition from one development phase to the next.*" There are four different critical junctures identified, with the first of them being *opportunity recognition*. This critical juncture is about the solution that can fulfil a yet unfulfilled market need (Bhave, 1994). Vohora et al. (2004) propose that without the required capability of combining scientific knowledge and offering that solution to the unfulfilled market need, academic entrepreneurs will fail in proceeding towards the commercialization of their innovation(s).

2.1.2 Opportunity framing phase

This second phase is about the transition from a recognized opportunity towards the creation of a USO, focusing on the academic and the TTO (Vohora, Wright, & Lockett, 2004). Both the university and the TTO are trying to investigate whether the opportunity that is created has sufficient value in order to proceed further with the development of the new USO, after which it is tried to "frame" it to a commercial opportunity (Vohora, Wright, & Lockett, 2004). When a USO is moving from this phase to the third one, it faces its second critical juncture, *entrepreneurial commitment*. It concerns the acts which connect the venture champion to a certain course of events (Vohora, Wright, & Lockett, 2004).

2.1.3 Pre-organization phase

If the framing of the opportunity of the previous phase has been successful, and the commercialization of their innovation is to be continued, it is time for management to start with developing and implementing their strategy, which involves taking decisions regarding the, in the previous section mentioned, resources and capabilities (Vohora, Wright, & Lockett, 2004). During this phase, Vohora et al. say that the academic entrepreneurs have the most learning to do, when the entrepreneurs have not gained much knowledge and experience in the past regarding commercialization, on how their target industry operates (Vohora, Wright, & Lockett, 2004). Academic entrepreneurship in the sense of USOs can be defined as the efforts undertaken by the university itself to support the commercialization of their technologies on their own grounds and in their environment, such as the region the university is located in (Siegel & Wright, 2015). All of this adds to the third critical juncture a USO must overcome, which is *venture credibility*, which is concerned with the entrepreneurs' abilities to obtain access to and acquire resources that are initially needed for the venture to be able to start functioning (Vohora, Wright, & Lockett, 2004).

2.1.4 Re-orientation phase

When the USO has figured out how to acquire the required resources for their business, it is time to begin focusing on their value proposition to their customers (Vohora, Wright, & Lockett, 2004). During this phase, there is a lot of change happening to the USOs, because the entrepreneurs of the start-up gain more new knowledge and information by interacting more with their customers, but also from interacting with the competitors in their market. Before a USO can move onto the last phase in this development framework, Vohora et al. propose that it still needs to face one last critical juncture, *venture sustainability*, where it is essential that the USOs ability to strengthen their resources and improve their capabilities that will enable the business to generate returns (Vohora, Wright, & Lockett, 2004).

2.1.5 Sustainable returns phase

Entrepreneurs at this phase will aim to obtain access to and re-configure resources in order to assemble the skills that will enable the USO to make progress at this phase, and the USO has addressed most of its uncertainties, and has been able to establish itself as a more sustainable firm (Vohora, Wright, & Lockett, 2004). The sustainable returns that the USOs aim for can take many forms, such as simply revenue from selling products to customers, or funding they receive from either new or existing investors. Being able to create such returns is a sign that the USO can offer and create value (Vohora, Wright, & Lockett, 2004).

2.2 The role of entrepreneurs and their teams

The quality of the entrepreneurial–managerial group and the individual capabilities and qualities of the entrepreneurs involved with the USO is a crucial factor that may affect the growth and success of university spin-offs (Clarysse, Tartari, & Salter, 2011; Visintin & Pittino, 2014). Visintin and Pittino focused more on the team structure and skills rather than individual competencies, and suggested that university spin-offs need to properly balance their scientific and business orientation (Visintin & Pittino, 2014). Proper composition of the founding team would help achieve this balance, by combining the entrepreneurs' traits that

both promote and favour integration (Visintin & Pittino, 2014). However, having a good mix of expetise, skills and experiences are good for a team to have, but having too many people in the team also results in more different opinions, which can raise managerial issues amongst others. Having a proper amount of entrepreneurs involved in the venture creation with the right balance between science and business orientation within the founding team is crucial for spin-offs in order to obtain governmental funding. Every aspect involved in venture creation is important for the businesses to be able to make a proper business plan but also being able to do the research that is needed in order to make the product and service fitting with the customers' needs and wishes. Following all of this information, the below-stated hypothesis is formulated.

H_1 = *A proper balanced entrepreneurial founders team has a positive effect on successful early-stage funding acquisition of USOs*

Such proper composition of the founders' team can only be done if the individual competencies of each entrepreneur are known and well-developed. These individual competencies can be defined as "*... higher-level, improvable characteristics entailing personality traits, skills, and knowledge that bring about the ability to accomplish something through the use of resources*" (Gümüsay & Bohné, 2018). Rasmussen, Mosey, and Wright identified three of such competencies, which are *opportunity refinement*, *leveraging*, and *championing*. The opportunity refinement competency is about being able to discover opportunities and making these opportunities into a viable business concept (Rasmussen, Mosey, & Wright, 2011). This competency also fits with the marketing competency used in a study of Danneels, which included the ability to see the potential in new markets and being able to set up a proper business in general (Danneels, 2016). Being able to find such a 'gap in the market', and then being able to actually explore the opportunity and making this into a proper business plan increases the likelihood for that business to grow. You do not create a need with your product, but you fulfil an already existing customer's need. Look at, for example, the inventions such as the paperclip, or Wi-Fi. Proposing such unique propositions to fulfil customers' needs makes it thus more likely for USOs to gain the credibility and thus receive the funding they require in order to be able to proceed with the development of their business. With this, the second hypothesis in this study is introduced.

H_2 = *The possession of the opportunity refinement competency has a positive effect on successful early-stage funding acquisition of USOs*

The second competency Rasmussen et al. (2011) mention, the leveraging competency, regards the ability to develop credibility and experience which is hardly needed for the USO to acquire access to resources (Rasmussen, Mosey, & Wright, 2011). These can all come from different sources, which means that there is a need for credibility and experience in different areas, such as the university itself but also among industry partners for example. One of the most important resources for USOs, especially in the early phases of the business, would be financial resources, which is where we will be focusing on for this part of the research as well. Without the credibility of your business, obtaining governmental funding will be very hard. This governmental funding is crucial for USOs who need this funding in order to bridge the financial gap they have in the beginning phases of development. If governmental funding is not granted, it would be next to impossible to receive other financial resources in a later stage, as the spin-off would not have gained its credibility. There are very few investors who would put their money into a business they do not seem trustworthy. This makes it thus even more important for USOs to be able to receive governmental funding. Therefore, the following hypothesis is formulated for this study.

H_3 = *The possession of the leveraging competency has a positive effect on successful early-stage funding acquisition of USOs*

The third and final competency mentioned by Rasmussen et al., championing, is about the ability to leverage company image to convince others to its development in order to develop credibility of your company (Rasmussen, Mosey, & Wright, 2011). Such 'champions' are the ones that often are very experienced, have a scientific background, and have the connections to the university that are needed in order to bring the required resources into the venture. These types of entrepreneurs are able to find proper business partners and getting in contact with the target customers to be able to properly understand their needs. These last-named two aspects are being discussed in their entirety in the following two sections. Obtaining this competency might be difficult for these starting companies, but as said above, it is very important for USOs to be able to do so. Being able to build a strong venture with connections to both university and the market helps the USO gain credibility, thus being more likely to receive governmental funding. From this reasoning, the below-stated hypothesis is introduced in this research.

H_4 = *The possession of the championing competency has a positive effect on successful early-stage funding acquisition of USOs*

Without the proper development of these competencies, it would be difficult to create a decent founding team, which all play a role in gaining the trust which is needed for the funding acquisition of USOs. The spin-offs cannot grow into a fully functioning organization without this critical and early-stage funding (Vohora, Wright, & Lockett, 2004).

2.3 The role of having a clear customer focus on USO success

New ventures are imprinted with the characteristics that fit with the environment where they were founded, and on the long-term, these characteristics show their effect on the development, performance, and eventually survival of USOs (Rasmussen & Wright, 2015; Ganco & Agarwal, 2009). University spin-offs are developed in an academic context, which means that there is a gap between the USO and a commercial market (Jensen & Thursby, 2001). This gap is often there due to the reason that a university campus is often not a commercial environment, which makes the transformation from the scientific findings into viable products or services even more difficult. This can also result in a mismatch between the actual customer needs and what that product or service actually offers them, which creates problems for these USOs when trying to move through the different phases of development (Rasmussen & Wright, 2015; Vohora, Wright, & Lockett, 2004). Knowing what your customers want is an essential factor in start-up success, as without demand, your product is not going to sell, meaning your business will not be able to continue to grow (Song, Podoynitsyna, Van Der Bij, & Halman, 2008). This study by Song et al. showed that having a clear market scope, which means having a clear customer focus and having a good overview of their wants and needs, was (one of the) significant success factors for new technology ventures (Song, Podoynitsyna, Van Der Bij, & Halman, 2008). To sum up, having a clear customer focus and having a good overview of their needs makes it that their will be demand for the product you are offering. This demand makes sure that customers would actually buy your product, which helps your venture grow in turn as well. This makes it thus crucial for new ventures to have a clear customer focus in order to be able to obtain governmental funding as, without it, there would not be a clear market scope

which makes it more difficult to come up with an innovation that would fit your target customers' needs. Therefore, the following hypothesis can be proposed.

H_5 = *Having a clear customer focus has a positive effect on successful early-stage funding acquisition of USOs*

2.4 The role of network partners in USO success

USO's collaboration with their network and industry partners can increase the spin-offs reputation and credibility, which is needed for spin-offs to have access to the necessary resources (Dickel, Hörisch, & Ritter, 2018; Rasmussen, Mosey, & Wright, 2011). These networks also help the USOs to remain competitive, and USOs could even outgrow their competitors due to the possesion of advanced knowledge. A very nice example of such network partners is given in the Xeltis case from the NWO (Van 't Hoog, 2015). When the interviewees were asked on why they think Xeltis received their funding from the NWO, they answered that not only their solid business plan was an important reason, but they also "benefited a lot from existing collaborations with Eindhoven University of Technology" (Van 't Hoog, 2015). After reading this information, the following hypothesis can be formulated.

H_6 = *The USO's possession over a network has a positive effect on successful funding acquisition of USOs*

3. RESEARCH DESIGN

3.1 Subjects of study

This study analyses 242 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, 2021). 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, 2021). 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, 2021). 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 a 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, 2021).

The VG has two phases: Phase 1 is the feasibility study with a maximum funding of 25.000 Euro that must 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, 2014). Phase 2 projects which received the funding must be completed within two years, including an interim evaluation (NWO, 2014). 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 dependent variable used for this analysis is the success rate of the USOs. Success, in this sense, is the ability of a USO to move through the development phases proposed by Vohora et al., which is mainly influenced by the ability of a USO to acquire the proper funding by the NWO. We formulate this dependent variable as a dichotomous variable, which has a simple yes or no outcome (Bevans, 2019). So, in short, the dependent variable in this study can be formulated as *early-stage USO funding acquisition*, where (1) indicates funding has been granted, and (0) indicates no funding has been granted.

3.2.2 Independent Variables

Independent variables can influence the dependent variable, which has been defined above. This effect on the dependent variable can be either in a positive or a negative manner. Following all the hypotheses stated in section 2.2, we will measure the effects on USO success according to the independent variables listed below.

3.2.2.1 Entrepreneurial competencies

Proper founding team is measured as the balance, thus the optimal diversity among the academic entrepreneurs in the founding team, with (1) being a highly balanced founding team, (0) meaning that it is neutral and (-1) meaning that the balance in the founding team is lacking.

Opportunity refinement competency is measured as the ability to assess the potential of opportunities and new markets, with (2) meaning a high ability to do this assessment, (1) meaning sufficient ability to do this assessment, (0) meaning it is neutral and (-1) meaning that the ability of this assessment is lacking.

Leveraging competency is measured as the USOs ability to gain access to other prior financial funds, where (1) means the ability to gain access is high, (0) meaning that it is neutral and (-1) meaning that the ability to gain access to other prior financial funds is lacking.

Championing competency is measured as the ability to leverage the company image to convince an organization and/or individuals to contribute to the USOs development, with (1) meaning a high ability to leverage the company image, (0) meaning it is neutral and (-1) meaning that this ability to leverage the company image is lacking.

3.2.2.2 Customer focus

Customer focus is measured as the ability to assess the needs of the USOs target customers, with (2) meaning this ability to assess customer needs is high, (1) meaning that the ability to assess customer needs is sufficient, (0) meaning that it is neutral and (-1) meaning that the ability to assess customer needs is lacking.

3.2.2.3 Business

Network is measured as the presence of one or multiple business partners in the form of either a launching customer and a business and/or university alliance, with (1) meaning that a credible network of partners is present, (0) meaning that this presence is neutral and (-1) meaning that there is a lack of a credible network of business partners.

3.2.3 Control Variables

Control variables are anything that stays constant during a research study, and although they do not always contribute to the research's aim, they could have an influence on the outcomes of the study (Bhandari, 2021). For this study, the *type of industry* a USO operates in is part of the control variables. This control variable is a nominal variable and will be coded by grouping the USOs in the study according to their NACE code, which is an

industry standard classification system used in the European Union. The other control variable used in this research is the *parent university* of the university spin-off. The third and final control variable used during this study is the *H-Index* of the academic entrepreneurs involved in the funding acquisition.

3.3 Data collection

To conduct a comprehensive analysis and test our 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 our independent variables, we used content analysis on the aggregated evaluation results regarding feasibility and valorisation potential of selected USO proposals. To further enhance our research model, we retrieved information regarding the performance of business incubators and technology transfer offices of the leading Dutch technical universities from their websites and open-source reports. We also retrieved scientometric 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 from Web of Science. We further matched the research fields of publications and USO grant proposals with the NACE industry codes.

3.4 Analysis

Testing the proposed hypotheses in this research will be done by the program SPSS, as this software allows us to run the data analyses we need for this study. The goal of this research is to identify the crucial factors of USO success and construct statistical models that support these findings. This fits best with using a quantitative analysis. This study will use content analysis and binary logistic regression, to analyse the coded data. Content analysis consists of open coding, axial coding, and selective coding, which are all steps in the grounded theory method of this type of data analysis (Delve, sd). In short, the first step in the content analysis is open coding, which is where you take the textual data and divide it in discrete parts. After this, you use axial coding, where you find connections between the codes you made. The last step is called selective coding, where one central category is selected that connects all the codes from the analysis and captures the essence of the research (Corbin & Strauss, 1990). Next to this, binary logistic regression is used, which is a type of regression analysis (Midi, Sarkar, & Rana, 2010). Within the use of logistic regression models, there are some general assumptions: a) the dependent variable must be a binary variable; b) all data must be independent from each other and c) the independent variables must not be highly correlated (Midi, Sarkar, & Rana, 2010). These general assumptions will also apply for this analysis.

4. RESULTS

This research was based on an existing database of 242 grant proposals from university spin-offs submitted in the Phase 2 of the Valorisation Program of the NWO. After the development of the independent variables in this study, the data was analysed according to these variables using open coding content analysis, done in Excel. After this analysis, some independent variables seemed to be overlapping and others were poorly represented in the database. Looking at these results, newly formulated categories and variables were designed, and coded by the way it is described in Appendix: Table 3. When the content analysis was completed, the dataset was analysed by binary logistic regression analysis, done in the computer program SPSS. Looking at the results from the analysis in SPSS, we will discuss the proposed hypotheses in this research paper, which will be either rejected or not.

To start off, we look at if our analysis met the assumptions that need to be met in order to proceed with binary logistic regression. The first assumption was that the dependent variable must be a binary variable. The dependent variable in this research was USO funding acquisition, which was either that the funding was received (1) or not (0). This makes it a binary variable, thus meeting the first assumption. Looking at Table 1, which gives an overview of the descriptive statistics and correlations for all variables used in this study, we can see that the correlations between these variables are overall low to moderate, implying that all used variables are, as expected, independent from each other, which confirms the second assumption that applied for this research. Testing for multicollinearity, the third and final assumption, can be done by looking at the variance inflation factor (VIF) values. For all independent variables these values were lower than 1.47. The threshold set for VIF values is commonly set at 5.00, and 1.47 is below this threshold. This eliminates multicollinearity and thus confirming the third assumption that needs to be met for binary logistic regression analysis.

From the correlation analysis in this table, there are five independent variables that showed a significant moderate positive correlation with the dependent variable. First of all, the independent variable of proper founding team is moderately positively correlated with the dependent variable of USO funding acquisition ([1] in the table) (Pearson $r = 0.323$, $p < 0.01$). Secondly, the independent variable of opportunity refinement is low positively correlated with the dependent variable (Pearson $r = 0.266$, $p < 0.01$). The third independent variable that has a low positive correlation with the dependent variable is championing (Pearson $r = 0.202$, $p < 0.01$). Additionally, the fourth independent variable of customer focus is low positive correlated with the dependent variable (Pearson $r = 0.222$, $p < 0.01$). Finally, the independent variable of network is low positive correlated with the dependent variable (Pearson $r = 0.149$, $p < 0.05$). Regarding the control variables used in this study (NACE Industry Code L1, Parent University and H-Index), neither of these control variables were marked to be significant.

Table 2 shows the binary logistic regression analysis results. In this analysis, the first model analyses the effect of the control variables, which in this study were the NACE Industry Codes, the parent university of the USO and the H-Index of the academic entrepreneurs. The following models 2-7 analyse the effect of each independent variable on the dependent variable separately, keeping the control variables in the analysis. Model 8 represents the effects of all independent variables altogether, with also the control variables still included. Model 9 is done the same way as model 8, but all outliers were removed. For the analysis of the proposed hypotheses in this research, we will be looking at this last model of Table 2, as for this model the -2 Log Likelihood is the lowest and the Nagelkerke R Square is the highest, meaning that this model is the most explanatory of all.

Hypothesis 1 proposed that a balanced founding team has a positive effect on the USO's ability to acquire funding. Looking at the results in Table 2, we can see that this independent variable has a significant positive effect on the funding acquisition of USOs ($B = 1.148$, $p < 0{,}01$). This means that we are able to confirm hypothesis 1. The other hypothesis that could be confirmed was hypothesis 2, which proposed that the possession of the opportunity refinement competency has a positive effect on the USO's ability to acquire funding. From Table 2 we can see that this independent variable had a significant positive effect on the funding acquisition of USOs ($B = 0.477$, $p < 0.01$).

Hypothesis 3 proposed that the possession of the leveraging competency has a positive effect on the USOs ability to acquire

Table 1: Descriptive Statistics and Correlation for Dependent Variable: USO Funding Acquisition

	Min	Max	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
[1] USO Funding Decision	0	1	0.41	0.493	1									
[2] Proper founding team	-1	1	0.13	0.660	0.323**	1								
[3] Opportunity refinement	-1	2	0.17	0.974	0.266**	0.114	1							
[4] Leveraging	-1	1	-0.07	0.451	0.010	0.029	0.026	1						
[5] Championing	-1	1	0.08	0.577	0.202**	0.353**	0.181**	0.101	1					
[6] Customer focus	-1	2	0.20	0.720	0.222**	0.111	0.358**	-0.048	0.099	1				
[7] Network	-1	1	0.15	0.616	0.149*	0.074	0.066	-0.053	0.431**	0.070	1			
[8] NACE Code L1	0	19	8.49	6.210	-0.086	-0.101	-0.037	0.038	-0.107	0.006	-0.077	1		
[9] Parent University	1	25	5.56	5.722	0.031	0.058	-0.031	-0.098	-0.051	0.076	0.056	-0.048	1	
[10] H-Index	0	92	25.08	18.977	0.009	-0.011	-0.019	0.023	-0.090	-0.041	0.069	0.170**	-0.037	1
N of cases 242														

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

Table 2: Logistic Binary Regression Model for Dependent Variable: USO Funding Acquisition

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8		Model 9	
	B	**s.e.**	**B**	**s.e.**	**B**	**s.e.**	**B**	**s.e.**	**B**	**s.e.**	**B**	**s.e.**	**B**	**s.e.**	**B**	**s.e.**	**B**	**s.e.**
Constant	-0.264	0.299	-0.486	0.322	-0.439	0.315	-0.260	0.300	-0.458	0.313	-0.394	0.311	-0.325	0.304	-0.760	0.348	-0.822	0.355
Proper founding team			1.081**	0.232											1,027**	0,255	1,148**	0,264
Opportunity refinement					0.581**	0.145									0.472*	0.168	0.477**	0.172
Leveraging							0.079	0.294							0.043	0.328	0.034	0.334
Championing									0.737*	0.243					0.085	0.310	0.136	0.318
Customer focus											0.653**	0.195			0.379	0.226	0.437	0.233
Network													0.451	0.222	0.370	0.272	0.368	0.278
NACE code L1	-0.030	0.022	-0.022	0.023	-0.029	0.023	-0.030	0.022	-0.024	0.022	-0.032	0.022	-0.026	0.022	-0.019	0.024	-0.026	0.025
University	0.014	0.023	0.011	0.024	0.020	0.024	0.014	0.023	0.019	0.024	0.008	0.024	0.011	0.023	0.012	0.026	0.017	0.026
H-Index	0.003	0.007	0.003	0.008	0.003	0.007	0.003	0.007	0.004	0.007	0.004	0.007	0.002	0.007	0.003	0.008	0.003	0.008
-2 Log likelihood	321.257		296.475		304.107		321.185		311.545		309.250		317.038		275.292		265.369	
Nagelkerke	0.013		0.144		0.105		0.013		0.066		0.078		0.036		0.246		0.278	
R Square																		

N = 242

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

funding. Table 2 shows us that there is a positive effect, but this is not significant (B = 0.034, p > 0.05). Hypothesis 4 proposed that the possession of the championing competency has a positive effect on the USOs ability to acquire funding. Looking at Table 2, we can also see that this positive effect is insignificant (B = 0.136, p > 0.05). Hypothesis 5 proposed that having a clear customer focus has a positive effect on the USOs ability to acquire funding. In Table 2 it can be seen that this independent variable has a positive effect on the USOs funding acquisition, but this effect is insignificant (B = 0.437, p > 0.05). In hypothesis 6 it was proposed that possessing over a business network has a positive effect on the USOs ability to acquire funding. Viewing the results in Table 2, it can be seen that there is a positive effect from this independent variable on the funding acquisition of USOs. However, this positive effect is insignificant (B = 0.368, p > 0.05). As hypotheses 3, 4, 5 and 6 all resulted in an insignificant outcome, these hypotheses can all be rejected accordingly.

5. DISCUSSION

Being able to understand university spin-off development has grown to be of great importance for academics, practitioners, and policy makers in research commercialisation. USOs have grown to be of such value for several reasons, for transferring knowledge and the economic growth they bring to their environment (Pattnaik & Pandey, 2014; Rasmussen & Wright, 2015; Vohora, Wright, & Lockett, 2004). Several studies and research have looked deeper into what factors could possibly have a positive influence on university spin-off success, but still failed to pinpoint what factors and characteristics could actually have an impact on the USOs ability to acquire governmental funding as a reliable financial resource in the beginning phases of development of USOs. This governmental funding provides university spin-offs the opportunity to bridge that gap towards venture credibility. If this funding is given, this often increases the chances to gain additional funding in the later stages of the USOs development, which makes it thus even more important for the entrepreneurs involved in spin-off creation to know which factors play an important role in the acquisition of governmental funding. From our results, we can see that having both a proper balanced founding team and the entrepreneurs' possession over the opportunity refinement competency, as defined in Section 2.2, both have a significant positive effect on this acquisition of early-stage governmental funding. This is crucial for USOs in order to overcome the critical juncture of venture credibility when moving from the re-organization phase to the re-orientation phase, as mentioned above and in Section 2 (Vohora, Wright, & Lockett, 2004).

Looking at the data with regards to the proper founding team aspect, specific team characteristics that seemed to have a positive influence on the entrepreneurs involved in giving feedback on the valorisation grants were for example "headstrong", "persuasive" and "driven". This led us to believe that there was a strong team present, which then led to the results that having a proper founding team is thus also of vital importance in order for ventures to be able to obtain governmental funding, and with that gain the credibility needed in order to process through the development stages determined by Vohora et al. (2014).

As was mentioned before, Rasmussen et al. (2011) already defined the opportunity refinement competency, but for this research we also looked at the research done by Danneels (2016), who added to this definition the ability to see new market potential. These two definitions were combined as it was believed this gave a more complete overview of what this competency encaptures and would thus give a better picture of what characteristics academic entrepreneurs would need in order for their venture to obtain governmental funding. In the data, there were comments regarding the good market position of some USOs, but also that some USOs had a really unique product which would ultimately lead to the venture fulfilling a market need. This led to the results of the opportunity refinement competency having a positive impact on the spin-off's ability to obtain governmental funding. A great example to demonstrate this finding is the Belgian spin-off ArtiQ from the University of Leuven, with their product ArtiQ|PFT (Postelnicu, 2019). One of the co-founders, Marko Topalovic, explained that their product uses artificial intelligence to facilitate "… the interpretation of pulmonary function tests (PFT) and improves the diagnosis of lung diseases", which would otherwise have to be done manually by medical professionals (Postelnicu, 2019). With their product, they were able to find a 'gap in the market', which was mentioned before, and help these medical professionals who are now able to do a more accurate and timely diagnose for their patients with lung diseases. Their innovation resulted in them obtaining a seed funding of 1.000.000 euro's, which the start-up can now use to launch their product to the market.

For the other independent variables (Leveraging competency, Championing competency, Customer focus and Network) we also discovered a positive effect on the USOs ability to acquire funding. However, this positive effect was not significant, which means that these variables cannot be seen as definite factors that have an influence on the acquisition of USOs.

5.1 Theoretical implications

This research papers builds upon the previous literature who studied academic entrepreneurship and the competencies and the spin-offs journeys towards commercialization with their innovative products. Clarysse, Tartari, and Salter (2011) and Visintin and Pittino (2014) already studied the importance of having a balanced team on the growth and success rates of university spin-offs. Having a balanced founding team is needed for ventures in order to be able to achieve both their business and research goals, all needed to be capable to develop a proper business plan, but also have the scientific knowledge and resources in order to make a viable product. Our findings can now contribute new information to this already existing literature, that having a balanced founder's team also increases an USOs possibility to receive governmental funding.

Rasmussen et al. (2011) and Danneels (2016) both studied on how being able to see market potential and knowing how to fulfil market needs contributed to a university spin-off's ability to develop into a viable business. This study's findings can add to both of these papers' definitions, that the opportunity refinement competency is not just needed to see new market potential, but also needed to be able to acquire governmental funding. Furthermore, Vohora et al. (2004) studied the different development phases a USO goes through. This research can contribute new information with regards to their study, by adding these new criteria which are vital for ventures to develop credibility, required to be able to receive governmental funding which would help survive the early critical stages of development (Vohora, Wright, & Lockett, 2004).

5.2 Managerial and Policy Implications

This research contributes to the needs of academic entrepreneurs, policy makers and creditors. The findings from this study offer a clear picture on the factors that positively influence the likelihood of receiving governmental funding in the earlier stages of development for USOs. This study is based on a unique database of funding proposal applications submitted to the governmental funding party, and therefore it presents novel insights of high importance. These insights provide information

that makes it possible to create a more complete framework, on which current and future spin-off creators can build.

Furthermore, the NWO can learn from this research by looking at their current criteria and see which factors lead to funding acquisition, and if this eventually leads to the USO grow to be a successful company. The current situation that (too) often occurs, is that a spin-off is able to receive funding from the NWO, but later still fails as a company. The NWO should look at these findings and take this new information into consideration when evaluating new proposal applications. If the NWO adjusts their funding criteria to these results, they could provide funding in a more consistent, sustainable, and concise way, making that their investment money is actually well-spent, preventing that the investments are going to waste and that the academic entrepreneurs can actually achieve their business goals and proceed with developing their innovative venture into a distinguished market player.

Academic entrepreneurs, after reading this paper, see scientific proof that having a good balanced founding team and that possession over the opportunity refinement competency helps them in the process of applying for governmental funding, by increasing the chances of actually obtaining this funding. These characteristics should thus lead to governmental funding and with that, become a successful business. Building on the literature of Bednár and Tarisková (2017), being able to obtain financial resources is vital in the early stages of development, as the ventures are not generating profits at this time, making it even more crucial for entrepreneurs to gain knowledge on what helps them obtain these resources. Relying on the provided knowledge in this study will help both entrepreneurs in their process of acquiring funding and will support policy makers in their decision-making process regarding the application of USOs for this funding.

5.3 Limitations and future research avenues

As with any study, this study came across several limitations over the course of doing this research. The first limitation was the fact that the data analysis that is done in this research is solely based on the evaluations submitted by expert referees and their subjective conclusions.. This feedback is based on the opinions of these assessors, which can result in a biased called the framing effect. How we chose to code the data is influenced by how the assessors of the NWO wrote down their opinions and feedback on the university spin-off's proposal, which could limit our choices made during the content analysis, and inevitably the outcome of the analysis. This could lead eventually to the occurrence of the framing bias.

Although our data source is what made our research so unique as it focuses on USOs still in the early phases of their development process, this also limits the scope of this research as it neglects any funding that a university spin-off might have received in later stages, or besides the funding granted by the NWO. To be able to gain a more complete overview of what leads to USO success, future research might want to focus on combining this paper to other literature that has focused on the later phases in the development of university spin-offs. Adding to this, future scholars might want to try a configurational approach and see how different combination of given USO factors can contribute to their success and try and identify several development trajectories towards a USOs success. Moreover, as it is still uncertain what eventually leads to a university spin-off growing into a successful business, future research might want to focus more on what happens after a venture is granted funding, and where it might be going wrong. Adding this to the insights provided in this study could lead to definite factors that play a role in USO survival.

6. ACKNOWLEDGEMENTS

First and foremost, I would like to express my sincere thanks to Dr. Igors Skute for supervising me and my fellow students in the process of writing this thesis. The time and effort that was spent to answer my questions and providing individual feedback by both Dr. Igors Skute and Dr. Tim Schweisfurth was and is very much appreciated. Secondly, I would like to thank my fellow students for the pleasant collaboration during this research and their provision of one-on-one feedback when needed. Thank you all for making this thesis a challenging but fun experience.

7. REFERENCES

Bednár, R., & Tarisková, N. (2017). Indicators of Startup Failure. *Industry 4.0*(5), 238-240.

Berbegal-Mirabent, J., Ribeiro-Soriano, D. E., & GarcÝa, J. L. (2015). Can a magic recipe foster university spin-off creation? *Journal of Business Research*, *68*(11), 2272-2278.

Bevans, R. (2019, November 21). *Understanding types of variables*. Retrieved from Scribbr: https://www.scribbr.com/methodology/types-of-variables/

Bhandari, P. (2021, March 1). *Control variables explained*. Retrieved from Scribbr: https://www.scribbr.com/methodology/control-variable/

Bhave, M. (1994). A process model of entrepreneurial venture creation. *Journal of Business Venturing*, 223-243.

Böckel, A., Hörisch, J., & Tenner, I. (2020, June 8). A systematic literature review of crowdfunding and sustainability: highlighting what really matters. Springer. doi:10.1007/s11301-020-00189-3

Bray, M. J., & Lee, J. N. (2000). University revenues from technology transfer: Licensing fees vs. equity positions. *Journal of Business Venturing, 15*, 385-392.

Clarysse, B., Tartari, V., & Salter, A. (2011). The impact of entrepreneurial capacity, experience and organizational support on academic entrepreneurship. *Research Policy, 40*(8), 1084–1093. doi:10.1016/j.respol.2011.05.010

Compagnucci, L., & Spigarelli, F. (2020). The Third Mission of the university: A systematic literature review on potentials and constraints. *Technological Forecasting & Social Change, 161*, 120-284. doi:10.1016/j.techfore.2020.120284

Corbin, J., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qual Sociol, 13*, 3–21. doi:10.1007/BF00988593

Danneels, E. (2016). Survey Measures of First- and Second-order Competencies. *Strategic Management Journal, 37*, 2174–2188. doi:10.1002/smj.2428

Delve. (n.d.). *How To Do Open, Axial and Selective Coding in Grounded Theory*. Retrieved from Delve: https://delvetool.com/blog/openaxialselective#:~:text=In%20a%20nutshell%2C%20the%20first,your%20analysis%20and%20captures%20the

Dickel, P., Hörisch, J., & Ritter, T. (2018). Networking for the environment: The impact of environmental orientation on start-ups' networking frequency and network size. *Journal of Cleaner Production, 179*, 308-316. doi:10.1016/j.jclepro.2018.01.058

Ganco, M., & Agarwal, R. (2009). Performance differentials between diversifying entrants and entrepreneurial start-ups: A complexity approach. *The Academy of Management Review, 34*(2), 228–252. doi:10.5465/amr.2009.36982618

Gonzalez, G. (2017, August 18). What factors are causal to survival of a startup? *Muma Business Review*, pp. 97-114. doi:10.28945/3845

Gümüsay, A., & Bohné, T. (2018). Individual and organizational inhibitors to the development of entrepreneurial competencies in universities. *Research Policy, 47*(2), 363-378. doi:10.1016/j.respol.2017.11.008

Jensen, R., & Thursby, M. (2001). Proofs and prototypes for sale: The licensing of university inventions. *American Economic Review, 91*(1), 240–259. doi:10.1257/aer.91.1.240

Lima, F. V., & Santos, J. A. (2018). Intellectual Property Management in Small and Medium-Sized Enterprises: A Systematic Literature Review. *International Journal for Innovation Education and Research, 6*(9), 109–127. doi:https://doi.org/10.31686/ijier.vol6.iss9.1161

Lockett, A., & Wright, M. (2005, July 11). Resources, capabilities, risk capital and the creation. Nottingham, United Kingdom: Elsevier B.V.

Midi, H., Sarkar, S. K., & Rana, S. (2010). Collinearity diagnostics of binary logistic regression model. *Journal of Interdisciplinary Mathematics, 13*(3), 253-267. doi:10.1080/09720502.2010.10700699

Nejabat, R., & Van Geenhuizen, M. (2019). University spin-off firms and market introduction of sustainable. *14th European Conference on Innovation and Entrepreneurship, ECIE 2019* (pp. 700-707). Academic Conferences. doi:10.34190/ECIE.19.085

NWO. (2014). *Annual Report.* NWO.

NWO. (2021). Retrieved from https://www.nwo.nl/en/what-does-dutch-research-council-do

Passer, M. (2013). Defining and Measuring Variables. In M. Passer, *Research Methods: Concepts and Connections* (pp. 43-52). United States of America: Worth Publishers.

Pattnaik, P., & Pandey, S. (2014, December). University Spinoffs: What, Why, and How? *Technology Innovation Management Review, 4*, pp. 44-50.

Postelnicu, L. (2019, July 11). *Belgian university spinoff closes €1m seed financing round*. Retrieved from Mobi Health News: https://www.mobihealthnews.com/news/emea/belgian-university-spinoff-closes-1m-seed-financing-round

Rasmussen, E., & Borch, O. J. (2010). University capabilities in facilitating entrepreneurship: A longitudinal study of spin-off ventures at mid-range universities. *Research Policy, 39*(5), 602-612. doi:10.1016/j.respol.2010.02.002

Rasmussen, E., & Wright, M. (2015, April 1). How can universities facilitate academic spin-offs? Springer. doi:10.1007/s10961-014-9386-3

Rasmussen, E., Benneworth, P. S., & Gulbrandsen, M. (2015). How academic entrepreneurship meets the university: university spin-offs in stakeholder networks. *CHEPS working paper series, 2015*(11), -. doi:10.3990/4.2589-9716.2015.11

Rasmussen, E., Mosey, S., & Wright, M. (2011). The Evolution of Entrepreneurial Competencies: A Longitudinal Study of University Spin-Off Venture Emergence. *Journal of Management Studies, 48*(6), 1314-1345. doi:10.1111/j.1467-6486.2010.00995

Shane, S. (2004). *Academic Entrepreneurship: University Spinoffs and Wealth Creation.* Edward Elgar Publishing.

Siegel, D., & Wright, M. (2015, May 12). Academic Entrepreneurship: Time for a Rethink? *British Journal of Management, 00*, 1-14. doi:10.1111/1467-8551.12116

Soetanto, D., & van Geenhuizen, M. (2018). Life after incubation: The impact of entrepreneurial universities. *Technological Forecasting and Social Change, 141*, 263-276. doi:10.1016/j.techfore.2018.10.021

Song, M., Podoynitsyna, K., Van Der Bij, H., & Halman, J. I. (2008). Success Factors in New Ventures: A Meta-analysis. *The Journal of Product Innovation Management, 25*, 7-27.

Van Geenhuizen, M., & Soetanto, D. (2009). Academic spin-offs at different ages: A case study in search of key obstacles to growth. *Technovation*, 671–681. doi:10.1016/j.technovation.2009.05.009

Van 't Hoog, A. (2015, Febuary 25). *Xeltis and the art of growing heart valves.* Retrieved from NWO: https://www.nwo.nl/cases/xeltis-en-de-kunst-van-meegroeiende-hartkleppen

Visintin, F., & Pittino, D. (2014, January). Founding team composition and early performance of university—Based spin-off companies. *Technovation, 34*(1), 31-43. doi:10.1016/j.technovation.2013.09.004

Vohora, A., Wright, M., & Lockett, A. (2004). Critical junctures in the development of university high-tech spinout companies. Nottingham, United Kingdom: Elsevier B.V. doi:10.1016/S0048-7333(03)00107-0

Warren, L. (2006). The university spin-out process: career transformation through the practice of entrepreneurial identity. *High Technology Small Firms Conference 2006 (HTSF).* Enschede: University of Twente.

8. APPENDIX

Table 3: Independent Variables Used in the Analysis

Independent Variable	Item Label	Item	Definition	Definition of Scale
Marketing Competencies	MComp1	Customer focus	The ability to access the needs of the customers	Ordinal scale, with (2) meaning this ability is high, (1) meaning that the ability is sufficient, (0) meaning neutral and (-1) meaning that the ability is lacking.
	MComp2	Societal need	The presence of a healthcare or environmental benefit	Dichotomy, either present (1) or not (0)
	MComp3	Opportunity Refinement	Market knowledge: the ability to access the potential of new markets	Ordinal, with (2) meaning a high ability, (1) meaning sufficient ability, (0) meaning neutral and (-1) meaning that the ability is lacking.
	MComp4	Market selection	The effective selection on the market, based on the market plan, importance of the market, market size.	Measured by negative mention (-1), neutral (0), or positive (1)
	MComp4	Commercialization	The ability to commercially exploit a patented invention, or in some cases technology transfer	Measured by negative mention (-1), neutral (0), or positive (1)
	MComp5	Ability to research new competitors/customers	Whether the research into customers and competitors was properly done	Measured by negative mention (-1), neutral (0), or positive (1)
Business/Entrepreneurship Competencies	BEComp1	Proper founding team	Having a well-balanced and motivated team	Measured with (1) a high balance, (0) meaning neutral and (-1) meaning that the balance is lacking.
	BEComp2	Business model	Whether the business model is properly defined and implemented	Categorial, (0) lacking, (1) weak, (2) sufficient, (3) strong model
	BEComp3	Motivation	The ability of personal motivation and enthusiasm for the asset	Measured by (-1) lacking, (0) neutral, or (1) well developed
	BEComp4	Scientific-business balance	To which extend the scientific (research) and the business efforts of the USO are balanced (Visintin & Pittino, 2014)	Measured by negative mention (-1), neutral (0), or positive (1)
	BEComp5	Championing	The ability to leverage company image to convince an organization or individuals to contribute to the USO's development	Ordinal, with (1) meaning a high ability, (0) meaning neutral and (-1) meaning that this ability is lacking
	BEComp6	Network	The presence of a business partner in the form of either a: launching customer, business alliance or university.	Measured with (1) meaning that a network is present, (0) meaning neutral and (-1) meaning a lack of network
	BEComp7	Leveraging	Ability to gain access to prior financial funds	Measured by (1) meaning the ability is high, (0) meaning neutral and (-1) meaning that the ability is lacking.
Technology Competencies	TComp1	Technological innovations	The ability to access their advantage through competitor products	Measured by ordinal scale where it is well defined (2), sufficiently defined (1), neutral (0) or lacking (-1)
	TComp2	IP Position	IP definition and establishment	Measured by well established (2), existent (1), neutral (0) or difficult position (-1)