

University spin-off early stage success – The relationship between individual & team conditions and competences in acquiring government funding

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ABSTRACT

University spin-offs (USOs) are increasingly recognized as important mechanisms fostering regional economic and societal development. This research study responds to recent scholarly works on academic entrepreneurship and contributes novel insights by assessing the impact of different USO individual and team conditions & competencies related to the necessity of acquiring early stage government funding. This is seen as one of the main impacting factors of USO venture credibility and success in the early stages of development due to the limited financial aid from government sources. To address this research problem, this study focuses on understanding the role of star scientist involvement in the early stage of USO development, the process of team development in the goals of creating an effective team that is able to deliver promising products into the market, the business and technological skills needed to be developed to achieve the vision and goals set from the start, the R&D competences needed in the USO team for the process of researching and developing ground breaking innovative products and the role of marketing competences in the USO team that determines their ability in reaching customers interested in the developed products on USO ability, all these factors that help to create sustainable and impactful solutions. This study benefits from comprehensive interviews with experts and the findings indicate that the involvement of star scientists in USO teams can be beneficial if the objective usefulness of their participation is the main focus instead of the popularity that these figures can bring to help attract funding. USO teams need to be established correctly from the first days of the venture, aligned under a unified vision and common goals to become effective and therefore able to deliver promising products that increase the USO credibility. All academic spin offs need to acquire technological and business skills that are unmissable to develop the products and set up a profitable and successful business. R&D competences are essential in USOs with high tech nature but could be less centric to spin offs of lower tech heavy projects stemming from universities by students instead of researchers. The marketing competences are a must to all academic spins offs that wish to not only survive but also thrive and grow to generate an increased economic and social values to societies.

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Keywords

USO credibility – government funding– Early stage – inventor involvement – team development – marketing competencies- R&D competencies – team technological & business skills and networks

1. PROBLEM STATEMENT

Employees in a team are the heart of any project or organization, in different words used by Amazon inc. "Our employees are our greatest asset" (Tapscott, D., Ticoll, D., & Lowy, A.,2020). This applies not only for established multinationals but also for an academic entrepreneurial journey launched by researchers and other University figures such as assistant professors, PhD students and (external) business experts, creating the backbone of what is called a university spin-off or USO (Gübeli, M. H., & Doloreux, D.,2005). There is increasing number of academic research focusing on team conditions in terms of inventor/scientist involvement, team development, skills and networks, team diversity and team cognition and the resulting effects on the productivity and performance of the team as a whole (Horwitz, S. K., & Horwitz, I. B.,2007). However, less research and attention has been provided to how individual and team conditions and competencies in USOs are impacting the credibility by acquiring governmental funding necessary for survival.

The issue discussed in this paper is to address the fact of USOs having a considerably high failure rate of around 80% mostly at the early stages of these ventures in the Netherlands. What is even more problematic is the inability of surviving academic spin offs in growing and thriving further in later stages in the future. Many different reasons could be attributed to this high failure percentage. The business idea itself can be intriguing in theory but unprofitable in practice, the business strategy and business model can be insufficiently reflective of the market conditions and customer needs, financial problems can appear relating to decreased funding and cash flows (Ooghe, H., & De Prijs, S.,2008), in addition to problems that can arise in the main figures creating the USO team(s), other issues can appear related to different (external) reasons that impact the success of the venture. (François, V., & Philippart, P.,2019)

University spin offs if successful can be a source of economic, social and technological advancements, which can be benefitting different stakeholders in societies such as the individuals creating these ventures alongside the universities they belong to, future employees landing a job in a market of increased job opportunities and the increased advancement of science and technology that are translated into a practical application and lead to financial gains and economic growth. This is why more attention should be shifted towards USO success factors and this paper attempts to make a small contribution towards this goal.

In the five steps of the life of a university spin offs framework (Vohora et al., 2004), more specifically at the transition from step 3 to step 4, the USO has to overcome the threshold of credibility in order for it to be convincing as a legitimate and independent organization which has the potential to survive and thrive in the market. The way to do that is by acquiring resources such as sufficient funding for the venture to become credible. In this research study, the aspect of credibility is revolving around the individual and team conditions and competencies contexts in USOs to increase credibility and as a result the success of the USO. This results in the formulation of the research question that is related to the aim described which is:

- ***Which factors of team conditions and competences in university spin-offs are critical in increasing credibility and therefore acquiring government funding?***

With this main research question this paper tries to showcase the importance of specified team conditions and competencies which form the main determinants of USO credibility and success at the early stages of the USO life cycle.

2. LITERATURE REVIEW

2.1) General overview of University spin- Off development process

Academic entrepreneurship is a relatively new way of thinking about entrepreneurship and value creation in the business administration world. The idea of technical and scientific knowledge and expertise being translated into a real world product and/or service that can satisfy customer needs, advance science and technology and boost economies are some of the positive effects of university spin-off but of course only if done successfully and especially in the critical early stages of USO development.

That is why different researchers have been working on determining the different stages of USO venture life cycle to grasp a better understanding of the importance of each stage of development, enabling the USOs into survival and flourishing in the rough early stages of their existence in the market. The most known model describing these different stages was developed by Vohora (2004) which shows the five main stages that all USOs go through in their early days (Vohora, Wright, & Lockett, 2004). These stages start with the research phase where all the knowledge and expertise of a certain technological innovation by scientists at universities are judged by its potential for commercialization in the external environment of the university walls (Vohora, Wright, & Lockett, 2004). Not any scientific theory and model can be successful in the implementation in the practical context of turning a theory into a useful product and/or service. The involvement of renowned scientists with accredited studies can help increase the potential for commercialization due to the wide array of research that these key academic figures have conducted in the span of long years and even decades of work (Vohora, Wright, & Lockett, 2004). If the research phase is successfully completed then the new academic venture moves to the second phase of the opportunity framing. In this step, the research idea selected in the first phase is studied to confirm that the resulting technology is going to provide the promised functionalities in the market when received by target groups of the interested customers (Vohora, Wright, & Lockett, 2004). After determining the opportunity that can be capitalized on, the newly formed USO moves to the third phase which is the main focus of this paper called provisional organization. In this phase the USO starts to establish itself as a company which seeks to develop the necessary entrepreneurial capabilities. For the USO to be able to move to the next phase of reorientation it needs to overcome a certain crucial threshold called the credibility threshold (Vohora, Wright, & Lockett, 2004). In order for the USO to be credible, it needs to be legitimate in the eyes of all the stakeholders that are to any extent or level are involved with the USO venture. Only then the USO can acquire the necessary resources such as government funds, which is the main topic of this paper. Figure 1 below showcases Vohora's (2014) critical juncture framework of entrepreneurial development (Vohora, Wright, & Lockett, 2004).

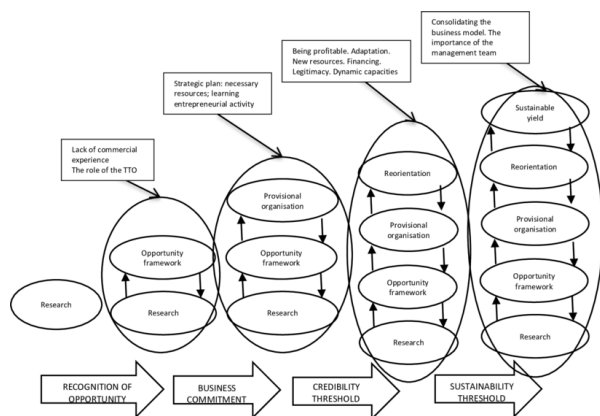


Figure 1. Vohora's (2014) critical juncture framework of entrepreneurial development

2.2) Proposition development

2.2.1) The role of Inventor/Scientist involvement in the team

The relationship between the USOs and the scientists/inventors of research universities has been considered to be one of the main factors that could be examined which can contribute to increased USO success born from Universities, which can also be used to answer the research question asked in this paper (Mathisen, M. T., & Rasmussen, E., 2019). These individuals possess a wide range of knowledge, skills and networks with other highly renowned scientists who can assist the USO in different areas of problem solving, even if only in the context of them being external agents working part-time for the venture. (Toole, A. A., & Czarnitzki, D., 2007)

More specifically "star scientists" who also have additional business expertise next to their scientific and technological knowledge are proven to being a necessary contributor for the legitimacy and success of early stage USOs in previous scientific studies (Mathisen, M. T., & Rasmussen, E., 2019). It is namely suggested that involvement of scientists can only be fully meaningful if it involves both technological and business expertise from the scientists in the USO teams. (Lacetera, N., 2009). The relationship between star scientist involvement and acquiring government funding starts with the initially established credibility represented by the wide range of expertise and professional network of connections that the star scientist possess which increases the likelihood of the university spin off succeeding and therefore creating high tech products and solutions that benefit the society as a whole, which is in the end the ultimate goal of the government when providing funds to USOs.

Based on the information above, the following can be proposed:

P1: The involvement of inventors/scientists in USO ventures has a positive effect on increasing USO credibility and therefore the chance of acquiring government funding.

2.2.2) The role of team development

The majority of USO representatives operate in the form of teams. Team development is the core concept of assembling highly skilled and highly performing individuals of different areas of science, technology and business expertise to form a team that acts as a unified entity instead of separated islands of different and isolated people (Woodman, R. W., & Sherwood, J. J. (1980). Rasmussen (2019) found that multidisciplinary teams

of different professionals in various fields of entrepreneurship, science and engineering can boost the image of the USO and the more well-known scientists and key science figure are involved in the earlier stages of USO development the more credible the venture appears to external stakeholders such as government agencies that fund USOs (Mathisen, M. T., & Rasmussen, E., 2019). Based on the theory of the five stages of team development, team development consists of five continuous stages developed by Bruce Tuckman in the 1960's (Fransen, J., Weinberger, A., & Kirschner, P. A. (2013). (See below figure 1)



Figure 2 . The five stages of team development in USOs

It starts with the first step of "forming" in which diverse group of members with different backgrounds come together to form a unified body of a team and agree on unified goals and strategies with the manners they decide to reach the finish line of agreed goals. Followed by the second stage called "storming". At this stage all different team members start to operate by sharing their individual ideas in the hopes of standing out and appearing as superior to their colleagues inside the team. At this stage it is the responsibility of the team leaders to interfere and resolve issues which may arise between team members and ensure that the team is working together by staying on the track set by the initial plans in the first storming step. Stage 3 is called "norming", In this stage a sense of unity is already established in the team between all the members and an end is in sight to the major internal conflicts and disagreements that occurred previously between them. This results in this stage being more efficient and effective with implementing plans and reaching end goals due to the knowledge of all the organs of the teams with their responsibilities and how these responsibilities are aligned with the others in the same team. The fourth stage "performing" represents the peak of the highest form and level of efficiency in the collaboration, team work and conflict resolution between all team members who all have a comprehensive and clear objectives and do not require the assistance of the leaders by wasting their times to solve conflicts and ensure goal achievement. At the last stage of "Adjourning", the team complete the major goals and objectives of the project and starts to assess the end results to understand the quality of work and performance of the team. After that team members can decide whether they are willing to stay in the USO and accept new projects or if they want to exit and move to different ventures. This model of the five stage of team development can help the leaders of the USO teams to understand the impact of separated individuals and the united team on the performance of their academic venture. The team representing the USO is the core entity that is required to be properly developed and organized for the venture to be fully functional and prosperous. A well established team logically helps in increasing the effectiveness and efficiency of the USO in creating a convincing product that

leads to credibility and as a result increased probability in acquiring government funding.

Based on the information above, the following can be proposed:

P2: The implementation of the model of the five stages of team development has a positive effect on increasing USO credibility and therefore the chance of acquiring government funding.

2.2.3) The role of technological & business skills

The third individual/team condition determining USO venture credibility is the nature and the timing of the acquired skills and networks of the professionals who bring in different expertise linked to their respective specializations (Walter, A., Auer, M., & Ritter, T. (2006). It is usually more beneficial to involve more academic minds and highly ambitious university students of different fields of studies to work on creating the basics of the initial thoughts and ideas surrounding the USO venture to create the final prototype and then after the completion of prototyping to seek more experienced professionals in the industries to help with their contributions in the USO in later periods of the venture for reasons related to increasing sales numbers of the newly developed product/service and gaining more market share to increase competitive advantage over established businesses and corporations. That is why the investment into the skills and expertise relating to R&D are of an essential nature in the early days of the USO venture and marketing and sales investments at the later stages after agreeing on the quality of the final prototype. (Grandi, A., & Grimaldi, R. (2003).

A challenge specific to USO ventures compared to regular startup ventures is related to the fact of the USOs having to deal with conflicting set of skills and networks between the academic members who lack the ways of doing business in the practical context and the industry focused professionals who lack the academic and research based approaches of goal setting that academics have. This difference needs to be addressed and dealt with in the early stages of the USO venture development or face the consequence of a potential driver for failure.

The technological and business skills adapted by the members of the USO team form the basis of what the developed product will be like in terms of functionality and usefulness for the market. Having the correct set of technological and business skills in the USO enables the venture to deliver on the promised vision set at the start and therefore increase the USO credibility in the eyes of the fund providers who will be more encouraged in providing initial funding.

Based on the information above, the following can be proposed:

P3: High business & technological skills and networks have positive effects on increasing USO credibility and therefore the chance of acquiring government funding.

2.2.4) The role of marketing competence

USO teams have to possess different types of specific professional competences for them to become legitimate or in other words credible. In his work, (Danneels,2016), describes four different domains of competencies which can help USOs overcome the threshold of credibility namely, R&D competence, Technological competence, Customer competence and marketing competence which is the one discussed in this section.

Marketing competence is of utmost importance for a freshly developed USO which has no history of prior connections to the business world outside the university boundaries of research

work (Danneels,2016). This makes it crucial for these academic ventures to develop their marketing skills by hiring marketing professionals who can help understand the need from the market and communicate the innovative solution that the USO is planning on providing to all of their customers (Danneels, 2016). This in turn can help the venture to garner attention from the public such as the media but also the government who might become willing to provide funds to the USO if convinced properly through the marketing channels at the USO.

Marketing competences in university spin offs help with understanding market conditions and demands and as a result the delivery of a product that fits with the captured and analyzed image of the market. These competences help in laying down a convincing business plan which helps with gaining credibility by showcasing an understanding of the targeted markets in the business plan. Thus increasing the likelihood of receiving government funds.

Based on the information above, the following can be proposed:

P4: Higher marketing competence in USO ventures has a positive effect on increasing USO credibility and therefore the chance of acquiring government funding.

2.2.5) The role of R&D competence

A different central competence for overcoming the credibility threshold of (Vohora,2004) as described by (Danneels,2016) is the R&D competence of the USO team. For any product or service to be legitimate and convincing to the different stakeholders such as customers, suppliers, banks and government agencies, a fully functional prototype of a product or service that serves all the promised needs and wants of the market is a must. That is why investments into R&D activities in academic ventures are an unneglectable core function of the venture which will transform the “raw” scientific and technological theories and frameworks developed in academic contexts into a practical solution in the shape of a product and/or service that serves the market that it is aimed at. For the marketing competencies to be able to communicate and convince the various stakeholders, a fully functioning, high quality prototype is unmissable, otherwise showing the stakeholders the value that the academic venture is trying to convey will simply not be possible.

Research and development activities are seen as the first step in the process of creating a prototype to share with different stakeholders including fund providers. A high level of R&D has a direct effect on the outcome of the prototype and therefore the end product. A high quality product will increase the image of the USO, which in other words mean enhance the credibility. In turn this helps in pursuing fund providers to provide the necessary funds at the early stages but also in later stages when the USO starts to grow and expand in its size in the market.

Based on the information above, the following can be proposed:

P5: Higher R&D competence in USO ventures has a positive effect on increasing USO credibility and therefore the chance of acquiring government funding.

3. RESEARCH DESIGN

3.1 Research context

The aim of this paper is to analyze USO projects in the country of the Netherlands, more specifically in the region of Twente to reach a clear conclusion on the impacts of individual and team conditions and competencies on increasing USO credibility and

success in the early stages of the venture, more precisely from the perspective of acquiring needed governmental funds. The study in this paper will be based on a primary analysis of collecting, analyzing and understanding gathered data in order to reach a comprehensive discussion which will help answer the question to the research question provided in a previous part of this paper.

University spin-offs show similarities with non-academic startup ventures in some facets and differences and uniqueness in their characteristics in other regards. Comparing both ventures, the goal is the same namely to generate economic profit by bringing new innovative ideas to markets or by improving the already existing products or processes provided by the competitors. Like other entrepreneurship ventures, USOs start small with a team consisting of a few people of usually around 3 and then start to attempt to survive and grow in the later stages of their development. In addition, all forms of entrepreneurship ventures require funding at the early stages from either government institutions and/or private investors. It may seem that academic and non-academic entrepreneurship ventures are competitors of each other which is not true because they simply compete in different markets or at least different levels of the same market. Academic entrepreneurship ventures stem from scientific research beginnings conducted by professionals working in research universities who seek to enter a market by providing products and services that are difficult to produce by regular individuals who lack the academic background. As an example we focus on the academic entrepreneurship ventures at the University of Twente where researchers in their respective fields can work together with business experts at the government funded management consultancy Novel-T work on setting the first stepping stones towards a surviving and thriving USO born at the campus of the University of Twente. In additions to that, we cannot underestimate the role of the university in supporting these ventures by supplying funding at the start of the venture or by providing the researcher with all the support to conduct their research and development activities at the university. The Dutch government is also active in supporting scientific based business ventures through the Dutch Research Council which represents the national research council of the country that works on funding thousands of researchers in Dutch universities for the goal of increasing innovation and progress in scientific and technological developments in the Netherlands.

3.2 Data collection

The study will be a primary analysis of conducting interviews to collect raw data from experts in the field of USO in general and the impact of individual and team conditions and competences in specific in acquiring funds from governmental institutions.

The research will be qualitative in nature and based on conducting six interviews as the data collection method. The interviews will be held with experts in the field of USO projects such as a scientist/professor/doctor working at the University of Twente who was in the past or is currently involved in USO ventures. Other interviews will be carried with business management consultants from Novel-T at the campus of the University of Twente who have dealt with USO related projects in the past and possess a wide range of knowledge and expertise in this specific field.

From the three main types of research based interviews of unstructured, semi-structured and structured, the choice goes for the semi-structured interview for the reason that the semi-structured interview helps the interviewer with the possibility of expanding on the answered questions to gain more insights and

depth. It also helps to ensure the process of gathering complete and accurate data from the interviewees for analyzing receiving valid and credible results in line with the proposed theoretical framework in place. Second important aspect of the interview structure is to guide the conversation according to derived propositions, while enabling the interviewees to provide all the necessary information that will benefit this study in reaching a sound and comprehensive conclusion.

3.3 Definitions of constructs

This study aims to examine the impact of several theoretical constructs and their interplay on USO ability to overcome credibility threshold. Specifically, The role of scientist/inventor involvement: This construct examines the role of highly educated individuals in the early stage development of USO ventures. By conducting interviews with scientists and non-scientists of other backgrounds such as business experts (such as marketing competent individuals) and PhD students (with high R&D competence), the idea is to collect objective data from the different sources to investigate the role and degree of importance of the “star scientists” in early stage USOs to see whether it can help with attracting and acquiring government funds.

The role of the five stage model of team development : The idea is to gain insights and ideas from the interviews on the significance of the team development model in early stage planning of USO teams.

The role of high business and technological skill and networks: This independent construct focuses on both technological/engineering skills on the one hand and the business skills on the other on increasing USO credibility to acquire government funds. They are used together because of their inseparable nature of both skills and networks which are required to co-exist for these skills to be fully beneficial for the academic ventures. Some interview questions will be dedicated to examine the role of technological and business skills and networks and examine if proposition 3 indeed has a positive effect on the dependent construct.

High marketing competence in USO team: By asking specific questions related to the marketing competence construct the goal will be to extract information relevant to accept or deny proposition 4 to understand the exact role of this independent construct towards the dependent construct.

High R&D competence in USO teams: By asking specific questions related to the marketing competence construct the goal will be to extract information relevant to accept or deny proposition 5 to understand the exact role of this independent construct towards the dependent construct.

3.4 Data Analysis

For the analysis of the data received during the interviews the most suitable data analysis method in this particular case is content analysis. This analysis method is commonly used for analyzing interview data in the shape of text or video. Content analysis is also widely dependent on the research question(s) asked in the different studies.

The answers of the interview participants are first recorded as an audio recording to avoid data waste and then transcribed as a written text. The semi-structured, open type questions help provide extensive and comprehensive raw data that is used not only to understand the role of the five factors mentioned in previous parts of this report but also to gain new insights of potentially new factors that are of effect of increasing credibility and acquiring government funding.

In the analysis process, the idea is to thoroughly scan the transcribe to highlight all the essential segments of concepts and sentences which can help in creating the general narrative consisting of all the findings and the results.

4. RESULTS & FINDINGS

All the foundation necessary for collecting and analyzing data has been established. Eventually six total interviews were conducted with individuals of high skills and expertise relating to USO venture development and the knowledge of government funding acquirement in the early stages of academic spin offs. Through transcription, the data collected from the interviews were organized and prepared for coding and analysis to extract useful results and findings that can hopefully add some small contribution to the topic of academic entrepreneurship gaining credibility and acquiring government funding. In the following parts the results and findings of all five independent variables will be described in order and detail.

4.1) The role of star scientist involvement in gaining credibility and acquiring government funding

The six interviews resulted in five participants highlighting the importance of star scientist involvement in academic types of entrepreneurship. Participant 3 was the only exception who argued against the importance of the star scientist role in gaining credibility and thus acquiring government funds.

Participant 1 indicated the general usefulness of including well renowned researchers and scientists into the team by saying “Yes, the involvement of star scientists can increase the chance of acquiring government funding”. However, participant 1 was not necessarily satisfied and positive about this statement. They indicated the drawbacks of government funding agencies becoming biased towards funding projects from star scientists without an objective and fair assessment of the provided project proposal from all the other academic figures hoping for a chance of acquiring funding. Participant 1 indicated their experience of witnessing such cases occurring in the past which resulted to good projects not being financially backed by the government and failing due to the human psychological error of being biased when choosing who receives the money.

In psychology literature, this bias is usually linked to one type of decision making bias called the safety bias. This bias is directly the result of the anxious human nature in avoiding any dangers of the unknown to minimize the risk (Lorian, C., & Grisham, J., 2010). Which in this case means choosing to fund projects from well-known scientists who have a history of successful academic business ventures in the past. However, having successful USO projects in the past does not indicate that the star scientist will always be able to come up with brilliant proposals of projects that will lead to products and/or services that are requested and desired for in the market. Human error is always a factor no matter the person behind the proposed USO projects and this why the focus of the funding decision making must be on the proposed projects and not the figures behind these projects.

Participants 2,4 and 5 all assisted the positive effect of the inclusion of star scientists in acquiring government funding. They all argued the impacts that such a figure can have especially in the early stages for gaining trust and credibility from all stakeholders including providers of funds such as

government agencies that specialize in financial support of University spin-offs. Though, they do mention that in the later stages of the USO as a more established firm in the market, it becomes almost unnecessary to have a star scientist on the board of the firm and even as a member of the advisory board when the USO venture is no longer in need of government funds to continue its growth and commercial operations.

Participant 6 also agreed with all the previous interviewees on the importance of the existence of a star scientist in the team of an early stage USO venture to increase credibility but was hesitant from doing that themselves in their USO company. The reasoning was that star scientists are usually not interested in joining any academic entrepreneurship venture of other researchers and academic figures and prefer to keep themselves busy working for their own projects whether research only based projects or academic entrepreneurship projects. Participant 6 based this stating that the inclusion of well renowned academic figures will always lead to political conflicts within the team of an early stage USO which will increase the probability of the venture failing due to these disagreements. A second reason also mentioned in the interview is the risk associated of the star scientist to use the knowledge and expertise of the USO founders for their own personal gains and interests by creating a competing academic start up that competes and outperforms the original owners of the innovative product due to the star scientist having a wide range of skills and professional networks that ease and quicken the process of establishing a successful competitor.

Like mentioned previously, participant 3 was the only one to not associate the involvement of star scientists for increasing credibility that helps with attracting government funding. From his personal experience with USO ventures, government funding is not usually interested in assessing the individuals behind the proposed USO projects and the critics are mainly focused on the content of the project proposal itself. Although, he was not sure if the involvement of star scientists in some USO funding proposals did manage to succeed solely based on the popular researcher requesting the financial aid. That is why participant 3 thought that more research needs to be done to prove this aspect of government funding programs of University based startups in the Netherlands.

In general 5 out of 6 participants agreed on the positive relationship between star scientist involvement and increased credibility and acquisition of government funding. However, the involvement is not always positive to gained credibility and fund acquiring but can also be negative if not practiced correctly in the case of conflicts in the USO team. In general and based on the interview results we can state that **proposition 1 is true.**

4.2) The role of team & individuals development on gaining credibility and acquiring government funding

The role of professionals inside USO teams were analyzed through the answers received from questions that gave an insight of how these teams are developed and what role they play in gaining credibility and acquiring government funding. Participant 1 indicated the importance of three main functions of professionals that need to exist and develop for any USO to have a chance in becoming more credible. The first is a technology/natural science expert who specializes in the development of a new product based on tech skills and expertise. The second is an expert in marketing, someone who understands

markets and customers and what they desire and what is not interesting to them to ensure that the developed and produced product is demanded in the market by the customers. The third is a finance/accounting expert who knows all about financial management and accountancy, for example through the process of conducting investment analysis to find the best investment project that the USO needs to make to make the biggest profit. Participant 1 discussed about the importance of communication between these three different and unique specialists stating that the most difficult aspect of team development is when a marketing expert tries to communicate and understand an engineer in the marketing “language” that they use themselves or vice versa in the case of an engineer expecting the marketing or finance expert to know all about the technical details of the product being research and developed.

For participant 2, the most important part of team development is the existence of a highly skilled and experienced R&D personnel which are seen as the core group of his USO. Then he stated that marketing is the second crucial part of the team that helps in reaching customers and understanding their wishes and demands to enable a connection between the internal R&D researching and developing the product and the external base of customers who have an actual desire for the product.

Participant 3 also described the importance of developing a solid R&D team in the early stages of USO development that is able to conduct scientific research and then develop a product that is fully functional. He also emphasized the importance of both the CEO and CTO in the process of team development. He concluded that the CTO also known as chief technology officer should be an experienced, senior level engineer and/or scientist that knows how to lead the other engineers and scientist working in R&D. The CEO on the other hand needs to be an experienced and skilled business figure who knows how to formulate the business strategy and the general direction of where the USO should be heading to in terms of target markets.

Participant 4 was a bit different in his story describing team development in his own USO venture. He stated the importance of the connections that he had with suppliers in acquiring new knowledge and insights of technology used in his developed products. He also talked about the helped he received from the University of Twente in terms developing a business model that is profitable from business developers and experienced entrepreneurs who had more business knowledge and experience than participant 4 himself. The main idea that he tried to communicate is that internal team development is important but sometimes it is expensive to have a team belonging to you and in that case relying on external forces for help in technology and business is a must for survival.

Participant 5 when discussing team development emphasized the important fit between the product created by the USO and the political and economic state of the countries in specific and the world in general. As an example he mentioned the current developments in the European Union to push companies into becoming more sustainable and to changing their micro economics into a shift from the established linear to a circular economy that eliminates waste. When creating and developing a team in the early stages of USO development, it is important to highlight these aspects and have professionals who believe in these changes in the research and also the business environments.

Participant 6 also started her USO team development with scientists and researchers who were mainly focused on the development of the product. However, she mentioned that the lack of business developers and marketing experts in the team is currently preventing the USO from becoming more successful and thriving due to the lack of business and entrepreneurship

expertise inside the current. The team tried to develop these skills internally by participating in entrepreneurship courses, though the inclusion of business experts from the start would have been easier according to participant 6.

All the participants highlighted the importance of team development in the success of obtaining credibility and as a result funding from government agencies and institutions even more so than the first mentioned variable of star scientist involvement role. The criteria for success is the alignment of all different individuals in the USO team by creating a unified academic spin off culture that combines all the individual values together as one all for the goal of increased credibility through the USO team. **proposition 2 is true.**

4.3) The role of technological and business skills in gaining credibility and government funding

Participant 1 while talking about the technological skills emphasized the importance of being able to deliver a product that is technically feasible and able to deliver on the promised functionalities without falling into the mistake of overpromising and overhyping the customer based without a solid foundation for the hype. As for the important business skills he mentioned that the skill of being able to link the product to the market of potential customers is the most unmissable business skill to have in any newly developed USO venture.

Participant 2 mentioned that the skills that he sees as nonnegotiable is the perseverance and commitment in someone’s work in addition to the acceptance of the long working hours that are required especially in the early days of USOs from the team members.

The answer given by the third participant was based on the importance of having separate people with specialized skills working on parts of the whole bigger picture of the USO. One person in the team should not be expected to be skilled and experienced in both technological skills and business skills at the same time. This will only lead to a lower quality of work output which definitely impacts the credibility of the USO and the chances of acquiring funding.

Participant 4 was keen on pointing up that skills whether technological or business skills should not only be originate from inside the team of a USO but also gained from external sources in the environment of the newly developed venture such as suppliers and business consultants. He mentioned that not all required skills are existing in any team at any company and a helping hand from outside is sometimes needed to improve the product, the production process or the marketing and sales of the final product.

In the fifth interview with participant 5 some similar answers were received from participant 1 in the technological skills needing to provide a value to the customers having a demand for the provided product. Business skills are for the most part related to the ability of understanding markets and economics and knowing how to efficiently use all the raw materials in the process of researching, developing, producing and selling the product.

In the final interview with participant 6, she admitted of lacking the business skills in the team in the current time despite the technological skills and scientific talents which helped them with researching and developing the product. That is why the team decided to add new members represented by a business developer and a marketing expert that can help them with their unique skills

that are missed in understand their market better and approaching a wider, more different base of customers willing to pay for their products even if with some modifications to suit their needs and demands.

In the end all the participants discussed the importance of having all the different technological and business skills in the team to be fully functionable and credible in the eyes of government organizations specializing in fund provision. The most important part with this construct is about the USO being diverse in term of individuals in the team with either a more technological focus or a more business focus. Having individuals with both specialties is usually not recommended. **thus proposition 3 is true.**

4.4) The role of R&D competences in gaining credibility and government funding

In the role of R&D competences the first participant did not agree on the importance of research and development skills in most of the USO ventures. He sees importance in these competences only in high tech projects that are focusing on making new breakthroughs in science and technology. Such high tech projects require lots of funding mostly for the R&D activities. Most USO ventures focus on improving already existing products or improving other aspects in the business model which do not require any or only little and basic R&D skills.

The second participant also saw little importance of the R&D competences in gaining credibility and acquiring government funding for a different reason. Based on his past experiences and interaction with governmental fund providers the people assessing the proposed USO project are not knowledgeable in R&D and are not interested in knowing the details surrounding this function in the venture and therefore it actually plays little to no role in their criteria used for assessment.

The third interview participant put high importance on the R&D competences in gaining credibility and acquiring funding. His reasoning was based on the logic that states: without high quality R&D competences the resulting prototype of the final product will not be appealing to anyone including the government organizations providing early stage funding. Only the best and most convincing prototypes of products are able to provide a sense of trust and security to potential customers, suppliers and potential investors such as the Dutch government.

Participant 4 saw his R&D competences as a process of trial and error. As an engineer he had to fail multiple times in receiving convincing results to fund providers which he had to tweak and improve until finally reaching a result satisfying all the stakeholders including the government agency providing the funds for further development of the USO.

In the fifth interview, participant 5 clearly highlighted the importance of R&D competences in academic entrepreneurship ventures. Quoting participant 5 “Is your research credible and your results are agreed upon in the scientific field? Then it becomes easier to attract funding”. Therefore, it is essential for the academic body of a university or multiple universities to accept the results as academically approved for the project proposed to be accepted by fund providers whether government or private.

In the last interview with participant 6 the interviewee was emphasizing that R&D competences for her and her team are the most essential competences for their USO venture. Their venture started first as usual research which then due to unaccepted results from the R&D process convinced the researchers into

commercializing it as a product in the market in the form of a university spin-off. Thus, participant 6 fully believes that R&D competences for her venture were the reason for her to acquire government funding at the early stages of the USO development.

Four out of six interviewees confirmed a positive relationship (effect) between R&D competences and gaining credibility which result in increased probability of acquiring government funding. R&D competences are unmissable in most academic spin offs but is not required in all spin offs to be credible and worthy of government funding programs. **Proposition 4 is therefore true.**

4.5) The role of marketing competences in gaining credibility and acquiring government funding

Even before taking care of the design, the technical functionalities and developing an accepted prototype, the founders of USOs need to understand the need of the market and analyze whether the product in mind is a demand in which the customers will be happy or at least not regrettable to purchase according to participant 1. Sometimes what fund providers including government fund providers do is request a proof of the market interest from the founders of USOs before approving on the funding and even provide bonus funds if they can properly showcase an actual demand from the customer target in the market.

Participant 2 also agrees with participant 1 quoting “ it is definitely important to understand the market need and be able to add value to it”.

Participant 3 also agrees with the previous statement but also adding the brand awareness perspective of marketing which helps in spreading the word and product existence awareness for the customers. As an example he told that in a conversation with someone the person was surprised to hear that his USO venture was only consisting of a total of around 60 employees when the product that they produce and sell is visible everywhere as an advertisement. With this example participant 3 tried to showcase the importance of marketing competences in not only making customers aware of the product in the later, more established stages of the USO as a firm but also being able to attract funding in the earlier stages of development when the USO is still only a proposed project.

In the talk with participant 4 he emphasized on the important role of marketing in USO credibility and fund acquiring by conducting scientific market research that provide all the data that are analyzed and described in the fund proposal in a scientifically credible manner which definitely help increase the likelihood of receiving funding especially from governmental institutions.

Participant 5 introduced the sustainability and circular economy equation into his answer to the question relating to marketing competences. The statement was the more sustainable and innovative the proposed product is in the market the more attractive it is for the current day customer who is more environmentally aware and sustainable focused than customers in previous generations. This in turn encourages governmental fund providers in agreeing on providing funds.

In the last interview with participant 6 the importance of marketing competences was repeated with a unique addition of the interviewee mentioning that marketing veterans are not only possessive of market knowledge necessary but also what is even

more important the wide network on connections to the academia and the industry if different sectors who can all help in becoming customers themselves or advertising the product to third party firms as customers.

As a result all six interview participants agreed on the important role of marketing competences in gaining credibility and acquiring government funding. Marketing is required all types of entrepreneurship projects whether academic or not and a failing marketing function in the USO will have a significant decrease in its credibility. **Proposition 5 is true.**

In the end all five propositions were stamped as important factors influencing increased USO credibility and as a result increase probability of acquiring government funding. Though propositions 2, 3 and 5 are unanimously agreed upon as major factors influencing receiving government funding followed by proposition 1 which received agreed influence result from 5 out of 6 participants and finally proposition 4 which received the lowest agreement score of 4 out of 6, though still a majority agreeing that it is indeed an influence on acquiring funding for the government.

5. DISCUSSION & CONCLUSIONS

This paper highlights the complex nature of attempting to answer the research question that is interested in understanding the relationship between team characteristics represented by the conditions and competences existing in the USO team and the gained credibility that specifically results in attracting government funds. All five factors researched in this paper do play a role, whether a minor or a major one. However, the story is not that simple and more factors were introduced as a result of the interviews.

In the first factor while asking about the role of star scientists in the USO team, a significant factor was mentioned that can shift the focus when considering the involvement of well renowned scientists. This factor was the bias in decision making in human nature when choosing whether a certain USO project is deserving of funding or not (Evans, J. S. B., 1989). Human beings are usually limited and subjective in their thinking and choice making processes and playing favorites between different projects based on the playing actors inside the team can potentially lead to the funding decision maker to prefer to fund the proposed project by a team containing a popular academic figure no matter the quality and the potential of the proposed USO project. The existence of star scientists does not guarantee the success of USO ventures and all projects without any considerations to the specific members of the USO team should get equal chances of receiving funding. Government funds incoming from Dutch taxes to USO ventures are limited just like anything else in the world of economy which means that only specific numbers of academic entrepreneurship ventures can get financing and the choice have to be as wasteless as possible supporting USOs with the highest return on investments. One solution to the bias issue is the anonymization of the team figures to solve any subjective biases. Another concern with involving star scientists is the potential conflicts that can appear in the team in early stages between the star scientists and the rest of the team which can lead to failure if not resolved (Isa, A. A., 2015). Financing USOs with problematic team members is not a safe investment and should be avoided when demonstrated by the USO team.

When discussing the role of team development there was an unanimous agreement that all different team members from the

different educational and experience backgrounds are required to unify under a similar organization value and a sense of encouragement should exist between all team members for the team to be fully developed and utilized which in turn increases the credibility of the whole university spin off and increases probability of fund acquirement.

In the third construct relating to technological and business skills needed in the team, an overwhelmingly positive correlation was addressed by all six interview participants. An essential contribution made by one of the participant was emphasizing the specialization importance of team members in becoming fully effective and eventually credible. One person cannot be an expert in both technology and business at the same time and assigning one individual to different tasks and responsibilities related to different fields of expertise will decrease the quality of the work output and through that the results gained and shared with fund providers. A different point brought on table was the role of external stakeholders like suppliers in providing technological and business expertise that lead to mutual benefits to both the USO and the supplier. Not all technological and business skills are extracted from the internal environment of the USO and sometimes it is crucial to obtain knowledge and expertise from outside the boundaries of the ventures.

The role of R&D competence is what separates USO ventures from other types of entrepreneurship. In the majority of the interview cases research and development was described as the core entity of their USO venture, especially at the early stages of the USO development. Without a convincing prototype of a product resulting from successful R&D activities the chances of looking credible and acquiring government funding from institutions such as the Dutch Research Council (DRC) are impossible. The reason is because most USO ventures starting at the campus of a research university is high on scientific and technological complexity and require experienced and intensive R&D to fully bloom. However, not all university spin offs are required to be fully R&D based in their focus and an innovative idea stemming from developments in different parts of the business model can also prove to be attractive to government based fund providers.

The marketing competences are a must for all academic business ventures no matter the nature and the focus of the spin off. Professionals with extensive market knowledge are always needed to understand the requirements of the market and connect this need to the capabilities of the academic spin off in developing and providing solutions satisfying those needs. Without a full-scaled.

In the end, to concretely answer the research questions, all five factors are influencers of gained credibility and government funds acquirement. Although, careful considerations need to be made before jumping to including the aforementioned factors into a USO. As an example, the involvement of a star scientist can help with attracting investors and acquiring funds but at the same time it can lead to conflicts in the team as a result of differentiated interests which is leads to the opposite consequence of the venture not being credible enough to attract funding.

5.1. Theoretical Implications

The factors studied in this paper are all proven to contribute to increased USO credibility and therefore increased likelihood of acquiring government funding in the Netherlands. Therefore, the factors of star scientist involvement, team development, technological and business skills, marketing competences and R&D competences are of utmost importance and are required to

be considered when discussing the topic of USO credibility and government funding of academic spin offs in research work.

5.2. Practical Implications

The results of this study can assist both professionals such as researchers working in universities or university students who plan to start a spin off adventure from the heart of their academic institution. The five factors are all proven to be essential in gaining credibility and attracting government funding and the lack of any of these factors can decrease the probability of success in becoming credible and therefore funded. Of course, these five factors are not the only variables impacting the success and growth of USOs and additional resources need to be consulted from practitioners involved in academic spin offs to gain more insights of what makes USOs truly credible in the eyes of fund providers to attract funding.

6. LIMITATIONS & SUGGESTIONS FOR FUTURE RESEARCH

No work is complete or entirely factual and due to that all limitations need to be discussed and reasoned to understand the circumstances that existed while working on this paper. The first limitation was the relatively low response rate to interview requests that lead to a total of six interviews. The focus in this study was on the quality of data received from interview participants rather on the quantity of the respondents which would have lead in a higher sample of interview respondents but less dependable results. The goal in this research paper is to endure high quality results by only focusing the data collection process on experienced professionals who were or still are involved with academic spin offs.

For future research the suggestion is to dive deeper into understanding the exact consequences of star scientist involvement in USO teams. In this paper we saw that this involvement can mean both good or bad to university spin offs and understanding when is what is an intriguing aspect to learn more about to contribute more into the world of academic spin offs.

Another interesting aspect to dig deeper into is to study the effects of the five factors analyzed in this paper in the context of universities located in foreign countries such as the US, Japan or the UK and comparing the results gained from academic spin offs from these countries with the results described in this study about the USO credibility in the Netherlands. This in turn can help with understanding the differences between countries in terms of factors necessary to increase credibility of the USO in order to succeed in attracting government funding in these different nations.

A third suggestion is to research other factors that might or might not be of impact in the process of gained USO credibility and therefore attracting government funding to start with the ventures in the early stages or grow and expand in the later, more established stages of the academic spin off.

This research study is conducted in the context of Dutch technical universities with strong entrepreneurial ecosystem, where student entrepreneurship is on the rise. Hence, this study calls for future research examining the impact of proposed entrepreneurial competencies on the regional economic and societal impact of student-USOs.

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Appendices

Appendix (A): Interview questions

- 1) What team competencies and/or team conditions are essential in your opinion in acquiring government funding?
- 2) Does “star scientist” involvement impact the chances of acquiring government funding for newly developed USO ventures? Why or why not do you think that?
- 3) What compensation of professionals and expertise are required for the business model and prototype to be successful and convincing to attract government funding?
- 4) Based on your personal experiences from the past, what technological skills are essential to exist in USO teams to attract government funding? And what about necessary business skills?
- 5) What role do R&D competencies play in gaining credibility and acquiring funding from specialized government agencies?
- 6) What role do marketing competencies play in gaining credibility and acquiring governmental funding?