MASTER THESIS

The Success Formula for University Spin-Off Founders

How entrepreneurial characteristics can influence university spin-off success throughout different stages of the process

Noa van der Klooster
August, 2022

Supervisors:
dr. I. Skute
L. Bakir

Business Administration
Entrepreneurship, Innovation and Sustainability

Faculty of Behavioural, Management and Social Sciences

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

UNIVERSITY OF TWENTE.

Table of Contents

Abstract

Academic entrepreneurship has gained an increasing relevance, fostering the research field of university spin-offs (USOs). While the technological, social and economic importance of USOs is being emphasized in literature, many actual USOs continue to fail either at an early stage or fail to become impactful. Thus, to decrease this failure rate of USOs, this paper seeks to provide in-depth insights into the influence that the characteristics of an entrepreneur have on the success of their USO, throughout different phases of the process. Qualitative research methods are used to form a deeper understanding of the underlaying mechanisms of entrepreneurial characteristics. To conduct this research, high knowledgeable USO founders, which practical experiences and relevant insights are interviewed, after which the interview results are validated by experts in the field. The results indicate that different entrepreneurial characteristics are important during different stages of the USO process. Moreover, the results show that some characteristics have the potential to be both helpful and harmful. Not only do these findings build on to existing literature by combining previous literature with practical knowledge and experiences, these findings also have practical implications for academic entrepreneurs engaging in (early stage) USOs, providing insights that can be used as guidelines.

Keywords University spin-off – Entrepreneurial Characteristics – Academic Entrepreneurship

1. Introduction

Throughout the twentieth century, economies in countless countries have started moving from resources-based towards knowledge-based. This movement towards a knowledge economy put pressure on universities. Besides having to do research and educating the younger generations, universities were asked to play a more central role in these economic developments (Baldini, 2010). A way for universities to contribute to these knowledge economies in which technology and information transfer play a central role is through creating USOs, which are companies focused on the commercialisation of research output, founded by people originating from a university (e.g. students or employees) (Perez & Sánchez, 2003; Rasmussen & Sørheim, 2012). While there are many more ways for universities to contribute to a knowledge economy, the focus will be on contribution through USOs, as this is the most impactful and direct way. In 2020, the Dutch government provided a budget of 4,201.9 million euros for R&D in the educational, cultural and scientific sectors. The increasing importance of USOs is reflected back in the current budget plan of the Dutch government, that said to provide an additional 130.7 million euros on top of the 2020 budget by 2025.[1] From these numbers, an increasing trend in investment budget, and thus importance of R&D in the educational sector, can be seen.

Universities are often on top of the latest technological developments. Through technology transfer, university spin-offs contribute to the development of the technological field and, additionally, they have the potential to contribute on both the economical and societal level. By developing new concepts, products or procedures, these university spin-offs can have societal and economic impact, which can be both positive and negative (Fini et al., 2018). In many cases, novel technologies have a positive impact on either the economy or on society. However, there are also cases in which such innovative technologies have had negative impact as well. An example of this is the electric car, which initially has been claimed to have a positive impact on the environment, whilst it later became evident that the batteries that are used to power those cars are extremely harmful for the environment (Hendrickson et al., 2015). This example, that illustrates how novel technologies can have adverse effects, emphasizes the need for further research into the field of USOs and innovation. By deepening the USO research field, potential adverse implications could be prevented in future USO development.

While the development of USOs has great potential to contribute to different levels in our society, there are numerous challenges associated with the topic as well. Due to the various

[1] https://www.rathenau.nl/nl/wetenschap-cijfers/geld/wat-geeft-nederland-uit-aan-rd/overheidsfinanciering-van-rd

challenges associated with USOs, research shows that approximately 25% of USOs fails (Rodríguez-Gulías, Rodeiro-Pazos & Fernández-López, 2016; Lopez-Sintas, Lamberti & Sukphan, 2020). This means that 75% succeed, which is a considerably high survival rate (Mustar, Wright & Clarysse, 2008). However, only few of these ventures that survive succeed to generate meaningful impact. Many of the surviving USOs tend to show limited activity or growth, which is called the "living dead" phenomenon (Rodeiro-Pazos et al., 2021). However, this does not always directly mean that the idea for the spin-off itself was a failure. In many cases, with this failure of a USO, potential gets lost too. Therefore, it is important to determine how the success of USOs can be influenced.

A topic that is widely discussed to influence USO success in literature is the entrepreneur and their individual characteristics. Rasmussen, Mosey and Wright (2011) describe how USOs as ventures need resources to develop. In order to get these resources, the founder(s) need to possess certain characteristics. Previous research has already shown which individual entrepreneurial characteristics can influence start-up success (Mueller & Thomas, 2001; Asante & Affum-Osei, 2019). While these studies have provided valuable insights by using quantitative research methods, they lack a deeper understanding of underlying mechanisms. For this reason, this research aims to develop a deep understanding of the influence of an entrepreneur's character throughout the entire early stage USO process. In order to determine what the early stages of a USO process encompass, a framework defining the different phases USOs go through developed by Vohora, Wright and Lockett (2004) will be used as foundation. By researching the influence that different entrepreneurial characteristics have on the success of a USO using qualitative methods, this research contributes to existing literature. The research question of this research is formulated as follows:

"How do different entrepreneurial characteristics influence a USO's success throughout different phases of the process?"

Before being able to answer this research question, a set of sub-question is answered first. These sub-questions are:

SQ$_1$: What is a university spin-off?
SQ$_2$: Which entrepreneurial characteristics play a role in the success of a new venture?
SQ$_3$: What are the different phases that a university spin-off must go through?
SQ$_4$: What is considered success for each different phase?

In order to obtain a deep understanding about individual success factors as well as the combinations of multiple success factors, a qualitative approach is used. This qualitative research is conducted through semi-structured interviews with academic entrepreneurs, originating from an entrepreneurial ecosystem. The results of these semi-structured interviews are then validated by conducting similar interviews with experts in the field. The results of this study can have various implications. The theoretical implications of this study have the potential to contribute to existing research by providing new insights on how configurations of different success factors, that have already been proven to be of influence separately, influence the performance of USOs. The practical implications of this research can be used by early stage USOs as prior information or guideline.

In the following sections, the sub-questions are answered. First, the phenomenon of USOs is explained. In this section, USOs are defined and a closer look is taken at the different phases entrepreneurs have to overcome when starting a USO. Following this, it is formulated when each phase is considered successful. This section, which answers sub-questions 1, 3 and 4 forms the foundation for the rest of the research. The next section focuses on USO success determinants. The different entrepreneurial characteristics included in this research are explained, answering sub-question 2, and the research model is provided. Then, the methodology for conducting the research is provided, after which the results are shared. Finally, after discussing the research results, a conclusion is drawn, in which the main research question is answered.

2. The Phenomenon of USOs

2.1. Defining USOs

A ‘spin-off’ is a vague concept, that can encompass a broad variety of topics. It is therefore important to define what can be considered a USO within the scope of this research. Zhang (2009) defines USOs as “companies founded by university employees” and refers to these founders as “academic entrepreneurs” (p. 255). Other studies indicate that a USO does not necessarily have to be founded by university employees, but that it can also be founded by other people originating from a university (e.g. students) (Perez & Sánchez, 2003). Pirnay, Surlemont and Nlemvo (2003) summarize overarching themes that can be seen in almost all definitions of USOs. After comparing and combining these overarching themes, they defined USOs as “new firms created to exploit commercially some knowledge, technology or research results developed within a university” (p. 356). Mathisen and Rasmussen (2019) largely agree to this definition, but they add on that the parent institution of the so called spin-off does not necessarily need to be a university, since academic research can also done by public research institutes (PRIs). While PRIs have no responsibility to teach students, they often collaborate with universities. As the focus of PRIs is mainly on conducting research, they tend to specialize more and are closer to applying this research.

For the purpose of clarity within this research, an overarching definition of USOs has been formulated. Based on the previous literature, a USO in this research is defined as:

“A new company, originating from a research based institute (i.e. universities and PRIs), that is founded to commercially exploit knowledge, technology or research results produced by academic or research based activities”

2.2. Critical Junctures in the Development of USOs

Vohora et al. (2004) developed a framework in which they identified critical junctures that USOs need to overcome in order to succeed. In this framework, shown in figure 2.1, the five different phases that USOs go through in their development from a research idea to a sustainable business are mapped. All USOs start in the *research* phase, in which valuable intellectual property is created. This intellectual property provides the opportunity for commercializing the research findings. The next phase is *opportunity framing*. The

individual(s) who recognized the opportunity (e.g. student, teacher or researcher) focus on examining whether the recognized opportunity has sufficient value to evolve further into something that can actually be commercialized. They "frame" the opportunity within a commercial context. After this, the *pre-organization* phase starts, in which the USO founders have to take decisions on, for example, which resources and capabilities to develop, what knowledge to acquire and how to access these resources and knowledge. Then, the *re-orientation* phase can start. After the USO has gained sufficient credibility and access to resources, they can start attempting to offer value to customers, and generating returns. In this re-orientation phase, the entrepreneur(s) face challenges like constantly having to relocate and identify new resources and re-configurating these resources. If the USO succeeds to overcome this phase of constant restructuring, they are able to move on to the final phase: *sustainable returns*. At this point, the USO will has overcome most (early) uncertainties, and has succeeded to attain sustainable returns (Vohora et al., 2004).

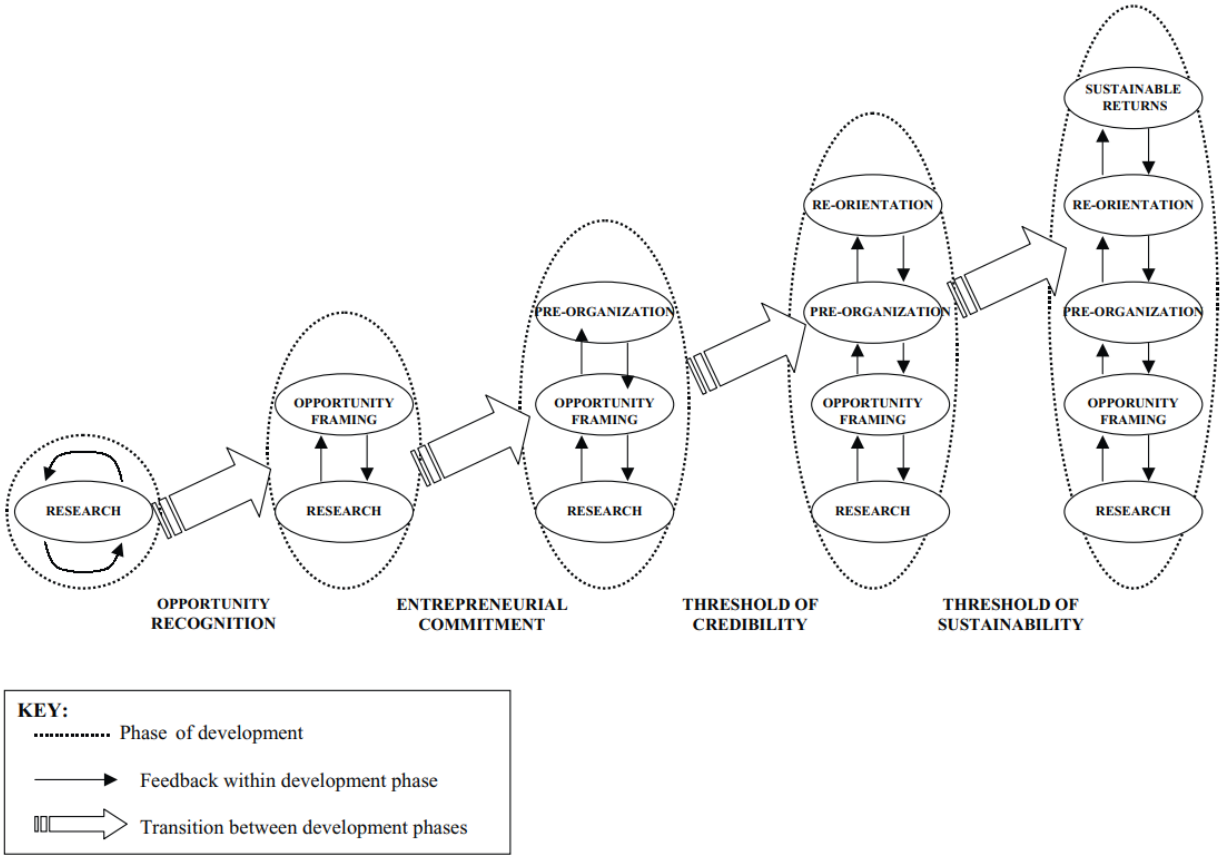


Figure 2.1 – Critical junctures framework (Vohora et al., 2004)

The different phases are divided by "critical junctures" (e.g. capabilities or resources the venture needs to acquire), which are: *opportunity recognition, entrepreneurial commitment, credibility* and *sustainability*. The junctures are critical, as ventures will not be able to move

on to the next phase without overcoming each juncture (Vohora et al., 2004). In other words, if an entrepreneur overcomes a critical juncture, they have successfully completed the prior phase. Therefore, the critical junctures following each phase (and how they can be overcome) will be used as measures for success of that phase. Since these junctures form the foundation for this research, they will each be explained below.

2.2.1. Critical Juncture I: Opportunity Recognition

Juncture I needs to be overcome to move from the research phase to the opportunity framing phase. Recognising an opportunity means finding a match between a market need and a solution (Bhave, 1994). Not everyone is capable of making the connection between scientific knowledge and a commercial opportunity. According to Venkataraman (1997), this requires a specific set of skills, insights and circumstances. Based on this Vohora et al., (2004) proposed that entrepreneurs must be able to access, acquire or develop the ability to combine knowledge from research with an offering that is commercially feasible in order to overcome this juncture. Once a USO founder is able to do this, they can overcome the first critical juncture, which means that they have successfully completed the first phase: *research*.

2.2.2. Critical Juncture II: Entrepreneurial Commitment

According to Gersick (1991) businesses arise from an entrepreneur's intentions and ideas. Since the intention of the entrepreneur is where all new businesses (including USOs) start, this plays a large role in the establishment of the venture. However, having the intention to start a new venture does not imply that the entrepreneur follows through with this plan. Entrepreneurs must have entrepreneurial commitment in order to move from the opportunity framing phase to the pre-organization phase. In their research, Vohora et al. (2004), identified four key reasons why this juncture is hard to overcome. First, there is often a lack of role models for academic entrepreneurs. Second, academic inventors usually suffer from the fact that they have little to no prior business experience. Third, most academics lack self-awareness with regards to their capabilities. When it comes to business they prefer to "leave it to the experts". Fourth, some academics struggle to find a surrogate entrepreneur, due to a limited social network. Vohora et al. (2004) state that if USOs can overcome these four challenges, they should be able to develop their new venture into an actual business. This means that they have successfully passed the *opportunity framing* phase.

2.2.3. Critical Juncture III: Credibility

In order to transition from the pre-organization phase to the re-orientation phase, USOs must overcome juncture III: credibility. At this point, the (surrogate) entrepreneurs have recognised an opportunity and committed their selves to developing this opportunity into a USO. The main challenge in this critical juncture is for USOs to acquire or gain access to the initial resources they need for the venture to start functioning. In their research, Vohora et al. (2004) found that the hardest resources to gain access to for USOs are often financial resources. The fact that USOs emerge from the non-commercial environment of universities, are in many cases regarded as a liability by investors. For the USOs that encounter these challenges regarding a lack of (financial) resources, it is important that they overcome these challenges. Otherwise, the USO will not be able to move on to the final phase. If the entrepreneur(s) have successfully gained access to sufficient resources and knowledge, they have successfully overcome the third critical juncture, and thus passed the *pre-organization* phase.

2.2.4. Critical Juncture IV: Sustainability

Once the USO has successfully gained access to all resources needed, it is ready to exploit its knowledge, technology or research results commercially. There is one juncture left to overcome before the USO can be regarded a sustainable business. In order to overcome juncture IV, entrepreneurs must be able to continuously adapt, re-configure and improve. Once the USO starts making its first sales, new information and knowledge will be gained, and new resources might be required. For an entrepreneur to deal with these changing demands can be challenging, and not many are able to deal with these challenges. However, when an entrepreneur succeeds in handling the changing demands that arise once the USO has made the first sales, there is a high likelihood that the USO will progress beyond the last critical juncture, and grow into a sustainable business with sustainable returns (Vohora et al., 2004). Overcoming this last juncture means that the USO founder(s) have successfully completed the fourth phase: *re-orientation*.

3. USO Success Determinants

3.1. Characteristics of Entrepreneur

For determining how different characteristics can impact USO success throughout different stages of the process, four characteristics will be considered: *entrepreneurial competencies, locus of control, risk taking* and *innovativeness*. These four characteristics have already been proven in literature to have the potential to influence start-up success independently (Rotter, 1966; Mueller & Thomas, 2001; Dess & Lumpkin, 2005; Rasmussen et al., 2011). However, there is a lack of research explaining how configurations of these characteristics influence the success of a start-up. After explaining all characteristics individually, the research model used in this research will be provided.

3.1.1. Entrepreneurial Competencies

According to the findings of Rasmussen et al. (2011), there are three main competencies that can help an entrepreneur in developing a new venture. The first competency is *opportunity refinement*. In short, this means that being able to refine a business opportunity (e.g. through ideation), is a competency that is beneficial for entrepreneurs. Since USOs are usually based on non-commercial high knowledge ideas or technologies, the founders of USOs need to be able to transform this into a version of the idea which can be profitable. This means that the idea needs to be pivoted and refined, usually more than once, before it can be exploited commercially. If an (academic) entrepreneur is able to both develop an innovative business opportunity and successfully translate this business opportunity into a commercially exploitable technology, product or service, this significantly increases the USOs competitive advantage. This competitive advantage, fostered by the innovativeness of the USO, increases the chances of funding. This, on its turn, results in higher chances of survival in the early stages of the USO process. Therefore, it is needless to state that opportunity refinement fosters USO development, especially during the early stages in which the business idea is formed.

Leveraging, the second competency, relates to an entrepreneur being able to combine and acquire the necessary resources that are fundamental for creating the new venture. Not only do USOs have to overcome the challenges that all new ventures face (e.g. liability of newness, liability of smallness), the non-commercial environments of universities and PRIs are often also associated with high risks and uncertainties. In many cases, this means that USOs are reliable on independent actors for getting access to all necessary resources. Therefore, being

able to acquire and combine resources is a competency that is often necessary for entrepreneurs operating in USOs. One could argue that, without the ability to leverage the resources needed, a research outcome can never become a commercially exploitable business. Once the business opportunity of the USO has been recognized and refined into a viable business idea, the USO will need resources in order to take off. Not only do most USOs need financial capital in order to get the venture started, many USOs will also need human capital or other resources. If the USO founder is able to leverage, they will be more likely to acquire and combine the resources necessary for their USO to take off. Logically, this significantly increases the chances of becoming a profitable business, as resources are required to start up the USO. While the ability to leverage appears most important in the early stages of a USO, it might also positively influence USO development at later stages of the process, e.g. when (additional) funding is needed.

The final competency that can help entrepreneurs in starting up a business, as posed by Rasmussen et al. (2011), is *championing*. This competency relates to the entrepreneur(s) being able to relate themselves to their venture, and to convince other people to contribute to the development of this venture. Championing is a crucial competency for entrepreneurs, as it provides them the opportunity to share their innovative ideas with others. According to their research, Rasmussen et al. (2011) stated that the more complex a venture is, the more championing is needed. Since USOs are often complex, high knowledge or technology based ventures, they conclude that championing might even be more important for USOs. If a USO founder possesses a high degree of championing, they are able to motivate their colleagues, which increases overall commitment to the USO. Not only can a champion increase motivation and thus commitment among their colleagues, they can also positively influence the commitment of other stakeholders, like business partners or investors. This increased commitment directly impacts USO results, which positively influences the outcomes (e.g. sales) of the USO.

3.1.2. Locus of Control

Locus of control, a construct developed by Rotter (1966), can be explained as an individual's perceived control over a certain situation. According to this construct, individuals can perceive the outcome of any situation either outside of their control or within their control. If one perceives that certain events are within their control, they believe they can influence the outcome through effort, skills or ability. However, when one perceives an event to be outside

of their control, they believe that factors or forces outside of their own control (e.g. environment, timing, influences from others) determine the outcome. Locus of control has been widely researched within the field of entrepreneurship ever since Rotter (1966) developed the construct (Kaufmann, Welsch & Bushmarin, 1995; Hansemark, 1998; Ishak, Omar & Moen, 2015). This can be explained by the fact that entrepreneurs are often initiators who do not want to be dependent on other people and take responsibility for their own employment and thus welfare (Mueller & Thomas, 2001). Rotter (1966) confirmed this earlier as well, by arguing that individuals who have an internal locus of control are likely to pursue entrepreneurial activities as this means that actions directly impact results. Asante and Affum-Osei (2019) add on to this by stating that a high locus of control influences the way in which entrepreneurs spot opportunities. Individuals who have a high locus of control perceive to have control over a situation, which means that they believe they can influence the outcome of said situation. Often, this implies that these individuals are willing to improve their capabilities and knowledge. Consequently, this belief in their own abilities and effort can make the individual more proactive and perceptive to (entrepreneurial) opportunities (Asante & Affum-Osei, 2019).

This perceptiveness to entrepreneurial opportunities might even be more important for USO founders than for 'normal' entrepreneurs. The initial goal of research conducted at universities is to obtain new knowledge, therefore, for a researcher it might be even harder to spot a business opportunity as their focus lies elsewhere. If a researcher has a higher locus of control, and thus a higher perceptiveness to opportunities, they are more like to spot a business opportunity for starting a USO. Another way in which locus of control can be of direct influence on USO success is through the behaviour of the founder. If a USO founder has a high locus of control, implying a higher willingness to improve capabilities/knowledge, a higher proactiveness and a higher perception of control, this will most probably influence their behaviour as well as their image. Given that the founder (or founding team) is often one of the main evaluation criteria for investors deciding on an investment (Bernstein, Korteweg & Laws, 2017), it could be argued that a higher locus of control can foster USO development by increasing the chances of funding.

3.1.3. Risk Taking

Risk taking, on the individual level, refers to an entrepreneur's willingness to create or seize an opportunity for their new venture while not knowing whether this will be successful. In other words, if an entrepreneur is risk taking, they are prone to take bold actions without

knowing, considering or caring about the possible consequences (Dess & Lumpkin, 2005). However, while risk taking involves taking chances, it is important to state that it is not the same as gambling. There are various methods that entrepreneurs can use to minimize negative consequences, such as conducting extensive research and assessing the risk factors before taking action. While risk taking can have consequences, it is often a fairly important characteristic to have for entrepreneurs. As Dess and Lumpkin (2005) describe, starting a new venture involves embracing newness and uncertainty. Often, entrepreneurs have to take risks in order to grow their business. This is confirmed by other studies, that state risk taking is a characteristic often used to describe entrepreneurs (Macko & Tyszka, 2009; Renko et al., 2015). According to these studies, risk taking is one of the key values of an entrepreneurial orientation.

For USO founder(s) in particular risk taking might be an important characteristic. Many USO founders either already have a career in research or are building towards a career in research. When researchers decide to start up a business (USO), which is a career path that encompasses many insecurities, they often take a risk by leaving behind a (secure) career in research. In taking this first step a high degree of risk is already associated. Another way in which risk taking can positively influence USO development is through increasing business opportunities. However, it must be stated that risk taking is a complex concept, and does not always foster positive outcomes. In some industries, risk taking is more appreciated and encouraged than in others. Often, risk taking is preferred in complex, emerging industries (e.g. technological industries). Given that these industries grow quickly and competition is often high, risk taking is often required for a USO to gain competitive advantage. On the other hand, in more mature, developed industries (e.g. the pharmaceutical industry), taking risks can have irreversible consequences for entrepreneurs. In these industries, one wrong decision could mean the end of a business. Due to this complex nature of risk taking propensity as a characteristic, it is difficult to provide generic reasoning on its importance. However, in most innovative industries (that are often quickly emerging and highly competitive), entrepreneurs must take risks if they want to grow their business (Dess & Lumpkin, 2005). This highly competitive nature of these rapidly growing industries calls for competitive advantage. If an entrepreneur is willing to take risks while their competition is not, this significantly increases competitive advantage and thus chances of funding and success for USOs.

3.1.4. Innovativeness

Dess and Lumpkin (2005) describe innovativeness as one's efforts to come up with novel solutions and find new opportunities. Mueller and Thomas (2001) add on to this that innovation is more than inventing something new. They argue that innovativeness also involves commercializing and implementing ideas and modifying resources, systems and existing products. They state that "innovation is the process that turns an invention into a marketable product" (p. 57). Mueller and Thomas (2001) developed a measurement scale that can be used to determine the innovativeness of an individual. This scale, adapted from Jackson (1994), consists of eight statements to which respondents can indicate to what extent they agree or disagree. Most statements focus on original thinking, novel ideas and creativity.

Innovativeness plays a large role throughout the entire entrepreneurial process, especially for USOs. Often, a USO is founded from an innovative idea based on research output. By exploiting the innovative potential of the idea, the USO can be transformed into a business opportunity. Additionally, a successful entrepreneur implements their competitive idea(s) by reorganizing industries, creating new supply streams or even creating completely new markets, which all require a certain extent of innovativeness. Not only does innovativeness play a role in the creation and implementation of the business idea, it can also positively influence competitive advantage (Ismail & Alam, 2019). The more innovative the entrepreneur is, the more likely they are to come up with an innovative business idea, which results in more competitive advantage. This, on its turn, is not only beneficial for the USO's performance, but also has the potential to attract investors, which leads to higher chances of receiving funding. In later stages of the USO process, the innovativeness of the founder could foster the USO's development by creating new products, services or supply streams. Additional income or supply streams significantly increase the chances of the USO becoming a sustainable business. All in all, it can be stated that innovativeness is an important entrepreneurial characteristic that plays a crucial role in the development of a USO.

3.2. Research Model

In order to research how the previously explained four characteristics can influence university spin-off success throughout different stages of the process, a research model has been developed. The different stages that will be included in the research model are based on the phases included in the critical junctures framework (figure 1) developed by Vohora et al. (2004). For the scope of this research, not all phases in this framework will be included. The

phases that will be considered are *research*, *opportunity recognition*, *pre-organization* and *re-orientation*. As Vohora et al. (2004) describe, once a USO has reached the re-orientation phase, they can already start with offering value to their customers and generating their first returns. In most cases, this means that the entrepreneur has gained access to sufficient resources and knowledge to build the new venture and commercially exploit their product, knowledge or technology. For this reason, it is decided to exclude the final phase, *sustainable returns*, from this research. The research model can be seen in figure 3.1.

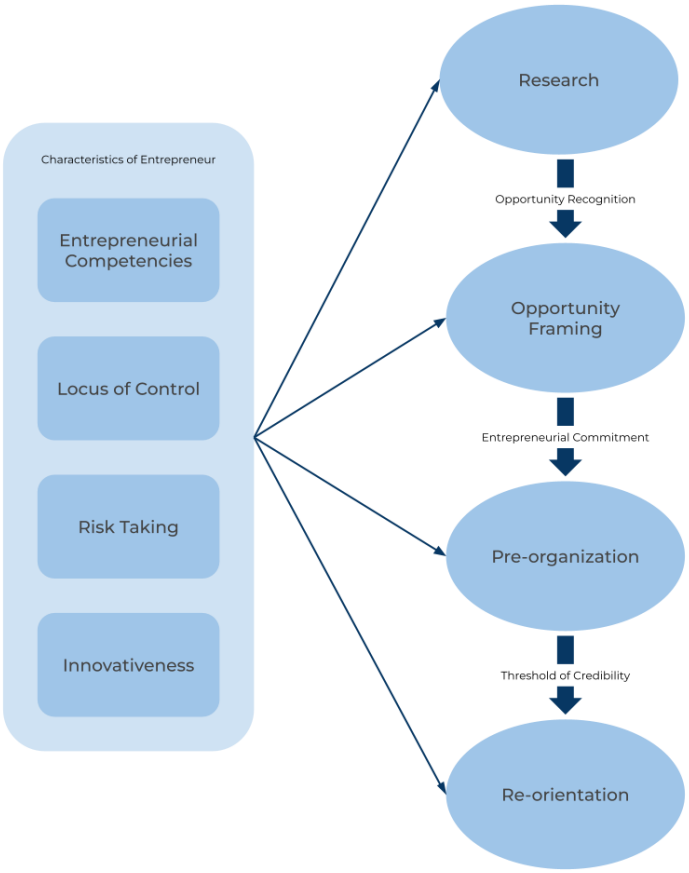


Figure 3.1 – Research model

3.3. Propositions

Based on the literature on how the four characteristics (individually) have already been proven to influence the success of a USO, various propositions are made. The first propositions that are made are related to entrepreneurial competencies. It is expected that the different entrepreneurial competencies are of importance during different stages of the start-up process.

P1: A higher degree of opportunity refinement increases competitive advantage, which is influential during the research – and opportunity framing phases

The first proposition is that *opportunity refinement*, which plays a role during the early stages of a USO process, increases competitive advantage. The reason for this is based on Rasmussen et al. (2011) their definition of opportunity refinement: "… *an ability to discover opportunities based on scientific research and to further refine these opportunities into a viable business concept.*" (p. 1333). As Vohora et al. (2004) explain, opportunities are discovered in the research phase, and refined into a business concept that can be commercially exploited in the opportunity framing phase. If an entrepreneur has a high degree of opportunity refinement, it is expected they are better equipped to both develop a business idea and turn this into a commercially exploitable product. It is expected that a higher degree of these entrepreneurial abilities to recognize and refine business opportunities increases competitive advantage for USOs.

P2: The ability to leverage positively influences the chances of funding, which is most important during the pre-organization phase

According to literature, *leveraging* relates to the ability to combine and acquire the resources necessary to start up a business (Rasmussen et al., 2011). This definition is almost identical to how Vohora et al. (2004) explain the pre-organization phase: "… *taking decisions what resources and knowledge to acquire now and in the future"* (p. 156). Therefore, it is expected that leveraging is most important during the pre-organization phase, especially for getting access to financial resources. In this phase of the development of a USO, the newly build ventures often need to get access to financial capital in order to get off the ground. It is proposed that a high ability to leverage significantly increases the chances of receiving funding for USOs.

P3: Championing competency increases USO outcomes, and is influential during the research – and opportunity framing phases

Championing relates to an entrepreneur's ability to identify with their business, convince others to contribute to it and share their business with others (Rasmussen et al., 2011). It is proposed that these qualities are needed in the first two stages, especially for overcoming critical juncture II: entrepreneurial commitment. According to Vohora et al. (2004), one of the largest challenges associated with overcoming this juncture is that many academics struggle to find partners or a surrogate entrepreneur, due to a limited social network. If, through championing, the academic succeeds in finding either a partner or a surrogate entrepreneur, they will be more likely to commit to their business idea an overcome critical juncture II. Not only does the ability to champion increase the founder's own commitment to their company, it also positively

influences the commitment of their colleagues and other stakeholders. It is proposed that this increased commitment impacts USO results and thus USO outcomes.

P4: A high degree of locus of control increases the chances of receiving funding, and is thus of influence throughout the first three phases of the USO process

Proposition 4 poses that a USO founder with a high degree of *locus of control* has higher chances for receiving funding for their spin-off. Therefore, it is proposed that a high locus of control is specifically important during the first three phases of USO development. As Asante and Affum-Osei (2019) described, the belief in one's own abilities and efforts makes them more perceptive to (entrepreneurial) opportunities. This perceptiveness to opportunities is desired in the research phase in order to recognize the business opportunity in the first place. Once the USO has entered the second phase, opportunity refinement, they are presented with numerous challenges. According to Vohora et al. (2004) one of the key reasons why it is difficult to overcome the entrepreneurial commitment juncture is a lack of self-awareness. Most academics have little to no business experience, which makes them doubt their own capabilities. However, individuals who have a high locus of control not only believe they can overcome challenges through their own effort and abilities, they are also willing to improve their capabilities and knowledge (Rotter, 1966; Asante & Affum-Osei, 2019). Therefore, it is expected that a high locus of control might be beneficial during the opportunity refinement phase. The final phase in which locus of control is expected to be of influence is the pre-organization phase. USOs emerge from non-commercial environments, which is often considered a liability by investors. However, if the entrepreneur who founded the USO shows a high locus of control, this has the potential to radiate confidence and trust towards investors, increasing chances of receiving funding.

P5: A high risk taking propensity can help a USO gain competitive advantage, being of influence in the research – and opportunity framing phases

As discussed previously, *risk taking* is a complex concept, and cannot be generalized easily. Therefore, this proposition only applies to USOs operating in emerging, highly competitive industries, for which was concluded already that risk taking can provide competitive advantage. Dess and Lumpkin (2005) described how risk taking refers to one's willingness to seize an opportunity. While seizing an opportunity is something that happens more often during the USO process, the most prominent situation in which this happens is at the very start of starting a USO. This is supported by Antoncic et al. (2018), who state that risk taking propensity is

often crucial in the decision to start a career in entrepreneurship and found a start-up. Besides its importance in the research phase, risk-taking is proposed to be important during the opportunity refinement phase as well. One of the key reasons USOs cannot overcome critical juncture II is that there is a lack of role models for academic entrepreneurs (Vohora et al., 2004). This lack of role models directly implies a lack of (success) stories, emphasizing the potential risks associated with entrepreneurship. Therefore, if a USO founder has a high risk taking propensity, they are more likely to commit to their idea. Moreover, it is proposed that a high risk taking propensity contributes to competitive advantage. If an (academic) entrepreneur is willing to take a risk while their competitor is not – given that the risk turns out to be successful – it gives them a competitive advantage.

P6: Innovativeness positively contributes to competitive advantage, showing its importance during the research – and pre-organization phases

The final entrepreneurial characteristic, *innovativeness*, is proposed to positively influence competitive advantage, playing a large role in both the research phase and the pre-organization phase. Vohora et al. (2004) argued: "*... without developing, acquiring or accessing the capability to combine scientific knowledge with a commercially feasible offering that satisfies an unfulfilled market need, academic scientists would not be able to proceed towards commercializing their technologies.*" (p. 160). This capability to combine knowledge with a commercially exploitable offer calls for innovative thinking. Research describes innovativeness as not only the ability to come up with novel solutions, but also the ability to implement these solutions and modify resources and knowledge for own benefit (Mueller & Thomas, 2001; Dess & Lumpkin, 2005). Besides the research phase, it is expected that innovativeness is of influence during the pre-organization phase as well. In this phase, USO founders have to take decisions on which resources and capabilities to develop, what knowledge to acquire and how to access these resources and knowledge (Vohora et al., 2004). Acquiring access to these resources and combining them calls for a certain extent of innovativeness. Moreover, the higher the degree of innovativeness of a product, the more competitive advantage it might provide. (Ismail & Alam, 2019). This competitive advantage benefits the USO in this stage by attracting investors, which can lead to receiving funding. This financial capital, on its turn, could be the resource needed to overcome critical juncture III and progress to the re-orientation phase.

4. Methodology

4.1. Research Context

This research is conducted in the ecosystem of the University of Twente (UT), which has been named "Most entrepreneurial university in the Netherlands" for multiple times in a row.[2] This entrepreneurial ecosystem at the UT was born approximately 35 years ago, when former rector magnificus Prof. dr. Dr. Harry van den Kroonenberg gradually changed the identity of the university to an entrepreneurial university (Schutte, 1999). Ever since then, the UT has introduced countless efforts to stimulate innovation and entrepreneurships. Among these efforts was the development of Novel-T, which is an incubator that stimulates innovation and offers support, coaching and a network to starting and more experienced entrepreneurs.[3] Due to these and other incentives originating from the UT, approximately 15 to 25 USOs are born at the UT each year. While the university is achieving large successes in the field of entrepreneurship already, their mission does not stop here. In their mission "Shaping 2030", the UT describes how they want to shape 2030 by empowering society through sustainable innovations.[4] This entrepreneurial ecosystem at the UT emphasizes the importance of USO development. Moreover, it provides a convenient environment for conducting this research, which will be done through qualitative research methods.

This research aims to form a deep understanding of how the character of an entrepreneur influences the success of their newly build venture throughout the process. Therefore, a qualitative approach is used. According to Queirós, Faria and Almeida (2017), qualitative research allows a researcher to deepen the understanding of a problem through producing in-depth information to better understand the different dimensions of the subject. This qualitative research is conducted through semi-structured interviews, as interviewing subjects can provide insights into their opinions, thoughts, feelings and world (Hove & Anda, 2005). The advantages of semi-structured interviews are that they employ a blend of open-ended and closed-ended questions, leaving room to delve into unforeseen topics (Newcomer, Hatry & Wholey, 2015). These semi-structures interviews take place in two rounds. The first round of interviews are held with individuals who have founded/are founding a USO. During the second round of interviews, experts within the field of entrepreneurship and the role of the individual herein are interviewed, in order to validate the answers from the entrepreneurs. The

[2] https://www.utwente.nl/en/business/most-entrepreneurial-university/
[3] https://novelt.com/en/aboutus/
[4] https://www.utwente.nl/en/organisation/about/shaping2030/mission/

setting for all interviews is the UT, as this has been proven to be a fruitful ecosystem for USOs. Moreover, the UT has years of experience within the field of academic entrepreneurship, making it an ideal context for conducting this research.

4.2. Data Collection

During the first round of interviews, which are held with academic entrepreneurs, a total of five participants is interviewed. The considerably low number of participants allows for in-depth conversations, which is necessary to obtain a deep understanding of underlying mechanisms. The participants that are selected for the interviews are knowledgeable entrepreneurs, who have practical experience and possess relevant insights. In order to determine the trustworthiness of potential research participants, various criteria were established. Table 4.1 shows an overview of these criteria. By diligently selecting these participants, it is aimed to gather insightful, saturated data. While the low number of participants was chosen deliberately with the aim of

Criteria	Method of addressing
Eligibility	- Participant originates from educational institute - Participant has founded/is founding USO
Credibility	- Participant has been working on USO(s) for over 1 year - Participant has at least reached the pre-organization phase
Understanding	- Participant has practical experience in USO(s) through (co)founding - Participant understands theoretical concepts (through studies, use of theoretical methods/frameworks or professional USO guidance)

Table 4.1 – Trustworthiness criteria participants

conducting extensive, in-depth interviews, it could result in a potential bias of similarity in answers. In order to prevent this potential bias, it is aimed to select an as diverse group of (knowledgeable) entrepreneurs as possible for the interviews. During the selection of participants, a diversity in USO industry, team size, team role and USO stage are considered (table 4.2). Another potential bias that might arise using such a low number of participants is that the results are not representative or meaningful. In order to eliminate this potential bias, the second round of interviews is included, in which two experts are interviewed. The expert interviews are added as validation for the first round of interviews, to ensure that the results are an accurate and meaningful representation for USOs. The participants selected for these expert interviews are again selected diligently. One of the experts selected is specialized in spotting and supporting starting entrepreneurs in their USO process. The other is an expert in

Participant	USO industry	Team size	Team role	USO stage
1	SAAS	8 (3FTE)	Co-founder & CCO	Sustainable returns
2	MedTech/EdTech	3 (1 FTE)	Co-founder & CEO	Pre-organization
3	Retail	5 (3 FTE)	Founder & CEO	Re-orientation
4	Retail	4 (0FTE)	Co-founder	Pre-organization
5	EdTech	11 (2 FTE)	Founder & CEO	Re-orientation

Table 4.2 – Background of participants and respective USOs

the more theoretical field of USOs and the psychology of the individual entrepreneur. These experts have been selected as their experiences and specialties complement each other. Where one of the experts has a large amount of practical experience and knowledge, the other is more theoretically oriented. The expert interviews follow the same methodology as the interviews with the academic entrepreneurs.

Prior to the interviews, the participants are provided with an information letter about the background and purpose of the research, and about the way in which (personal) data will be handled. All participants are informed that their participation is voluntary and that they may withdraw at any moment. After the participants have been informed about the research and provided with all information necessary, the interviews start. For the interviews, a set of prepared questions is used (Appendix A). However, as the interviews are conducted in a semi-structured manner, room is left for additional questioning and input from the participants. During the in-depth interviews, with the consent of the participants, the audio is recorded for the purpose of analysing the interviews at a later moment. Besides the audio footage that is being recorded, data is also collected through another manner. During the interviews, a (virtual) sticky note board is used to visualize what is being discussed. The interviews consist of an introduction, and three main phases. Phase I focuses on the participant's USO process, phase II focuses on the entrepreneurial characteristics that the participant possesses, and in phase III process and character are combined.

Table 4.3 shows which data collection methods are used during the different stages of the interview. Furthermore, the table summarizes the aim of each data collection method in the different phases, and shows the results of this method at the end of each phase. Audio footage is recorded during the entire in-depth interview, for the purpose of being able to review the interviews at a later moment. The sticky note board is used to facilitate the three main phases of the interview. In phase I, blue sticky notes are used to chronologically describe the process that the participant's USO has been through using keywords. For this part of the interview, an

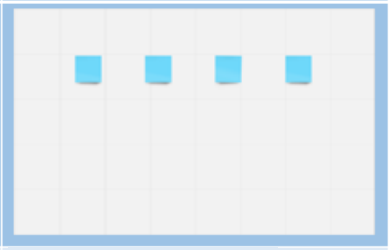
Interview phase	Data coll.	Aim	Result
Introduction	In-depth interview	Capturing interview for the purpose of reviewing	Audio footage of in-depth interview
Phase I: USO process participant	In-depth interview	Capturing interview for the purpose of reviewing	Audio footage of in-depth interview
	Sticky note board	Creating a visual overview of participant's USO process, showing the highlights per phase in keywords	
Phase II: Characteristics participant	In-depth interview	Capturing interview for the purpose of reviewing	Audio footage of in-depth interview
	Sticky note board	Creating an overview of entrepreneur's characteristics and reflecting their influence (positive/negative)	
Phase III: Combining process and characteristics participant	In-depth interview	Capturing interview for the purpose of reviewing	Audio footage of in-depth interview
	Sticky note board	Creating a visual overview of when (in process) participant's characteristics were helpful or harmful	

Table 4.3 – Data collection methods during the different interview phases

adapted version of the critical junctures framework (Vohora et al., 2004) is used as a basis, that provides some explanatory text using more practical language (Appendix B). In phase II, the characteristics that the entrepreneur possesses are written down on yellow sticky notes. After all entrepreneurial characteristics are discussed, the participants reflect on the type of influence (positive/negative) these characteristics have had for them. Characteristics that have been helpful are noted on green sticky notes, and red is used for the harmful characteristics. For this phase, an information sheet explaining the four characteristics from literature is used as foundation (Appendix B). This information sheet again explains the theoretical characteristics in a practical and concise manner. During phase III, the process and characteristics are combined. The participants are asked to place the characteristics under the phase(s) in which

they have had the most (positive/negative) influence. If they feel like certain characteristics played an important role throughout the entire process, the participants can place these sticky notes above the process (blue sticky notes). By letting participants use visuals to explain themselves, they can organize the information they are explaining in a more coherent structure (Mayer & Gallini, 1990).

4.3. Data Analysis

In order to analyse the interview results, an analytic abductive approach is used. The propositions from section 3.3., which were developed based on literature, are reviewed and tested. Given the theoretical background of this research, a thematic content analysis is used, in which the focus is on looking for keywords or patterns that were identified in previous studies already. However, given the qualitative approach of this study, room is left in this analysis for identifying new concepts based on the interview results. In other words, the answers given by the participants of the interviews are analysed on a content level, using the theory from prior research as a foundation. Additionally, the participants were provided the freedom to provide their own input beyond the concepts from previous literature. In practice, two main sources of input are used for this analysis. Initially, the sticky note boards are the primary source for the thematic content analysis, as these form a visual overview of what has been discussed during the interviews. The interview transcripts are mainly used for elaborating on the answers given, and providing reasoning when necessary. The five boards from the first round of interviews are analysed and compared. The goal of this analysis is to build a new framework showing which (configurations of) different entrepreneurial characteristics are important during what stages of the USO process.

In order to build this framework, the USO process is taken as a starting point. The phases from the critical junctures framework (Vohora et al., 2004) that were recognized by all interviewees are included in the new framework immediately. For the phases about which there were disagreements, the interview transcripts are analysed, to determine the reasons behind the disagreements among the interviewees. By comparing the answers and taking into account the background and situation of the individual participants, the goal is to determine whether the deviations from the original framework (Vohora et al., 2004) are due to personal circumstances or due to a gap between theory and practice. After this first part of the analysis, a new framework, adapted from Vohora et al. (2004), is provided, showing insights into the practical view on a USO process.

The second part of the analysis focuses on the characteristics discussed and their importance during the various stages of the newly developed USO process framework. For this part of the analysis, the Gioia Methodology is used, which helps in analysing the qualitative data retrieved in the interviews (Gioia, Corley & Hamilton, 2013). Using this methodology, aggregate dimensions are build based on first order categories and second order themes. Figure 4.1 shows the data structure that resulted from this analysis. In this stage again, the starting

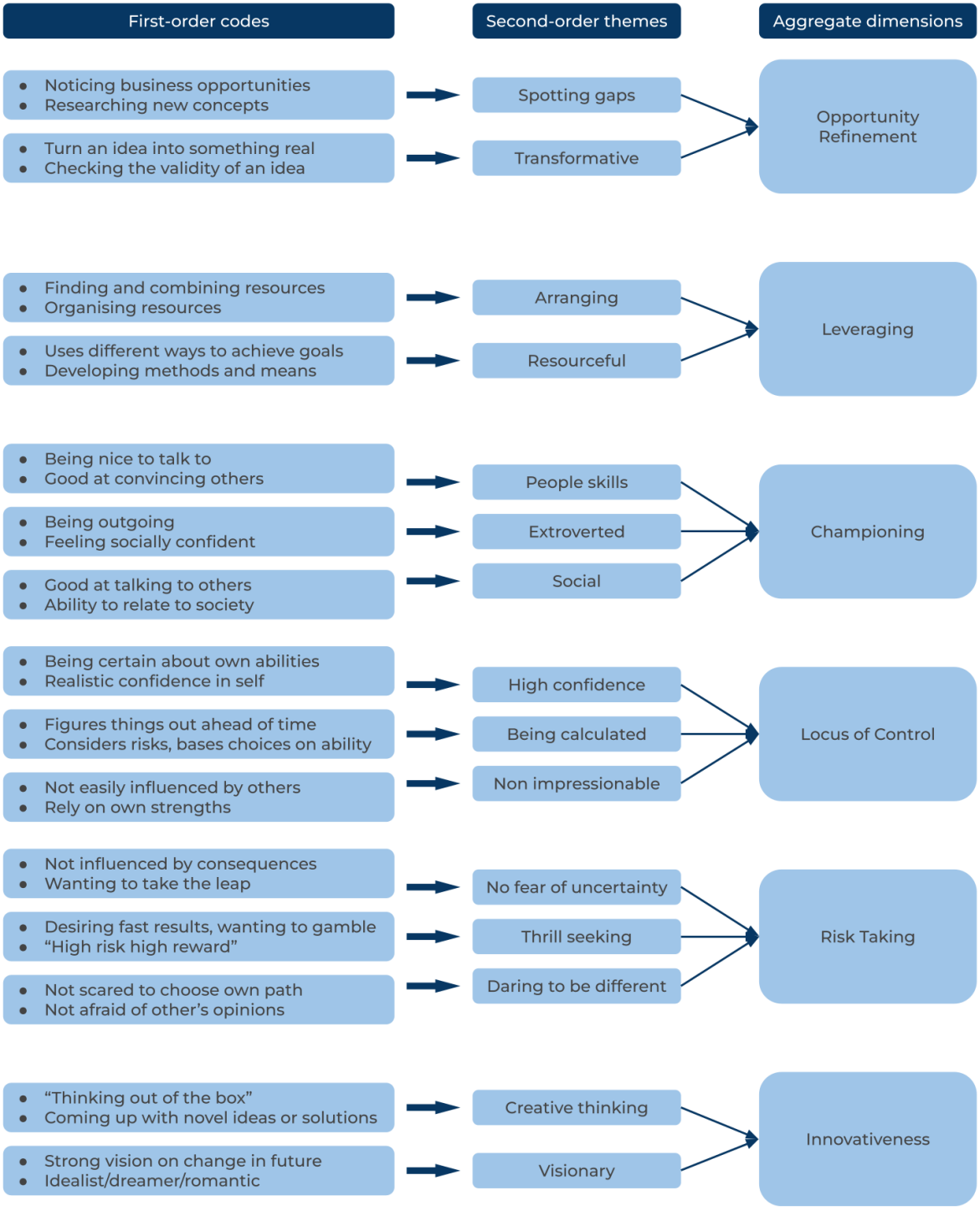


Figure 4.1 – Data structure for analysing characteristics

points are the characteristics on which all five participants agreed. These are immediately integrated in the framework. Then, the characteristics about which there were disagreements are analysed in more depth, considering the reasoning, background and situation of the participants. After analysis, the newly developed USO process framework is extended with combinations of characteristics that (positively/negatively) influence the process during the different stages.

Finally, after having analysed the outcomes of the interviews with the entrepreneurs, a critical look is taken at the newly developed framework using the input from the expert interviews. The parts of the framework that the experts agree on is confirmed and finalized, and if there are differences in opinion between the experts and the framework, these are again considered in more depth, taking into consideration reasoning, background and situation of both the entrepreneurs and experts. After these final iterations are made to the framework based on the expert interviews, the framework is finalized and explained in more depth.

5. Results

5.1. USO Process

The results from the five interviews with entrepreneurs show that the different phases in the entrepreneurial process as described by Vohora et al. (2004) are accurate. While some participants stated that there is a phase they have not (yet) been through, all participants acknowledged the different phases and their order. However, the majority of the participants emphasized that the process of starting up a new venture is not a linear process. Therefore, the non-linearity of the entire process must be emphasized. Furthermore, it became evident during the interviews that multiple participants were confused by the term 'Opportunity Framing'. After explanation of this phase, various participants recognized this phase as the 'Validation' phase at it is often referred to in practice. Thus, given that this paper aims to combine theoretical knowledge on USOs with practical experience from USO founders and experts, the *Opportunity Framing* phase will be renamed to the *Validation* phase in the new framework. The original USO process is adapted according to the changes suggested by the participants (figure 5.1).

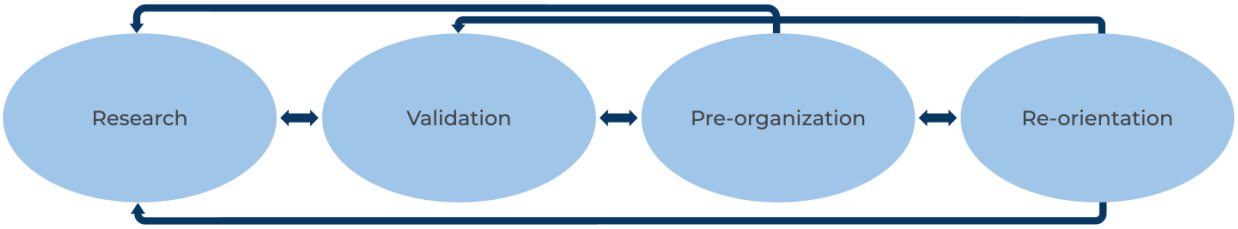


Figure 5.1 – Adapted USO process

5.2. Entrepreneurial Characteristics

All six entrepreneurial characteristics from literature were recognized and agreed upon by all participants. When asked about other characteristics that influence the USO process, the participants named and explained various characteristics outside of the research model. Table 5.1 shows an overview of the different additional characteristics named by the participants, and whether they are included in the final framework or not. For all characteristics that will not be included, reasoning is provided. As shown in table 5.1, some characteristics are excluded as they were recognized to be similar or even identical to second-order themes in the data structure, meaning they fall under one of the aggregated dimensions.

Characteristic	Included	Reason for exclusion
Passion	Yes	-
Daring to be different	No	Falls under Risk Taking
Not fearing uncertainty	No	Falls under Risk Taking
Lack of motivation	No	Only named by one participant
Complaining	No	Only named by one participant
Calmness	No	Only named by one participant
Flexibility	Yes	-
Adapting to change	No	Falls under Flexibility
Managing a team	No	Rather a skill than a characteristic
Risk adversity	No	Opposite of Risk Taking
Insecurity	No	Only named by one participant
Perseverance	No	Only named by one participant
Social	No	Falls under Championing

Table 5.1 – Additional characteristics named in interviews

5.3. *Founder Influence Framework*

The Founder Influence Framework that is built with the results obtained during the interviews with entrepreneurs shows how entrepreneurial characteristics can influence USO success throughout different stages of the process. The adapted process and characteristics from

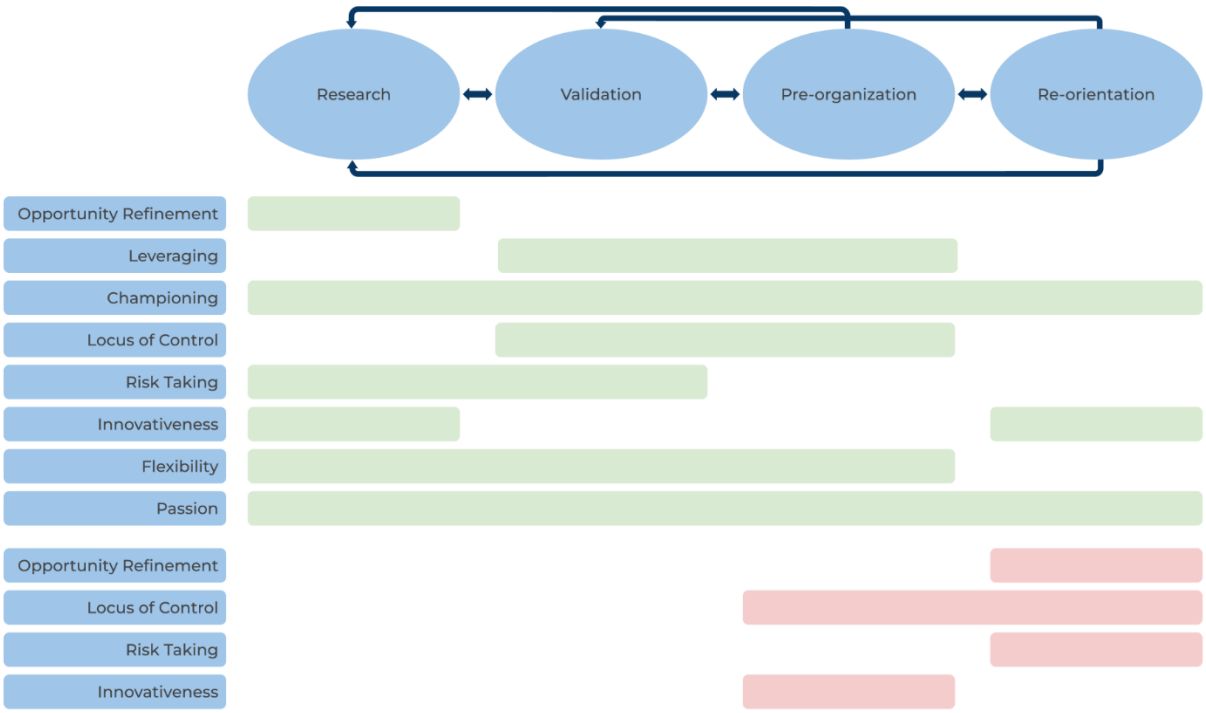


Figure 5.2 – Founder Influence Framework

previous sections are combined. Figure 5.2 shows the Founder Influence Framework, listing the characteristics most commonly discussed and their influence. The timeline after each individual characteristic shows in what phase(s) the characteristic is most influential. The colour of the timeline shows whether the characteristic can positively (green) or negatively (red) influence the respective phase(s). Whether each characteristic is influential per phase is primarily based on the results of the (virtual) sticky note boards (Appendix C). If three or more participants stated that a characteristic is of strong influence in a certain phase, this influence is included in the framework. For the characteristics about which there were varying answers among the participants, the different answers were considered. Based on the reasoning behind the answers of the participants, a decision was made about the situation. With this framework, the propositions posed in section 3.3. could be tested. The results of the proposition validations can be found in table 5.2. The results that have led to the (partial) validations of the six propositions are discussed individually in section 6.2.

P#	Proposition	Validated
P1	A higher degree of opportunity refinement increases competitive advantage, which is influential during the research – and opportunity framing phases	Partly
P2	The ability to leverage positively influences the chances of funding, which is most important during the pre-organization phase	Partly
P3	Championing competency increases USO outcomes, and is influential during the research – and opportunity framing phases	Partly
P4	A high degree of locus of control increases the chances of receiving funding, and is thus of influence throughout the first three phases of the USO process	Partly
P5	A high risk taking propensity can help a USO gain competitive advantage, being of influence in the research – and opportunity framing phases	Yes
P6	Innovativeness positively contributes to competitive advantage, showing its importance during the research – and pre-organization phases	Partly

Table 5.2 – Proposition validations

6. Discussion

6.1. Research Purpose

USOs have the potential to contribute to different levels in our society. Not only can spin-offs contribute on a technological level through technology transfer and the development of new technologies, they also have the potential to contribute on both the societal and economical level. Therefore, it is important to foster the development of USOs. However, many USOs either fail at an early stage or fail to become meaningful, and with these failures, potential gets lost too. In order to prevent this, a better understanding must be formed about the role of the entrepreneur's character in shaping the USO process. For this reason, the purpose of this research is to gain insights into the influence that the character of an entrepreneur has on the success of their USO throughout different stages of the process. This will be achieved by performing an in-depth, comprehensive study using qualitative research methods.

6.2. Findings

The research, to a large extent, supports the critical junctures framework as developed by Vohora et el. (2004). However, as this study aims to combine literature with practical experiences, two minor adaptations are made to the framework based on the practical experiences of the academic entrepreneurs who participated in the research. The first adaptation that is made, is that the non-linearity of the framework is emphasized. In the original framework Vohora et al. (2004) imply that the process is not completely linear, as they include feedback loops between the consecutive phases. Nevertheless, the original framework does not show feedback loops between the stages that are not consecutive. While Vohora et al. (2004) do not exclude the dynamic nature of the entrepreneurial process, this dynamic dimension to the process is not evident in the original framework. The second adaptation that is made is the fact that the *Opportunity Framing* phase is renamed to the *Validation* phase. Given that all participants made this remark, as well as one of the experts, this change is implemented. While Vohora et al. (2004) developed the original framework, their research does explain in further detail that in the opportunity framing phase an important step is that "*... the opportunity had been evaluated for technological validity and performance*" (p. 151), which confirms the importance of validation in this phase. After these adaptations to the original framework, an adapted version of the USO process is provided (figure 5.1), which forms the foundation for the rest of the research findings.

The research findings support the importance of the four entrepreneurial characteristics from literature, as well as two additional characteristics: *flexibility* and *passion*. Per characteristic, the Founder Influence Framework (figure 5.2) shows in which phase(s) the characteristic is important to possess. The results show that *Opportunity refinement* is important during the research phase. This is in line with P1, which expected this characteristic to be of influence in the early stages. As proposed, opportunity refinement is crucial for recognizing the business opportunity from research output in the first place. If academic entrepreneurs fail to do this, USOs would never exist. According to the findings, *Leveraging* is an important characteristic during the validation and pre-organization phases. While these findings confirm part of P2, that leveraging is important during the pre-organization phase, which was based on Vohora et al. (2004) and Rasmussen et al. (2011), they also show the importance of leveraging during the validation phase. When reconsidering the definition of leveraging according to Rasmussen et al. (2011) which includes: "*the ability to evolve the credibility …*" (p. 1336), these findings can be justified, as during the validation phase USOs must examine and evolve the credibility of their business idea. *Championing* appeared to be of importance throughout the entire USO process. While the expectations formulated in P3 were that championing would be influential during the opportunity framing phase, this insight can be explained. As Rasmussen et al. (2011) explained, championing relates to the commitment needed to sustain the USO start-up process. While their research states that championing is particularly important during the early stages of a USO, their results showed that new champions always had to be recruited later in the process again. With these findings from Rasmussen et al. (2011), which were confirmed by the participants in this research, the importance of championing throughout the entire USO process is emphasized.

Besides the entrepreneurial competencies described by Rasmussen et al. (2011), the other three entrepreneurial characteristics from literate have also been proven to be crucial in the USO process. The findings show that *locus of control*, which P4 proposed to be influential during the first three phases of the process, was indeed considered important during the validation and the pre-organization phase. Academic entrepreneurs with a high locus of control are more self-aware, confident and willing to learn than entrepreneurs showing a low locus of control (Rotter, 1966; Asante & Affum-Osei, 2019). During the interviews, the importance of these characteristics was emphasized by all participants, who stated that without a high locus of control, it is very challenging to become an entrepreneur. The fact that the findings did not show the importance of locus of control in the research phase can be explained. The reason that this was expected was that Asante and Affum-Osei (2019) described how a high locus of

control makes an entrepreneur more perceptive to opportunities, making it easier for them to recognize a business opportunity. However, one of the participants stated: "*If you have an entrepreneurial mindset, you can spot business opportunities everywhere.*", implying that, other than an entrepreneurial mindset, one does not need much to be able to spot business opportunities. Based on research, *risk taking* was expected (P5) to be important during the research and validation phases (Vohora et al., 2004; Dess & Lumpkin, 2005; Antoncic et al., 2018). The findings confirm this proposition, emphasizing the importance of risk taking in the early stages of the USO process. All participants confirmed this importance, with the annotation that the risks the participants take themselves are always based on careful considerations. *Innovativeness* has been proven to be influential during the research phase and the re-orientation phase. While it was proposed in P6 that this characteristic was crucial during the research phase, these findings contradict the second part of the proposition. However, when considering the fact that, as Mueller and Thomas (2001) write, "*Innovation is therefore more than invention; it also involves the commercialization of ideas, implementation, and the modification of existing products, systems and resources*" (p. 57), these findings can be motivated. That innovation is more than the invention of the original product is confirmed in older literature as well (Bird, 1989). The process of modifying existing products, systems and resources, as Mueller and Thomas (2001) describe it, occurs in the re-orientation phase, where USOs have to re-configure their resources (Vohora et al., 2004).

Besides the expected characteristics, the findings show various unexpected influences of characteristics as well. Two characteristics that were not included in the research model but did appear to influence USO success were discussed: *flexibility* and *passion*. While these characteristics were not included in the research model in the first place, there is research confirming the importance of these characteristics. According to Utomo, Cahyaningrum and Kaujan (2020), *flexibility* is a characteristic that can identify an entrepreneur. Other research has also shown this importance for flexibility and open thinking in entrepreneurship (Abood, Aboyasin & Ajloni, 2014). The fact that this research describes the importance of flexibility in entrepreneurship in a rather general manner, not specifying about certain phases of the entrepreneurial process, explains the fact that the findings show that this characteristic is important in almost all phases of the USO process. *Passion* has been proven in research to be an important characteristic for entrepreneurs, which fuels entrepreneurial efforts (Gielnik et al., 2015). According to the results, passion is important throughout the entire USO process. This can logically be explained by the fact that passion is a motivational factor for entrepreneurs to work on their entrepreneurial activities and tasks (Baum, Locke & Smith, 2001; Cardon et al.,

2005). Logically, entrepreneurial activities and tasks have to be performed throughout the entire USO process, and are not bound to a specific phase.

Finally, the results show that numerous characteristics that are included in the research model not only have the potential to positively influence USO development, but can also negatively influence USO development. What is striking about these findings is that these potential negative influences solely appear to be a problem during the last two phases of the USO process. While *opportunity refinement* and *risk taking* show their importance in the earlier stages, these characteristics might have adverse effects in the last two stages. This can logically be explained by the fact that, while these characteristics are of importance during the first stages, too much opportunity refinement or risk taking during later stages in the process might result in problems for the USO. According to the findings, *locus of control* can especially be harmful during the last two stages of the process. One of the interviewees argued: "*If you are overconfident, so too much locus of control, this might be beneficial for you during the start of the process, but if you do that in the pre-organization phase, while trying to arrange for funding, it might kill you. Same goes for that last phase, if you think you can control everything, which is not the case in a start-up, you might run into big challenges.*". This emphasis on having 'too much' of a characteristic was mentioned as main argument for all characteristics that could be of negative influence among the participants.

6.3. Theoretical and Practical Implications

The findings from this research can have both theoretical and practical implications. The theoretical implications are that this research builds onto existing theory on the USO process and entrepreneurial characteristics. Previous literature has already researched the influence of individual entrepreneurial characteristics on the development of USOs and start-ups (Rotter, 1966; Mueller & Thomas, 2001; Dess & Lumpkin, 2005; Rasmussen et al., 2011). However, there is a lack of research that examines how combinations of these different characteristics influence USO success. Therefore, this study enriches the theory on entrepreneurial characteristics by considering combinations of these different characteristics (Rotter, 1966; Mueller & Thomas, 2001; Dess & Lumpkin, 2005; Rasmussen et al., 2011). Additionally, while these previous studies researching USO development have provided valuable insights through quantitative research methods, they lack a deeper understanding of underlying mechanisms. Through conducting this research using qualitative research methods, it has provided in-depth

results that show a deep and thorough understanding of the influence of entrepreneurial characteristics throughout the early stages of a USO process.

Besides theoretical implications, the findings of this research also have the potential to have practical implications. The Founder Influence Framework, that is developed based on the results of this research, could be used by starting academic entrepreneurs and early phase USOs. The framework can have different implications for different stakeholders. Experienced academic entrepreneurs might use the framework to reflect on their character, and the role that their character plays in the development of their USO. Starting academic entrepreneurs (e.g. students) might use the framework as a handle when searching for co-founders and creating a diverse founding team. Moreover, educational and supporting institutes like the UT or Novel-T, that encourage and foster academic entrepreneurship, could use the framework in their programs and courses. This framework offers these type of institutes the incentives to better understand the role of the individual entrepreneur in USO development, and the way that their character can influence this process. They can put this practical knowledge to use by providing better support to USOs who encounter difficulties related to the founder(s) and their character(s). Finally, supporting stakeholders like funding parties or the Dutch Research Council could use the framework to reconsider their selecting criteria or programs, in order to become more inclusive for USOs as opposed to 'normal' start-ups. Through educating starting academic entrepreneurs, early phase USOs, and other USO stakeholders, early stage USO failure might be decreased.

6.4. Limitations and Future Research

While the decision was made deliberately to conduct this research through qualitative methods, this research methodology has disadvantages as well. One of the disadvantages of conducting qualitative research is that it limits the scope of the research to some extent. Given the extent of the interviews, and the objective to conduct in-depth interviews, it was decided to interview participants originating from an entrepreneurial ecosystem in the Netherlands (the UT). While this decision was made diligently, it also comes with implications. The results from the Founder Influence Framework are not generalizable, but rather transferable. In other words, while the results of comparable research, if researched in different research contexts (e.g. less entrepreneurial universities or universities in other countries), might differ from these findings, the concepts and methodology used in this research can be transferred to different research contexts (Finfgeld-Connett, 2010). To increase the chances of more generalizable results,

expert interviews were conducted. Through these expert interviews, which functioned as validation and saturation of the initial interviews, it was attempted to minimalize the chances of bias. Nonetheless, there is a high likelihood that a different research context would yield different results. Therefore, it is suggested that future research will be conducted, testing the Founder Influence Framework in a larger group of academic entrepreneurs and USOs. By testing the findings of this research among a broader audience of USO founders and academical entrepreneurs, as well as more experts in the field, the findings can be extended complemented. A suggestion for future research could be to perform this research at different entrepreneurial universities in different regions or even countries. This way, a potential bias caused by a specific entrepreneurial ecosystem (such as the UT) can be prevented.

While the qualitative approach used in this study allowed for an in-depth analysis of the topic, this somewhat limited the scope of the research in another way as well. In this research, the focus was on the individual academic entrepreneur and their character. However, from the interviews conducted it became clear that almost all USOs are founded by a team of multiple entrepreneurs. Due to the scope of this research, the context of a founding team was largely neglected by focusing on the individual. Logically, once a USO is founded by a team of entrepreneurs rather than an individual, different characters must be considered and a dynamic is developed within the team. However, with the Founder Influence Framework, the foundation has been laid for future research about the role of entrepreneurial characteristics in USO development. Future research could build onto this by researching the Founder Influence Framework within the context of a founding team. An interesting approach for this type of research might be to consider how founding teams that have similar characters operate compared to founding teams whose characters complement each other.

7. Conclusion

This research investigates the effects that different entrepreneurial characteristics have on the success of USOs throughout different stages of the process. Specifically, by using qualitative research methods, this paper builds onto existing literate by providing an in-depth analysis of the subject, which results in a deeper understanding of underlaying mechanisms. Through semi-structured interviews with high knowledgeable USO founders originating from an entrepreneurial environment, this research integrates previous literature on the USO process and characteristics with practical, real life experiences and insights. Based on the results of these interviews, which have been validated with various experts in the field, the Founder Influence Framework was developed. This framework shows when the different entrepreneurial characteristics are either most helpful or harmful throughout the USO process. This framework can be used as guideline or additional information for starting academic entrepreneurs, as it creates awareness about the role that the character of the entrepreneur has on USO success. This could reduce the failure rate among starting USOs, resulting in more technological, social and economic enhancements. Future research that focuses on USOs that are founded by a team of entrepreneurs might deepen the understanding of the role that the entrepreneur(s) play in the success of their USO.

References

Abood, N., Aboyasin, N. A., & Ajloni, M. I. (2014). Impact of the Entrepreneurial Attributes on Business Performance in a Sample of Jordanian Institutions. *International Journal of Professional Management*, *9*(1), 1-18.

Antoncic, J. A., Antoncic, B., Gantar, M., Hisrich, R. D., Marks, L. J., Bachkirov, A. A., ... & Kakkonen, M. L. (2018). Risk-taking propensity and entrepreneurship: The role of power distance. *Journal of Enterprising Culture*, *26*(01), 1-26.

Asante, E. A., & Affum-Osei, E. (2019). Entrepreneurship as a career choice: The impact of locus of control on aspiring entrepreneurs' opportunity recognition. *Journal of Business Research*, *98*, 227-235.

Baldini, N. (2010). University spin-offs and their environment. *Technology Analysis & Strategic Management*, *22*(8), 859-876.

Baum, J. R., Locke, E. A., & Smith, K. G. (2001). A multidimensional model of venture growth. *Academy of management journal*, *44*(2), 292-303.

Bernstein, S., Korteweg, A., & Laws, K. (2017). Attracting early-stage investors: Evidence from a randomized field experiment. *The Journal of Finance*, *72*(2), 509-538.

Bhave, M. P. (1994). A process model of entrepreneurial venture creation. *Journal of business venturing*, 9(3), 223-242.

Bird, B. J. (1989). Entrepreneurial behavior. Scott Foresman & Company.

Cardon, M. S., Zietsma, C., Saparito, P., Matherne, B. P., & Davis, C. (2005). A tale of passion: New insights into entrepreneurship from a parenthood metaphor. *Journal of business venturing*, *20*(1), 23-45.

Dess, G. G., & Lumpkin, G. T. (2005). The role of entrepreneurial orientation in stimulating effective corporate entrepreneurship. *Academy of Management Perspectives*, 19(1), 147-156.

Finfgeld-Connett, D. (2010). Generalizability and transferability of meta-synthesis research findings. *Journal of advanced nursing*, *66*(2), 246-254.

Fini, R., Rasmussen, E., Siegel, D., & Wiklund, J. (2018). Rethinking the commercialization of public science: From entrepreneurial outcomes to societal impacts. *Academy of Management Perspectives*, 32(1), 4-20.

Gersick, C. J. (1991). Revolutionary change theories: A multilevel exploration of the punctuated equilibrium paradigm. *Academy of management review*, 16(1), 10-36.

Gielnik, M. M., Spitzmuller, M., Schmitt, A., Klemann, D. K., & Frese, M. (2015). “I put in effort, therefore I am passionate”: Investigating the path from effort to passion in entrepreneurship. *Academy of Management Journal*, *58*(4), 1012-1031.

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational research methods*, *16*(1), 15-31.

Hansemark, O. C. (1998). The effects of an entrepreneurship programme on need for achievement and locus of control of reinforcement. *International Journal of Entrepreneurial Behavior & Research*.

Hendrickson, T. P., Kavvada, O., Shah, N., Sathre, R., & Scown, C. D. (2015). Life-cycle implications and supply chain logistics of electric vehicle battery recycling in California. *Environmental Research Letters*, 10(1), 014011.

Hove, S. E., & Anda, B. (2005, September). Experiences from conducting semi-structured interviews in empirical software engineering research. In *11th IEEE International Software Metrics Symposium (METRICS'05)* (pp. 10-pp). IEEE.

Ishak, S., Omar, A. R. C., & Moen, J. A. (2015). World-view, locus of control and entrepreneurial orientation in social entrepreneurship endeavour. *Mediterranean Journal of Social Sciences*, *6*(3 S1), 592.

Ismail, M. D., & Alam, S. S. (2019). Innovativeness and competitive advantage among small and medium enterprise exporters: Evidence from emerging markets in South East Asia. *The South East Asian Journal of Management*, *13*(1), 5.

Jackson, D. N. (1994). *JPI-R: Jackson Personality Inventory*. Sigma Assesment Systems, Incorporated.

Kaufmann, P. J., Welsh, D. H., & Bushmarin, N. V. (1995). Locus of control and entrepreneurship in the Russian Republic. *Entrepreneurship theory and practice*, *20*(1), 43-56.

Lopez-Sintas, J., Lamberti, G., & Sukphan, J. (2020). The social structuring of the digital gap in a developing country. The impact of computer and internet access opportunities on internet use in Thailand. *Technology in Society*, *63*, 101433.

Macko, A., & Tyszka, T. (2009). Entrepreneurship and risk taking. Applied psychology, 58(3), 469-487.

Mathisen, M. T., & Rasmussen, E. (2019). The development, growth, and performance of university spin-offs: A critical review. The Journal of Technology Transfer, 44(6), 1891-1938.

Mayer, R. E., & Gallini, J. K. (1990). When is an illustration worth ten thousand words?. *Journal of educational psychology*, *82*(4), 715.

Mueller, S. L., & Thomas, A. S. (2001). Culture and entrepreneurial potential: A nine country study of locus of control and innovativeness. *Journal of business venturing*, 16(1), 51-75.

Mustar, P., Wright, M., & Clarysse, B. (2008). University spin-off firms: lessons from ten years of experience in Europe. *Science and Public Policy*, *35*(2), 67-80.

Newcomer, K. E., Hatry, H. P., & Wholey, J. S. (2015). Conducting semi-structured interviews. *Handbook of practical program evaluation*, *492*, 492.

Perez, M. P., & Sánchez, A. M. (2003). The development of university spin-offs: early dynamics of technology transfer and networking. *Technovation*, *23*(10), 823-831.

Pirnay, F., Surlemont, B., & Nlemvo, F. (2003). Toward a typology of university spin-offs. *Small business economics*, *21*(4), 355-369.

Queirós, A., Faria, D., & Almeida, F. (2017). Strengths and limitations of qualitative and quantitative research methods. *European journal of education studies*.

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.

Rasmussen, E., & Sørheim, R. (2012). How governments seek to bridge the financing gap for university spin-offs: Proof-of-concept, pre-seed, and seed funding. *Technology Analysis & Strategic Management*, *24*(7), 663-678.

Renko, M., El Tarabishy, A., Carsrud, A. L., & Brännback, M. (2015). Understanding and measuring entrepreneurial leadership style. *Journal of small business Management*, 53(1), 54-74.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological monographs: General and applied*, 80(1), 1.

Rodeiro-Pazos, D., Fernández-López, S., Rodríguez-Gulías, M. J., & Dios-Vicente, A. (2021). Size and survival: An analysis of the university spin-offs. *Technological Forecasting and Social Change*, *171*, 120953.

Rodríguez-Gulías, M. J., Rodeiro-Pazos, D., & Fernández-López, S. (2016). Is university-based entrepreneurship successful? The Spanish case. *International Journal of Globalisation and Small Business*, *8*(4), 373-390.

Schutte 1, F. (1999). The University-Industry Relations of an Entrepreneurial University: the Case of the University of Twente. *Higher Education in Europe*, *24*(1), 47-65.

Utomo, M. N., Cahyaningrum, W., & Kaujan, K. (2020). The role of entrepreneur characteristic and financial literacy in developing business success. *Jurnal Manajemen Bisnis*, 11(1), 26-42.

Venkataraman, S. (2019). The distinctive domain of entrepreneurship research. In *Seminal ideas for the next twenty-five years of advances*. Emerald Publishing Limited.

Vohora, A., Wright, M., & Lockett, A. (2004). Critical junctures in the development of university high-tech spinout companies. *Research policy*, *33*(1), 147-175.

Zhang, J. (2009). The performance of university spin-offs: an exploratory analysis using venture capital data. *The Journal of Technology Transfer*, *34*(3), 255-285.

Appendices

Appendix A – Interview Questions

A.1. – Interviews with Entrepreneurs

Introductory Questions

Before starting the interviews, the interviewee will be given a short introduction about the research and interview. After that, the participant will be asked if they have read and understood the information letter that was shared with them prior to the interview. The participant will have the opportunity to raise any questions they might have about the interview procedure, data handling or other questions related to the research. If everything is clear, the interviewee will be asked to verbally consent to their participation in the interview and for being recorded during the interview. After this, the interview can start.

1. Can you give me a short introduction about yourself?
   a. What is your (educational) background?
   b. Why/How did you decide to start your own company?
2. Can you tell me in short what company you have started?
3. How was the team composition during the start of the process?
   a. Did the team composition change during the process?
      - If so, what changed?
   b. How do you think this influenced the success of the process?
   c. Did you and your co-founders already divide roles at the start of the process?
      - If not, when did you decide to introduce roles?
      - How do you think the distribution of roles influenced the success of your start-up?

Phase I – Determining Entrepreneur's Process

Prior to starting phase I of the interview, the (modified) critical junctures framework from literature will be shown and explained to the participant. The four main stages will be named and explained. After this, the participant will be given the opportunity to ask questions about the framework if something remains unclear. After this, phase I can start.

1. Looking at this framework from literature, how do you feel this is accurate to starting an actual business from your experience?

If the interviewee has difficulty answering this question, use examples from their own company to relate to the framework, provide some connections.

   a. At which stage in this process do you think you are right now?
   b. Considering these four main stages, do you think you can determine whether you have been through these stages as well?

2. What did stage [x] look like for you in your process of starting up your business?
   Repeat this question for all stages that the participant says to have been through.
3. How well do you think this framework represents all the stages that start-ups go through?
   a. Are there any stages that are not in this framework but you feel like you did go through?
   b. Are there any stages in the framework that you feel are not accurate from your experience?
   c. Were there any important milestones or significant events for you (e.g. receiving funding, being published) that you think have influenced your process?

Phase II – Determining Entrepreneur's Characteristics

Prior to starting phase II of the interview, the four characteristics from literature included in the research model will be named and explained. After this, the participant will be given the opportunity to ask questions about the characteristics if something remains unclear. After this, phase II can start.

1. How do you think that the individual characteristics of an entrepreneur can influence the success of their start-up?
   a. Do you think entrepreneurs must have certain characteristics to be successful?
   b. Do you think there are characteristics that entrepreneurs cannot have if they want to succeed?
2. Looking at the four characteristics discussed earlier, which of these do you think you possess?
3. For characteristic [x], how do you think this has influenced your process of starting up your own business?
   a. If so, how has this helped you during your process?
   b. If so, how has this hindered you during your process?

   Repeat this question for all characteristics the entrepreneur states to possess.

4. Which of these four characteristics are not important at all during the process of starting up a business from your experience?
    a. If any, why?
5. Are there any characteristics outside of these four that you feel like played a role in your process of starting up your business?
    a. If so, how has this helped you during your process?
    b. If so, how has this hindered you during your process?

If entrepreneur has started business together with someone else/group:

6. Do you feel like your co-founder(s) have complementary characteristics?
    a. What characteristics do they possess that you don't have?
    b. What characteristics do you possess that they don't have?
7. If you would not have had co-founder(s), how do you think this would have influenced the success of your start-up?

Phase III – Connecting Process and Characteristics

Now that both the entrepreneur's process and their individual characteristics have been determined, the two will be connected.

1. In front of you, you can see the different phases of your process, as you have experienced them, as well as the characteristics that you possess that played a role in your start-up process. Can you stick the characteristics (green for positive influence and red for negative influence) to the stages where they have had influence? You may use characteristics for multiple stages and also for both positive and negative influence if you want.

A.2. – Interviews with Experts

Introductory Questions

Before starting the interviews, the interviewee will be given a short introduction about the research and interview. After that, the participant will be asked if they have read and understood the information letter that was shared with them prior to the interview. The participant will have the opportunity to raise any questions they might have about the interview procedure, data handling or other questions related to the research. If everything is clear, the

interviewee will be asked to verbally consent to their participation in the interview and for being recorded during the interview. After this, the interview can start.

1. Can you give me a short introduction about yourself?
    c. What is your background?
    d. What are you doing right now?

Phase I – Determining Entrepreneur's Process

Prior to starting phase I of the interview, the (modified) critical junctures framework from literature will be shown and explained to the participant. The four main stages will be named and explained. After this, the participant will be given the opportunity to ask questions about the framework if something remains unclear. After this, phase I can start.

2. Looking at this framework from literature, how do you feel this is accurate to starting an actual business from your experience?
    c. Are there any stages in this framework that you think do not exist in an actual start-up process? If yes, which?
    d. Are there any stages missing in this framework that are normally in a start-up process? If yes, which?
3. Do you think that the process of starting up a business is comparable for all starting businesses?
4. Could there be a reason for a start-up to skip one of the phases (e.g. investment, etc)

Phase II – Determining Entrepreneur's Characteristics

1. How do you think that, in general, the individual characteristics of an entrepreneur can influence the success of their start-up?
    c. Do you think entrepreneurs must have certain characteristics to be successful?
    d. Do you think there are characteristics that entrepreneurs cannot have if they want to succeed?

Prior to starting phase II of the interview, the four characteristics from literature included in the research model will be named and explained. After this, the participant will be given the opportunity to ask questions about the characteristics if something remains unclear. After this, phase II can start.

2. Looking at the four characteristics discussed, do you feel these are accurate and important for starting a business?
    a. Are there characteristics among these four that you don't agree with?
    b. Are you missing any important characteristics among these four and what we've discussed earlier?
3. How do you feel that a founding team affects the success of a business?
    a. Do you think co-founder(s) should have complementary characteristics to each other?
    b. From your experience, what usually happens if co-founders have very comparable/similar characters?

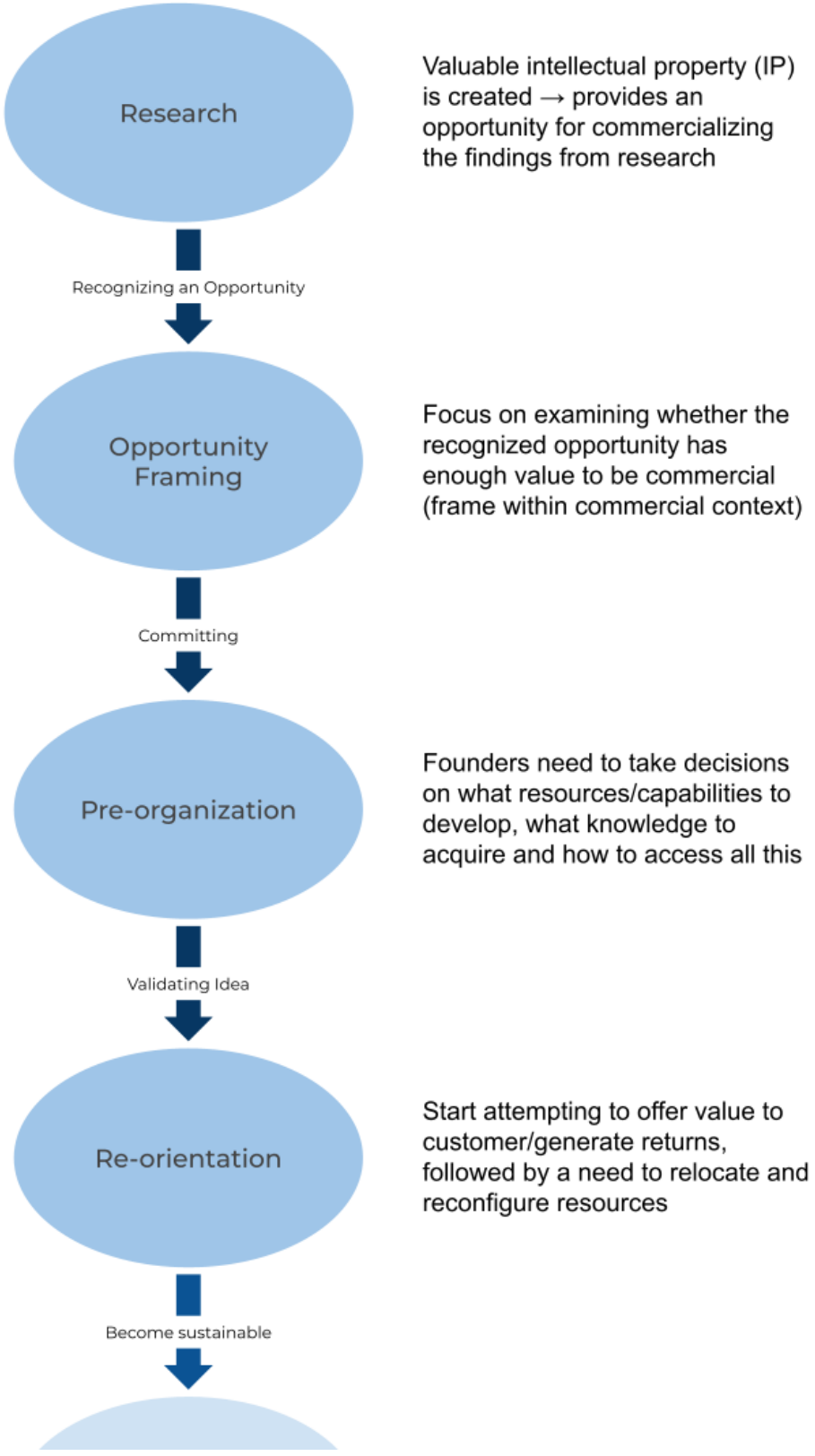
Phase III – Connecting Process and Characteristics

Now that both the entrepreneur's process and their individual characteristics have been determined, the two will be connected.

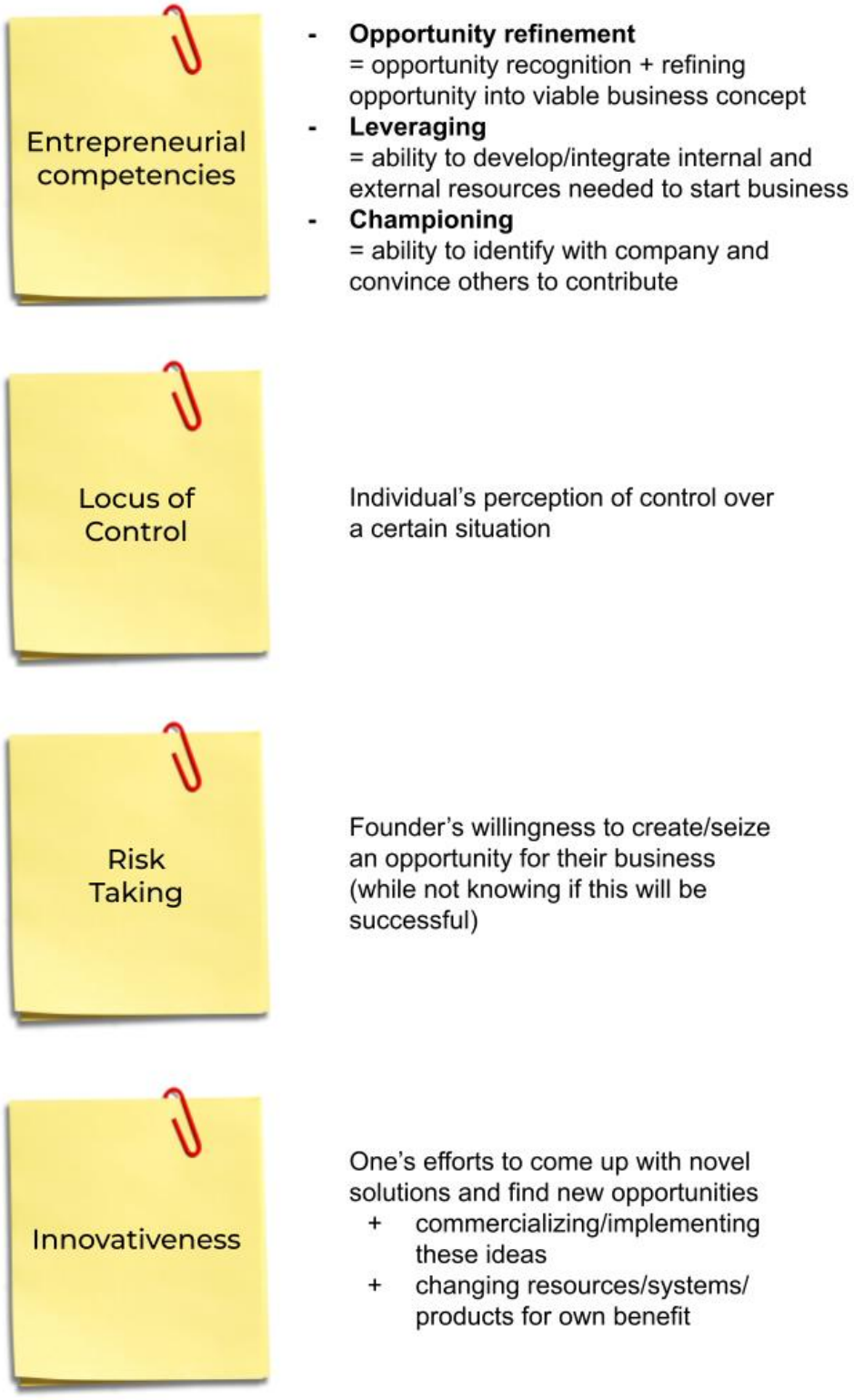
1. In front of you, you can see the different phases of your process, as you have experienced them, as well as the characteristics that you possess that played a role in your start-up process. Can you stick the characteristics (green for positive influence and red for negative influence) to the stages where they have had influence? You may use characteristics for multiple stages and also for both positive and negative influence if you want.

Appendix B – Interview Information Sheets

B.1. – Adapted Critical Junctures Framework



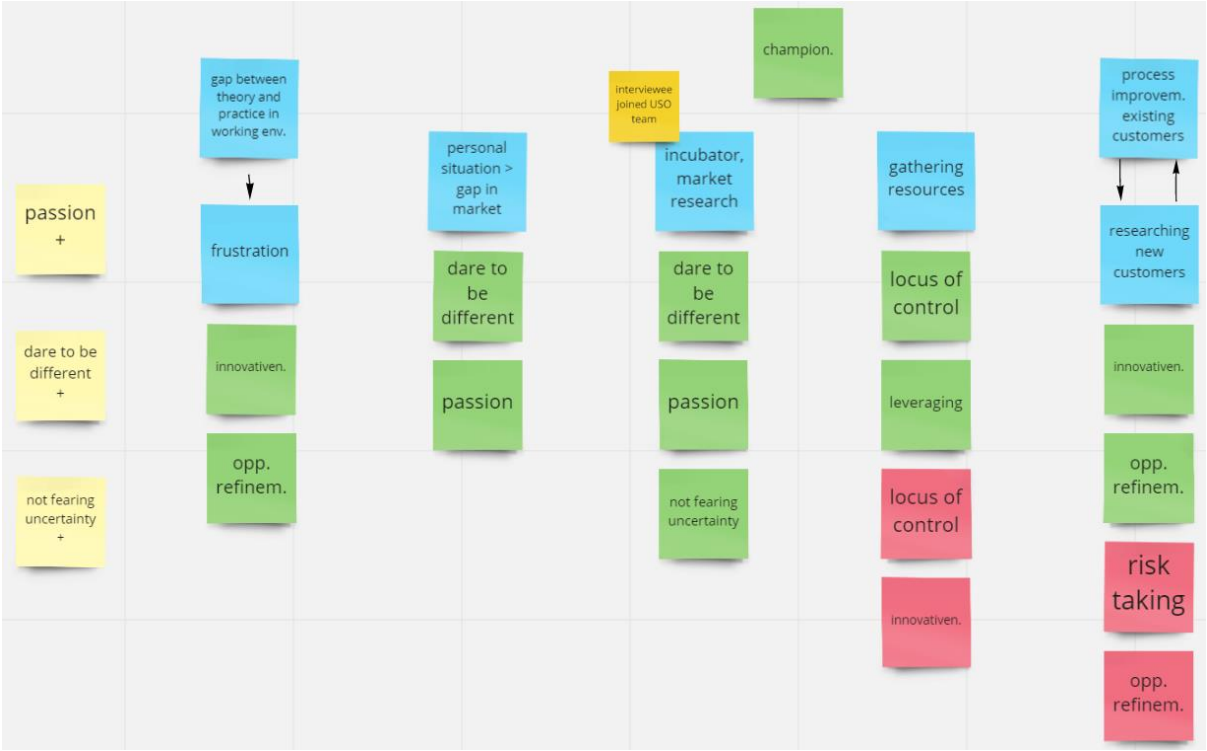
B.2. – Adapted Characteristics from Literature



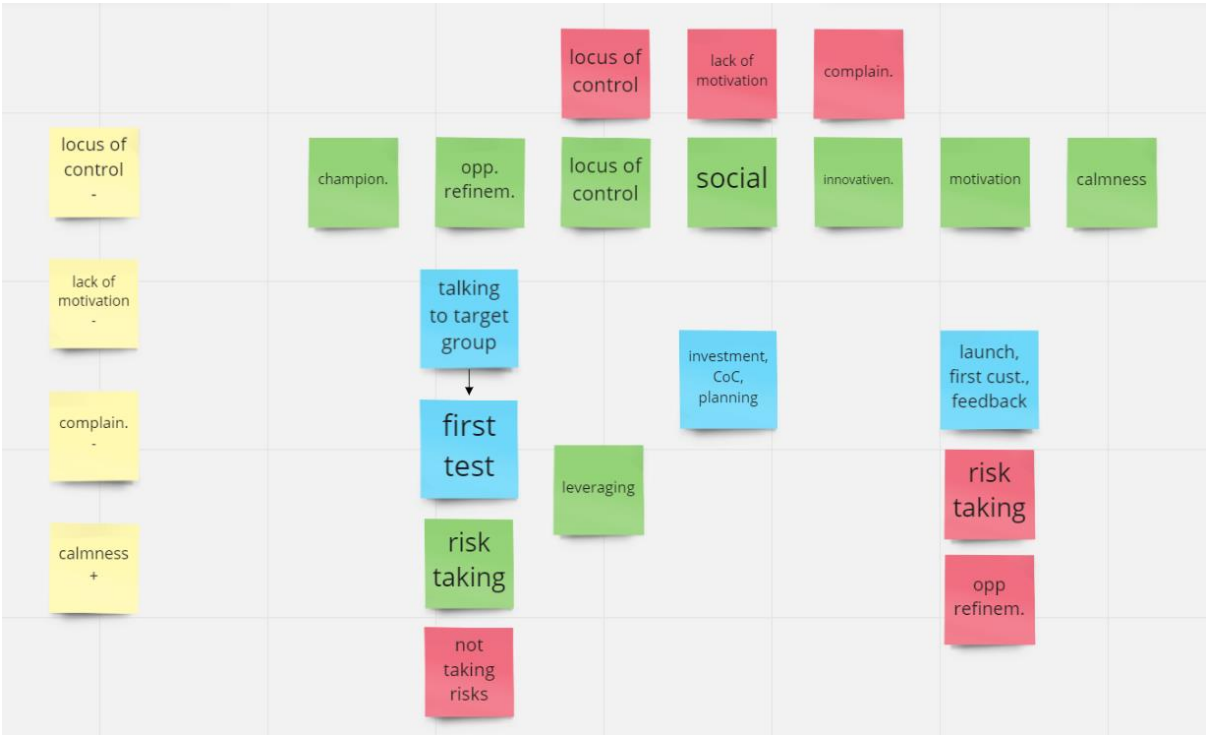
Appendix C – Interview Results

C.1. – Results Interviews with Entrepreneurs

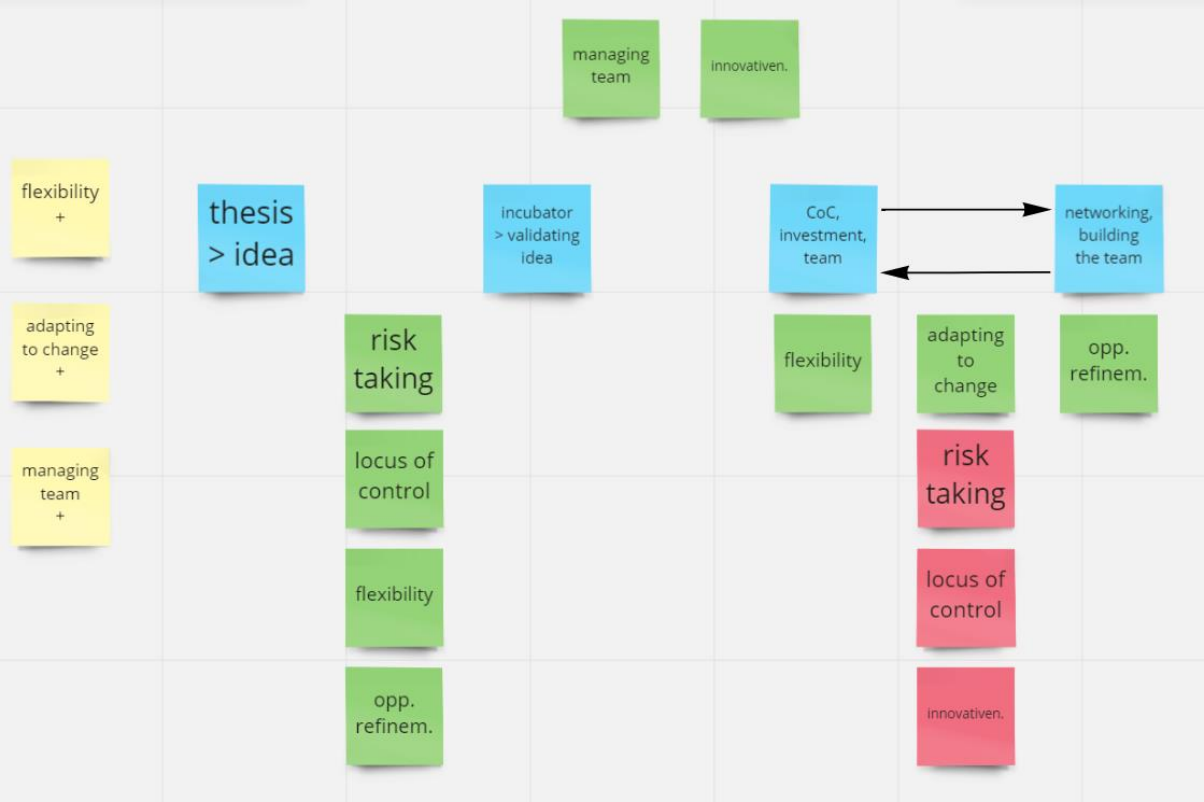
Participant 1



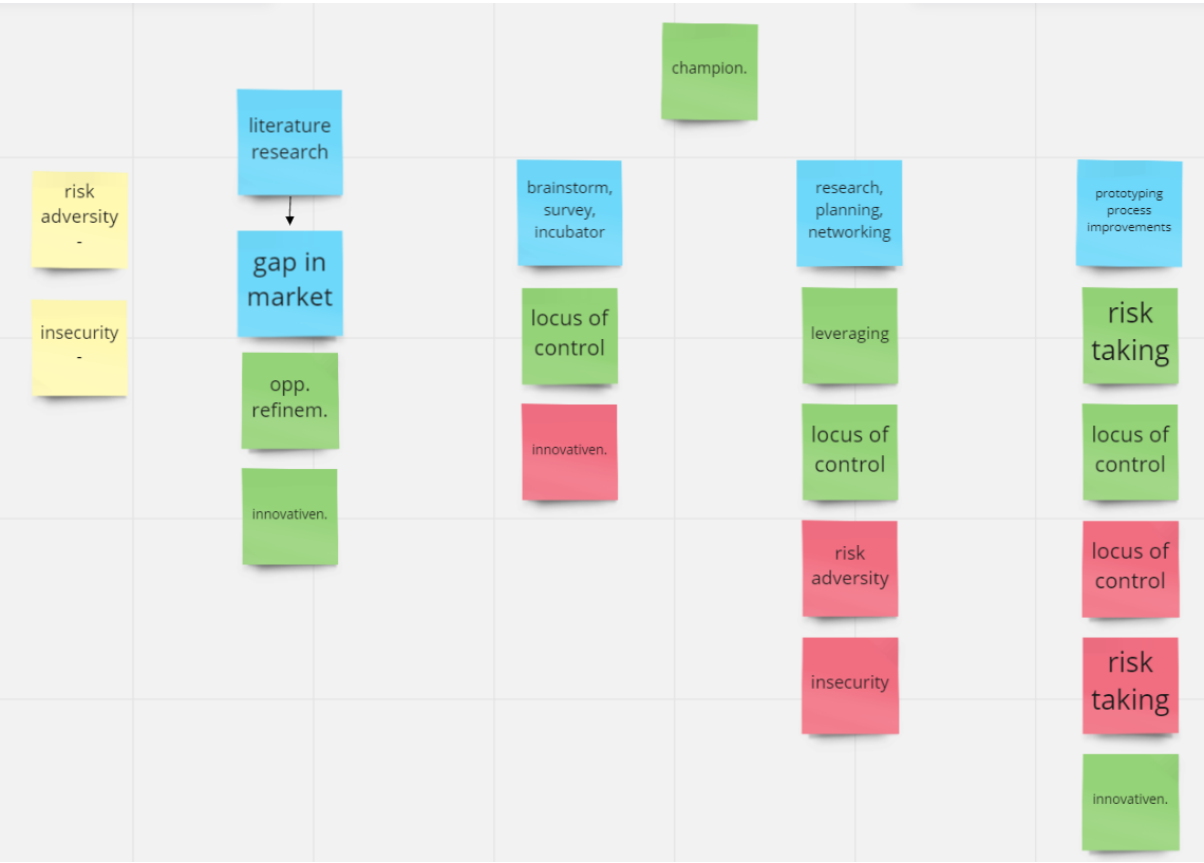
Participant 2



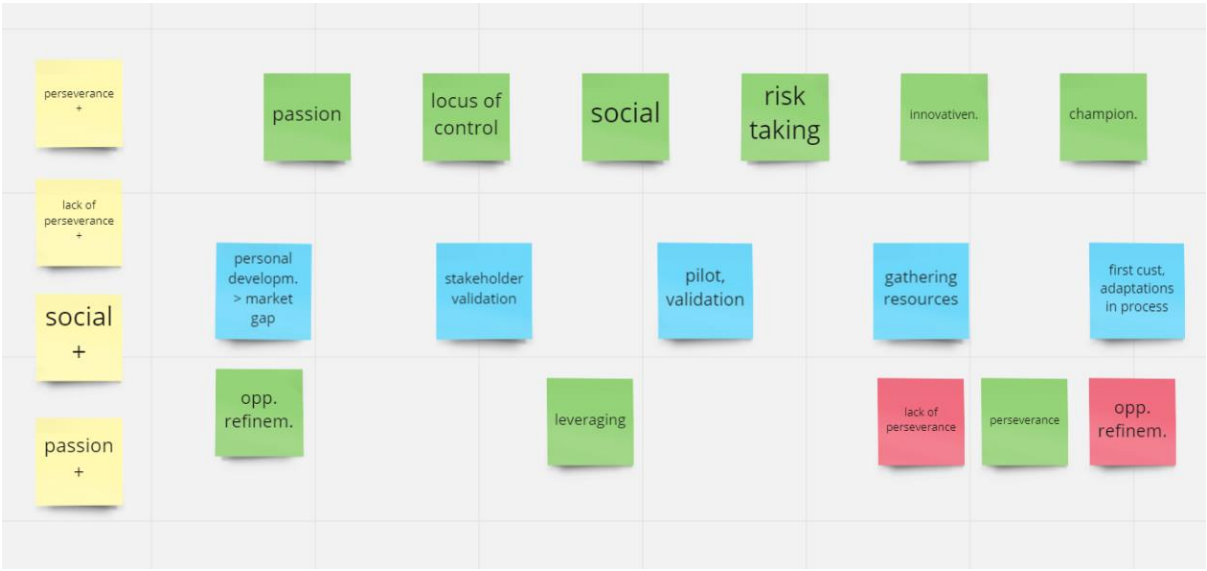
Participant 3



Participant 4



Participant 5



C.2. – Results Interviews with Experts

Participant 1

Participant 2