ACADEMIC ENTREPRENEURSHIP

STORIES BEHIND A TECHNOLOGY

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Abstract

Increasingly, universities are expected to go beyond their traditional education and research mission. As Tommy Ahlers, the Danish Minister for Higher Education and Science, has expressed "My ambition (…) is that in ten years' time, we will have more new companies emerging from the Danish research environment. Companies that can grow and become an engine for growth in the Danish economy"[1]. As a consequence of this *ambition*, a task that has become more important in recent years is the development and support of new entrepreneurial ventures coming from universities, sometimes called "Academic Entrepreneurship" (AE). Universities engage in AE to become more financially sustainable, have a stronger impact on society, prove the practical relevance of their research, and increase their reputation. Despite its growing relevance, the management and entrepreneurship literature on AE has several shortcomings, which I discuss in this thesis: it lacks focus and fails to work comparatively (not least because of the many definitions of AE used simultaneously); it is strongly shaped by positivist research perspectives and focuses very strongly on the context of the United States; and it silently assumes unity and aligned interests among the team members within an emerging AE venture.

In this thesis, I set out to mitigate some of these shortcomings by use of an in-depth qualitative case study of the Berlin based company ALPHA. Through a detailed review of the literature, I first identify voids and research opportunities and, as an attempt to focus the discussion, explicate my definition of AE as "Ventures exploiting codified or tacit knowledge that has the potential to be commercialized, which was generated (a) through research carried out in a university, and (b) by a faculty member of a university". Through the analysis of *ALPHA's stories*, this thesis expands on the existing literature in three ways: it explores the role of different team members and possible "Throne vs Kingdom" tensions in an AE venture, details the important but thorny legitimisation processes at play in such an organization, and clarifies how the internal identity of individual team members matters for the success of an AE venture.

Keywords: Academic Entrepreneurship; Organizational identity**;** Team complementarity; New venture legitimacy

[1] Source: https://cbswire.dk/tommy-ahlers-wants-universities-to-make-big-companies-ambitious-yes-realistic-maybe/

Acknowledgment

I came to Denmark to challenge myself with new understandings of life, but I never thought these two years will end with so many experiences, insights, and learnings. This thesis concludes a step of my personal development, for which I have to recognise the involvement of people I met along the way.

Christina: Thanks for being my supervisor in this thesis and other projects we got engaged with. Thank you for listening and advising me. I recognise you as an excellent mentor, and as an example of what an engaged scholar is. Thank you for the opportunity and believing in me. For that I will always be thankful.

I will also like to thank Thorsten for allowing me to catalyse my education; Ester for being a reminder of what I came here for; and the friends that made these years unforgettable.

Beyond all, my family. Alci, Marinde y Damita, gracias por siempre estar ahí.

Juan

Para mi abuela. Te fuiste volando, pero quedas en mi memoria y en las flores que, en una mañana de lluvia, bajo un árbol planté. 3 de marzo de 2019.

Introduction: Why Academic Entrepreneurship?

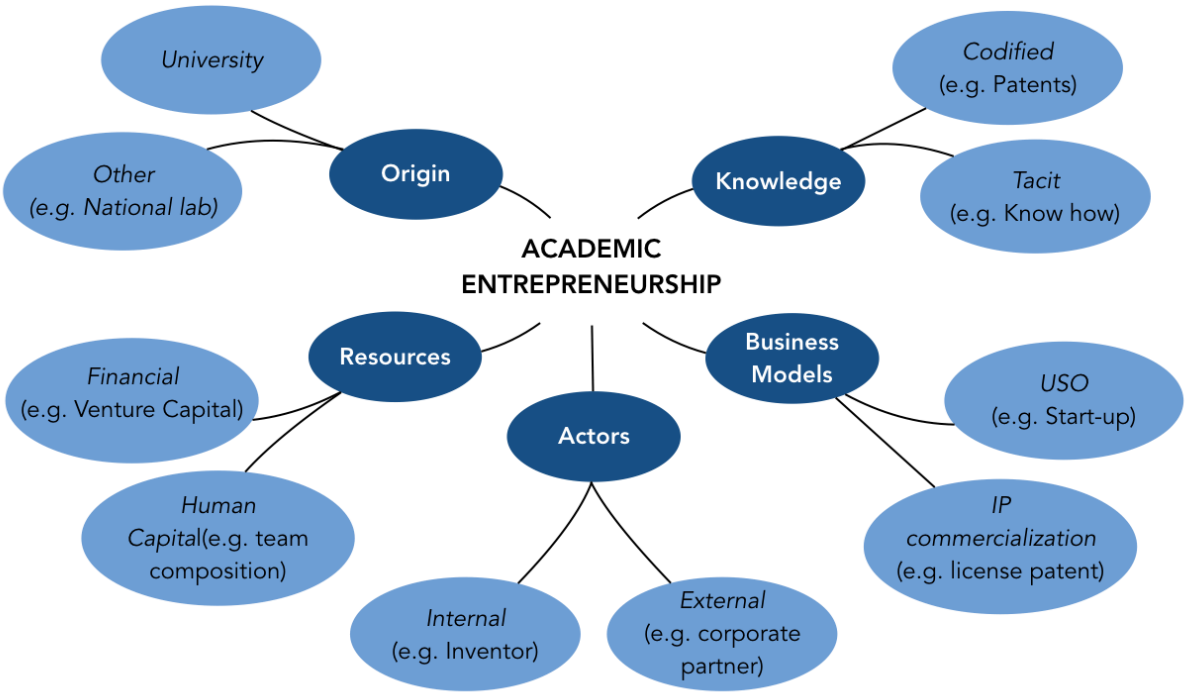
In order to be sustainable, universities are expected to go beyond their traditional educational and research activities. In their essay "An avalanche is coming: higher education and the revolution ahead" Barber, Saad, Foreword, & Summers (2013) discussed how universities will be impacted by new trends on learning methods, rising costs, and a general decrease in the value of academic degrees. Both academic research and degrees were the commonly expected outputs of universities, however enhancing the economic prospects of a region through new venture development is increasingly becoming more relevant for universities (Barber et al., 2013). Today, universities need to demonstrate "their short- and long-term contribution to national economic growth and local development, and the ways in which they are stimulating the setting up of new enterprises, and innovation in existing firms" (Gibb, Hofer, & Klofsten, 2018:2). As a consequence, as Barber et al. (2013) argued, if traditional universities want to survive and contribute to a better future, the development of new ventures should become a priority to them.

To explore this topic in research and eventually develop new ideas for universities' contributions to the start-up economy, it is important to first define the object of study. How have scholars so far defined new ventures that develop from universities? Based on Smilor, Gibson, & Dietrich (1990)'s analysis of the factors that foster the spin-out of companies from universities, Carayannis et al. (1998) defined "University Spinouts" (hereafter abbreviated as USO) as ventures created by former members of the respective parent organization (e.g. Research Centres, Universities), for which the core technology is based on research carried out in their former organizations. Reviewing this definition critically, Pirnay, Surlemont, & Frédéric (2003:355) argued that by including any type of parent organization (e.g. Research institutes) the scope of the discussion would be too broad, which in consequence leads to "researchers using the same concept [USO] for

studying and describing different realities". In an attempt to draw boundaries, Pirnay et al. (2003) defined USO's as (1) new companies with autonomous structure to pursue their activities; (2) organizations that were created specifically from research developed inside universities, excluding institutions such as national laboratories or research centres; (3) businesses with the objective of exploiting both technical know-how of an individual scholar and/or patents; and (4) ventures that are in pursuit of an economic profit. Additionally, Wright, Clarysse, Mustar, & Lockett (2007:5) argued that university-related people, such us alumni or industry partners "are only loosely connected to the university and are very difficult to identify in empirical studies". Therefore, Wright et al. (2007) only included university faculty members in their definition of USO.

Due to the great diversity in the type of ventures, scholars often use the broader term "Academic Entrepreneurship" (AE) when discussing the overall phenomena. Authors, such as Mathisen & Rasmussen (2019) and Wright et al. (2007), have studied the different dimensions that should be considered when studying AE typologies. According to them, these organizations are affected by their institutional origin, sponsorships, the forms of knowledge they engage in, their business models, resources, and actors. Each of these elements introduces sources of variation, which affect the definition. For example, Wright et al. (2007) identified that some spin-offs are not necessarily created based on codified knowledge embodied in patents. As a consequence, the definition should not be limited to only patent-related businesses. In line with this argument, Grimaldi et al. (2011:1045) used AE to describe the process of "stimulating technological entrepreneurship in universities via patenting, licensing, start-up creation, and university-industry partnerships". By following these latest definitions, USOs can be understood as a more specific outcome of the AE process, with AE being the broader umbrella term. The AE process, in turn, is shaped by a series of factors. Figure 1 summarizes the components that are of common consideration in the literature when defining AE.

Figure 1. A typology for AE



Source: Own elaboration based on Grimaldi et al. (2011); Mathisen & Rasmussen (2019); Pirnay et al. (2003); Wood, (2009); Wright et al. (2007*)*

Definitions are a "moving target"; they change based on research inquiries and new findings emerging from the field. As a result, when analysing AE, scholars should begin by clearly identifying the boundaries and interpretations of their object of analysis which could be specific for their study and research question. Based on the definitions discussed and the components shown in Figure 1, I will define AE in my analysis as:

> *"Ventures exploiting codified or tacit knowledge that has the potential to be commercialized, which was generated (a) through research carried out in a university, and (b) by a faculty member of a university"*

This definition is based on and expands on previous definitions and sets some boundaries for the meaning of AE in this study. This definition is in line with Pirnay et al. (2003)'s

description of USO but, by using the term "venture", I broaden the scope of the expected outcome (e.g. USO vs Consulting activities). However, I limit the understanding of what a venture could be by defining its origin (i.e. university research) and requiring it to have the potential to be commercialized. Finally, and aligned with Wright et al. (2007), I only consider ventures that were initiated by a faculty member, which, by definition, means that the scholar has an important involvement in the venture development, at least at the earliest stage.

Independent of the definition, there is a general agreement that AE is of great relevance for business and societal development. Scholars have shown that AE has an impact on societies' knowledge generation (Bercovitz & Feldmann, 2006), in consequence increasing the economic value that emerges from innovations developed (Shane, 2004a). Furthermore, authors such as Clarysse, Wright, Lockett, Van de Velde, & Vohora (2005) and Shane (2004a) expected an impact on the performance of regions due to job creation and industry development. Moreover, AE helps universities with their mission since they provide additional funding for research; help with the process of attracting and retaining faculty; and, support the education and training of students (Shane, 2004a). Finally, and even though Harrison & Leitch (2010) argued that spinoffs are not necessarily a major source of income for universities, scholars maintained that AE offers an economic return for entrepreneurs, universities, and external investors. (Bercovitz & Feldmann, 2006; Clarysse et al., 2005; Shane, 2004a; Rasmussen, 2019, Wallmark & McQueen, 1982). In conclusion, AE is expected to have an impact on society, regional development, institutional performance, and individual return (Figure 2).

Figure 2. Potential Impact of AE

Source: Own elaboration based on Bercovitz & Feldmann (2006); Clarysse et al. (2005); Shane (2004a); Rasmussen, (2019), and, Wallmark & McQueen (1982)

Due to the benefits discussed, governments have regulated how to structure the development of AE, especially in regard to Intellectual Property (IP) protection. The pioneer of AE regulation were the United States with the 1980's Bayh-Dole act (Wright et al., 2007). This policy transformed how universities commercialized their research since it gave the universities the property rights to federally funded inventions (Grimaldi et al., 2011; Shane, 2004a). With this act as precedent, and even though there are still countries were the IP is generally owned by the individual academic (e.g. Sweden), several countries have started implementing similar policies, for example, the Employer Invention Law in Germany or the Loi Allègre in France (Grimaldi et al., 2011). In countries where no national policy has been defined, universities tend to outline their own regulations and norms in this regard (Proyecto PILA, 2009). These policies have an effect on the forms in how the public sector assists the spinoffs, the financial support of the Technology Transfer Offices that support

the universities commercialisation efforts, and the invention disclosure requirements (Wright et al., 2007).

There are discussions in regard to the effects that regulations on AE have on publicly funded innovations. For example, the Danish Committee on Science Policy from the Royal Academy of Science and Letters has recently issued at white paper in which they discuss the risk of universities becoming "(…) 'hotels for researchers': universities that have no research funds of their own, but host researchers who conduct research based on external funding dominated by short-term projects within predefined research themes"[2]. Majken Schultz, chair of the Committee, argues that if this continues, the freedom of research could be jeopardized, thus private, public, and academic incentives in academia must be examined.

The field of AE regulation research is still emerging, and many open questions remain. Mowery, Nelson, Sampat, & Ziedonis (2001) concluded that some of what could have been public domain innovations are now being patented, which could jeopardize the dissemination of the research accomplishments. Likewise, the additional administrative procedure that researchers have to engage with, can delay the flow and licensing of scientific research (Grimaldi et al., 2011). Moreover, Bagley & Tvarnø (2015:48) observed that "close ties between academic researchers and industry can create conflicts of interest, result in perverse incentives, and force a shift from basic to applied research". With the main focus of the thesis being to analyse AE from a managerial perspective, discussing the positive or negative implications of AE regulation goes beyond the scope of this thesis. For further discussion of this issue, see Bagley & Tvarnø (2015); Grimaldi et al. (2011) and

[2] https://cbswire.dk/are-universities-at-risk-of-just-becoming-hotels-for-researchers/

Proyecto PILA (2009) or publications by HEINNOVATE[3], World Intellectual Property Organization[4] or Pila Network[5].

The thesis develops in six sections, starting with identifying the voids and research opportunities in the AE (management and entrepreneurship) literature and ending with the contributions and conclusion of this research. The first section develops an in-depth literature review and describes the evolution of the field, with the goal to offer a holistic description of AE and highlight important voids and research opportunities in the literature. In the second section, I explain my constructivist research philosophy, the used case study methodology, and describe ALPHA, the organization in analysis. In the third section, I describe four hypotheses in regard to scholar motivations, team's complementarity, ALPHA legitimisation process, and finally the organizational internal identity. In the fourth section, I discuss my hypothesis through the AE literature in order to make sense of the findings of this study and expose their managerial implications. In the fifth section, I describe the contributions to literature, the limitations that must be considered when making sense of my results and propose some questions to guide future research in regard to founders' control, internal leadership, legitimacy management, and internal identity development. Finally, I conclude this thesis with a final reflection on AE.

[3] https://heinnovate.eu/en
[4] https://www.wipo.int/portal/en/index.html
[5] www.pila-network.org

I. A literature review on Academic Entrepreneurship

To explore in depth the relevant literature on AE, I underwent a multi-step literature review process (Figure 3). First, I searched different library catalogues to determine the relevant monographs on the topic. It is noteworthy that I could only identify two specialized AE monographs: Shane, 2004a and Wright et al., 2007, which indicates that the research field is still in an early stage. I then focused my efforts on academic journal articles, which reflect the state-of-the-art of research. By using Google Scholar and the Copenhagen Business School library database, I carried out an initial term-based search of articles where I was able to track down (many of) the relevant authors discussing AE and the journals where this topic was mainly published. Based on these results, I compiled 62 different articles that set the grounds of the AE field and were continuously referenced throughout the literature. Considering that my main interest is in management studies, I then also reviewed the top management journals publishing on the topic and carried out specific queries[6] on the Business Source Complete Databases. This process allowed me to gather 210 articles that were related to my topic of interest. The search provided me with a database of 272 articles related, in principle, to AE.

Figure 3. Database constructions

[6] Queries based on the following keywords: Academ* Univers* Entrepreneur*Spin* and filtered through top journals and industries or relevant subjects. Moreover, I downloaded the top 20 articles of the top business journals that were related with the keywords.

The articles in the final database were filtered in two steps in order to classify them and analyse them further. By browsing the articles with a special emphasis on abstract, introduction and conclusion, I first decided which articles narrowly addressed the AE process and eliminated the articles that only mentioned it peripherally. A total of 88 articles were considered for the final literature analysis. In the second phase of analysis, the articles contained in the final database were reviewed and grouped into eight categories. Based on the research questions, theories used, and results and conclusions, I classified each article in one of the following groups: AE Literature reviews; AE Definition; Characterization of AE ecosystem, AE Development; AE Commercialisation; AE impact; AE Identity; and AE Networks (See Appendix 1 for details of the analysis).

In my literature review I found that the core publications in the field of management have not given sufficient attention to the topic of AE. It is worth noticing that in my literature analysis, less than 30% of the research done on AE has been published in top management journals[7] and this number is even lower in other relevant literature reviews (e.g. (Djokovic & Souitaris, 2008; Fini, Rasmussen, Siegel, & Wiklund, 2018; Rothaermel, Agung, & Jiang, 2007; Thérin, 2007)). One may hypothesize that the reason for this scarce attention has been the lack of interest from managers, venture capitalists and investors in projects coming from academia (Rasmussen & Tuft, 2018; Munari & Toschi, 2011). I also found that the most common target audiences were governments and universities, which could diminish the interest of highly ranked management journals. Furthermore, due to the common IP involvement in AE and the legal aspects related to commercialization of public domain research, Rothaermel et al. (2007) suggested that this field of knowledge used to be better suited for the policy research domain. Finally, Rothaermel et al. (2007) also claimed that classic management journals tend to emphasize theory building and theory

[7] For example: Academy of Management Perspective; Academy of Management Review; Journal of Management Studies; Management Science

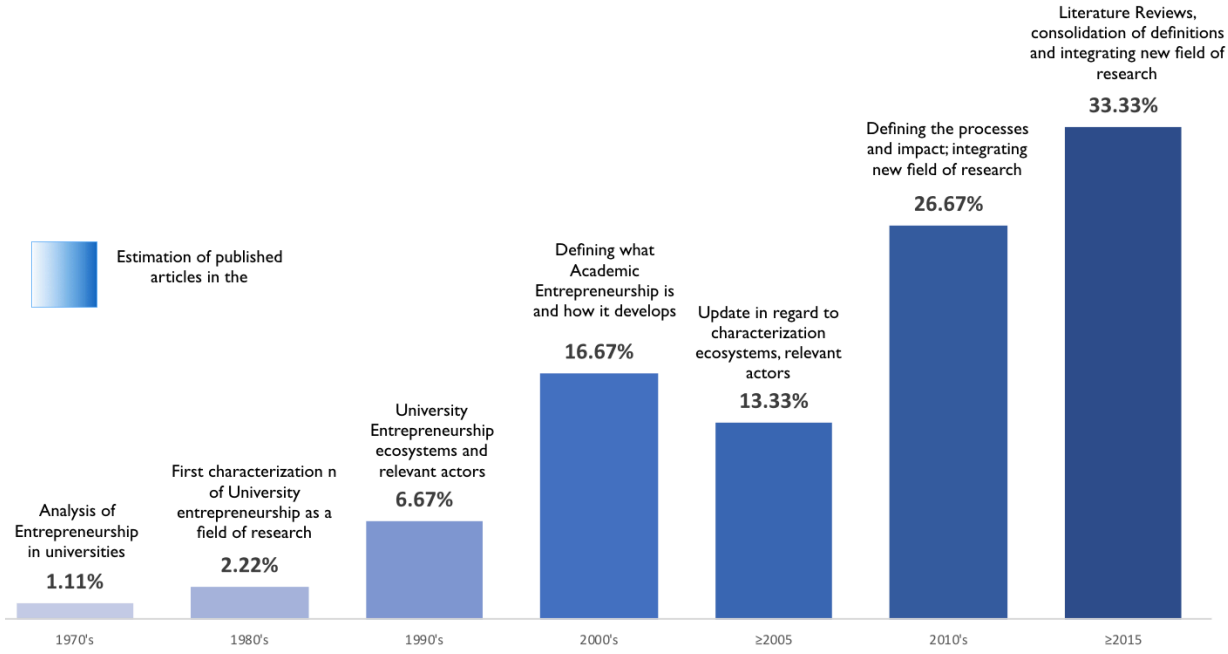
testing as the key publishing criteria and, by 2007, AE did not "possess a dominant theoretical paradigm on which empirical research can coalesce" (Rothaermel et al., 2007:699).

However, in recent years, AE research has evolved into a more mature field of inquiry. Contributions to AE are more frequently published in specialized or niche journals, such as Technovation, Small Business Economics, Technology Transfer, or Research Policy (Djokovic & Souitaris, 2008; Hayter, Nelson, Zayed, & O'Connor, 2018; Rothaermel et al., 2007). Since the 2000's, there has been a general increase in the AE research (Hayter et al., 2018). Even the top management journals are opening up to AE research. Based on my literature review, it was possible to identify that since 2007 there has been an increase of around 75%[8] of AE publications in the top management journals[9]. Finally, based on Djokovic & Souitaris (2008) review, I observed that between the 1980's and 1990's studies were mainly phenomenon-driven, however since the year 2000 there has been an increase in theory-driven articles. More than 50 years of literature development and the publishing trend already discussed, suggest that AE is gradually becoming a more mature field of inquiry with greater and continuously increasing relevance to mainstream management research.

[8] Some statistics such as relevant journal, more cited authors and years of publication can be find the appendix of this document.

[9] Academy of Management Perspectives; Entrepreneurship: Theory & Practice; Journal of Management Studies; Academy of Management Review; Strategic Entrepreneurship Journal; Organization Science

Figure 4. Evolution of the AE field of study



Source: Own elaboration

When it comes to the content of AE research, the field has been developing since the 1970's, with an increase in publications in the early 2000's and a consolidation of the field by the end of 2010 (Figure 4). Specific topics have dominated each period of research. Due to the attention brought by places, such as Route 128 or Silicon Valley[10], scholars towards the turn of the century were interested in understanding the development of these high technology ecosystems. Some of the first authors to research the relation of this phenomenon with universities were Cooper (1971a) and Roberts (1970) who studied the high technology new ventures related to Stanford and MIT, respectively, and explored and questioned the factors that foster this type of spin-off.

[10] For a brief story on Route 128 and Sillicon Valley visit: https://techcrunch.com/2009/10/31/the-valley-of-my-dreams-why-silicon-valley-left-bostons-route-128-in-the-dust/?guccounter=1&guce_referrer_us=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_cs=hjK3ZBeWhUSrCT0KGUW3wQ

To broaden the findings coming from the 1970's, in the 1980's and 1990's, scholars focused on characterizing university entrepreneurship. Questions related to type of companies, the actors and their roles, and the relevant resources dominated the field. Some of the pioneering authors to research and write about this phenomena were Carayannis et al., 1998; Doutriaux, 1987; Louis, Blumenthal, Gluck, & Stoto, 1989; Roberts & Malone, 1996; Smilor et al., 1990; Wallmark & McQueen, 1982. In the early 2000's scholars aimed to define what AE was and analysed its life cycle and development processes (e.g. Ndonzuau et al., 2002; Pirnay et al., 2003; Shane, 2004a; Shane & Stuart, 2002; Wright, Vohora, & Lockett, 2004b).

More recently, authors are analysing AE in different areas. By 2010, several literature reviews had been carried out, and scholars focused on understanding the processes that AE entailed, its resource management, and its economic and societal impact (e.g. Grimaldi et al., 2011; Patzelt & Shepher, 2009; Rasmussen et al., 2011; Rothaermel et al., 2007; Wright et al., 2012). Moreover, there is an interest in AE business models and commercialisation processes (e.g. Lehoux, Daudelin, Williams-Jones, Denis, & Longo, 2014; Ziaee Bigdeli, Li, & Shi, 2016). Likewise, and recognizing that there is a theoretical paradigm on which to build, authors are engaging with the analysis of AE development based on Identity Theory or Network theory (e.g. Bjørnåli, 2010; Fisher, Kotha, & Lahiri, 2016; Hayter, 2016; Huynh, 2019; Meek & Wood, 2016a; Rasmussen, Mosey, & Wright, 2015). Finally, new comprehensive literature reviews identify current trends and future research opportunities. Amongst others, recent literature reviews call for: the application of a broader set of theories reflecting the challenges faced by AE and their stakeholders (Balven, Fenters, Siegel, & Waldman, 2018; Mathisen & Rasmussen, 2019); cases from countries outside of the US and UK (Hayter et al., 2018), given the traditional focus on these geographies; and an in-depth analysis of the process for the growth and development of

USOs, "especially linking it to the development of technology and/or commercial alliances that facilitate such expansion"(Miranda, Chamorro, & Rubio, 2018:1021).

Close reading also reveals that there was a shift in the philosophy of research that has dominated AE through time. By carefully reviewing the most cited articles in top management journals, I identified that in around 70% of the articles, scholars approached their research question from a positivist perspective. Moreover, around 60% of my sample used quantitative methods in their studies, which is a common practice for positivist research (Daniel, 2010; Keele, 2011). However, I identified a recent proliferation of articles using a more constructivist approach, for example Fisher et al. (2016) used a constructivist approach to understand the legitimacy and identity thresholds that academic ventures encounter through their organizational life cycle. Likewise, and based on Djokovic & Souitaris (2008), I identified that from 2000 to 2005 there was an increase of approximately 80% in the use of qualitative methods, which "parallels the naturalistic paradigm"(Keele, 2011:52).

Finally, it is noteworthy that the field (as many others) suffers from demographic homogeneity. When analysing the top cited articles, I identified a tendency that most interviews and surveys were conducted with male CEOs or Founders of the ventures, however this could be explained by the historic dominance of male scholars commercialising and patenting their research (Ding, Murray, & Stuart, 2006; Thursby & Thursby, 2005). A similar trend also applies to the homogeneity of scholars engaging the field. In line with Mathisen & Rasmussen (2019) and Miranda et al. (2018)'s rankings, my literature review identified that the most cited and published authors in the AE field were male and based in the US or UK. While the lack of gender diversity may influence which founders scholars focus on and how they interpret their actions, the lack of regional diversity implies the risk that we assume the US and UK context as "the norm" and underappreciate

variances that can be very insightful for the future development of AE (and AE research.) While both findings are not surprising as such – male scholars still dominate publications in management journals and both the US and UK are recognized for their investment in R&D, interest in entrepreneurship and entrepreneurial mindsets[11] – they do have an effect on the choice of research objects and interpretations. Significantly less attention in research is given to female founders and other geographic areas, although they may provide interesting new perspectives on the topic.

Until this point, I have described the process that AE as a field of study has experienced since its early years back in 1970. As a result of this analysis, I have also identified important trends in how research has been done in regard to the subject, analytical frame, and the research team. This robust literature review has increased both my knowledge and perspective of the field, which I summarize below:

- I defined AE as "Ventures exploiting codified or tacit knowledge that has the potential to be commercialized, which was generated (a) through research carried out in a university, and (b) by a faculty member of a university"

- Around 60% of the articles published are in specialized or niche journals, which give evidence for a low representation of the topic in top management journals.

- Approximately 70% of the most cited articles in management journals used a positivist approach to analyse AE; however, there has been an increase of scholar using a constructivist approach in recent years

[11] In the Global Innovation Index developed by University Cornell, INSEAD, & Organization World Intellectual Property (2018), UK and US are ranked 4th and 6th respectively.

- It is possible to observe homogeneity in AE field of study. First, around 80% of the citations in the AE field of study come from cases with subjects from US and UK; second, relevant empirical material is based on CEO/Founders, no other team members, and third, most research is produced by male scholars based in the US or UK

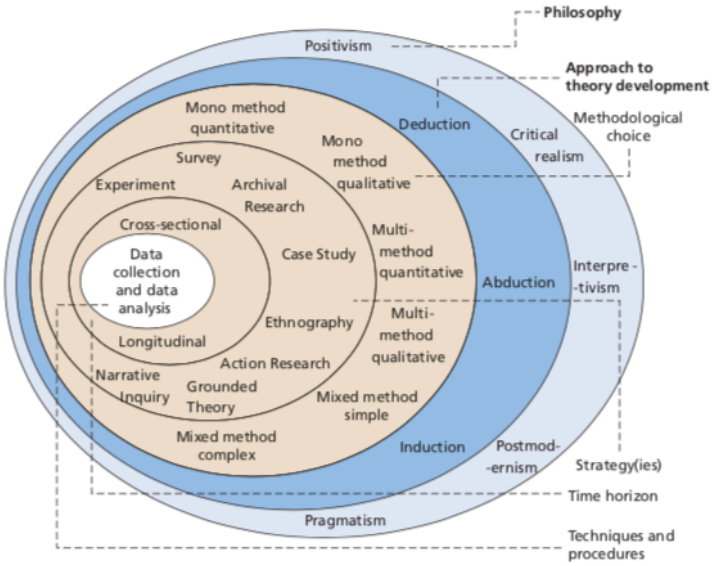
The conclusions reveal some noteworthy voids in the AE literature. First, due to the complexity and impact of AE, more articles focused on managerial challenges should be published, and hopefully, in top business management journals; second, due to AE's preponderance of positivist approaches, scholars could enlarge the understanding of the phenomena by using different philosophies of research; and, finally, by recognizing that "diversity has the potential to drive scientific discovery and innovation" (Nielsen et al., 2018:1) AE would benefit from incorporating diversity both in the research subjects and scholars studying it. To address these voids, which are largely unexplored in the literature, I posit that an in-depth case study of a company based outside of the US and UK is the best way forward because it allows me to identify elements which require further analysis and explore in which form such analysis could be pursued in the future. In the following section I will describe my methodological approach and introduce my qualitative case for analysis.

II. Methodology

Research philosophy

In order to study AE and fill the voids in the literature, it is important to define a suitable research design. To develop a well-structured research, it is necessary to be aware of the philosophical commitments done through the research strategy. Saunders, Lewis, & Thornhill (2006) developed what they called the "research onion". This model allows the researchers to define the assumptions taken and "design a coherent research project, in which all elements of research fit together" (Lewis & Thornhill, 2019:131). As it is possible to observe in Figure 5, each layer of the model demands a decision in regard to ontological (i.e. nature of reality), epistemological (i.e. knowledge assumptions), and axiological (i.e. role of values and ethics) components of a project. By using this model, I will structure my research design and delimit my research. However, and since it is not the objective of this project, I will not engage in an in-depth discussion of the concepts and theories behind each model's layer but rather focus on the notions that are relevant for my thesis.

Figure 5. Saunder's research onion



Source: Lewis & Thornhill (2019:130)

My thesis assumes a critical realism approach. The first component in the onion model is to define the research philosophy or, as Lewis & Thornhill (2019:130) described it, the "system of beliefs and assumptions about the development of knowledge". I believe that reality is constructed by people and their interactions, thus reality varies based on the social actors involved. This way of thinking fits the subjectivism philosophy, and more specifically the social constructivism approach, which argues that reality is constructed intersubjectively (Lewis & Thornhill, 2019). Based on a review of methodology literature (e.g. Lewis & Thornhill, 2019; Piekkari & Welch, 2019; Thomas & Myers, 2015) and the results obtained by carrying out the HARP test (see Appendix 2), I identified that critical realism is the most suitable research philosophy for my project. Critical realism "focuses on explaining what we see and experience, in terms of the underlying structures of reality that shape the observable events"(Lewis & Thornhill, 2019:147), thus it is aligned with social constructivism and I consider it appropriate for understanding the processes that AE ventures experience during their development.

Aligned with critical realism, I will use an abductive approach for theory building. The second layer is concerned with the theory development approach; in my project I want to understand and reflect on the way things are done inside an AE venture, and construct relevant insights that could help managing this type of organization. To reach my objective, and considering my critical realistic approach, the more appropriate theory building approach is the abductive reasoning. This approach initiates by identifying a surprising observation that our existing theoretical frames cannot answer. This initial observation is later transformed into different premises that, through an historical analysis, will allow us to identify the "underlying mechanisms and structures that might have produced it [the initial observation]" (Lewis & Thornhill, 2019:155).

The subsequent components of the research onion are related to the research design. Saunders et al. (2006) described the research design as the "general plan" of the research. In this sense it must define the objective, sources for data collection and consider the constrains each decision brings. For my thesis I have decide to use case study analysis as research strategy, and due to the importance of this choice, the next section will describe in detail the case study strategy, time horizon, and the techniques and procedures I used for the data collection.

Case study analysis

The case study has been recognized as a relevant research strategy when addressing social sciences inquiries. Case theory is a method used to deal with the complexity of business and management challenges and to ease the decision-making process by simplifying research and theory (Gummesson, 2017). In case studies, the researchers construct the case based on their interpretations, and focus their analysis on the perspectives, conceptions, experiences, interactions, or sensemaking processes found in the empirical material (Mills, Durepos, & Wiebe, 2013). When analysing Yin's (2014) approach to case study, Piekkari & Welch (2019:348) commented that, as in quantitative analysis, a qualitative case study approach offers internal validity, external validity, and both construct validity and reliability. Moreover, Eisenhardt (1989:547), from a positivist perspective, maintained that case studies methodology is likely to generate novel theory; is an attempt to reconcile evidence across cases, types of data, and different investigators; and increases the likelihood of creative reframing into a new theoretical vision. Furthermore, Flyvbjerg, (2006:221-223) identified that case study research assists researchers to "develop from rule-based beginners to virtuoso experts"; and is very useful to produce context dependent knowledge, which is key in social science research. For these reasons, case study research

is an appropriate qualitative methodology for management scholars and is the strategy I will use for my work.

However, there is a constant discussion in regard to the expected outcomes of case study analysis. Piekkari & Welch's (2019) described how having a generalization approach to case study analysis can jeopardize the research and learning process. For example, traditional case study analysis uses inductive theory building, however, Thomas & Myers (2015:46) claimed that theory building should not be the goal, while authors like Eisenhardt (1989) do. Thomas & Myers (2015) believed that the objective of case studies is to propose exemplary knowledge based on abduction and accessible through knowledge gained via experience (i.e. phronesis). Finally, Thomas & Myers (2015:48) explained that social science matters are unpredictable, thus phronesis malleability and corrigibility is better suited in an attempt of "talking about an example viewed and heard in the context of another's example". My thesis, which is limited in time and scope, will only be able to begin fulfilling some of the ambitious goals these scholars assign to case study research; for a more complete review of the matter, see Piekkari & Welch (2019) and Thomas & Myers (2015). However, what I will be able to put into practice is the ambition to extend the potential of case studies beyond positivism, therefore in my thesis I will use Thomas & Myers's (2015) approach to case study analysis.

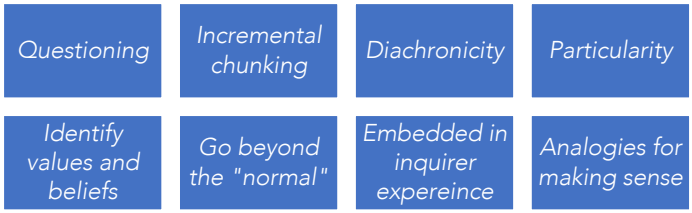
Case study research strategy allows to observe phenomena in a more holistic way. Thomas & Myers (2015:3) claimed that a case study is composed of a subject to be researched, for example a person, process, or institution; and an object of study, which the authors define as an analytical or theoretical frame. Furthermore, case study research "is interested in the uniqueness of the phenomenon and the phenomenon in its completeness". What this means is that no matter the subject of analysis (e.g. institution or period of time), what we want to identify are the reasons that motivated the occurrence of certain objects of analysis

and how they developed. As a result, we are able to understand the dynamics, tensions and motivations of a phenomena. In their book "The anatomy of the Case Study", Thomas & Myers (2015:3) defined case studies as:

> *"(…) analyses of persons, events, decisions, periods, projects, policies, institutions or other systems which are studied holistically by one or more methods. The case that is the subject of the inquiry will be an instance of a class of phenomena that provides an analytical frame – an object – within which the study is conducted and which the case illuminates and explicates."*

Thomas & Myers (2015) identified eight different elements when constructing a case study (Figure 6). First, questioning and surprise should always be the starting point, to later use phronesis to interpret the case; second, case analysis builds through incremental chunking and connects information to create a story; third, there is a narrative diachronicity, which means that inquirers must find a sequence of steps that allows us to identify changes and correlations; fourth, that the researches should think about the specific case as a particular instance of the possible, and avoid the use of artificial application of formal constructions; fifth, case studies should look into the beliefs, values and desires of people which are the important components of a case; sixth, the case should enable a recognition and understanding of what goes beyond the normal; seventh, the interpretation of a case will be embedded in both the inquirers and readers own experience; and finally, they stress the use of analogies to make sense of the unknown.

Figure 6. Elements of Case Study



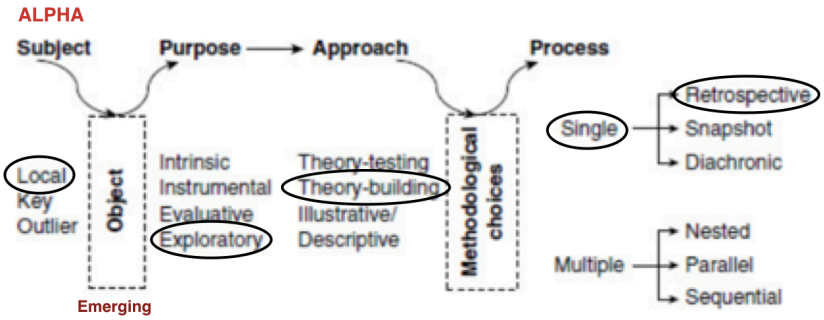
Source: Based on Thomas & Myers (2015)

Thomas & Myers (2015) developed a frame to guide researchers in the process of a case study analysis. To start a case study, there are two basic elements that need to be considered: the *subject* and the *object*. As said before, the subject is the practical and historical unit, and the object is the analytical or theoretical frame that we want to explore through the subject (Thomas & Myers, 2015). The subject might be chosen because it is a key example of the topic, it is an outlier, or because it has a local proximity. The *key* or *outlier* subjects are important for their ability to exemplify the object of the inquiry, however the local subject, implicates a "intimate knowledge and ample opportunity for informed, in-depth analysis; ample opportunity for identification and discussion" (Thomas & Myers, 2015:58). The *object* is the analytical frame that develops through the research and it can be defined both at the outset of the study or could emerge as the research evolves.

The next phase is to explain the reason for doing the study, the expected implications, and time horizon. Saunders et al. (2006) explained that depending on your research objectives, a study can be classified into three different categories. The study might be (i) exploratory, which aims to understand what is happening and through different questions analyse the phenomena from a different perspective; (ii) descriptive, which aims to describe accurately the people, events, and situations; or, (iii) explanatory, in which the researcher tries to identify causal relationships between different variable (e.g. depend and independent variables) (Saunders et al., 2006:133). Later, the researcher should identify if the case has theoretical implications or if it is just an illustrative case and describe the techniques and procedures that will be used to collect the primary data (e.g. interviews) or secondary data (e.g. news, company reports). Finally, Thomas & Myers (2015) suggested, the inquirer should evaluate if it would be a single or multiple case study and define its time horizon, which could be retrospective (analysis of past events), snapshot (analysis of a current event) or diachronic (analysis of different events through a period of time).

Case selection

Figure 7. Typology of Case Study



Source: Adapted from Thomas & Myers (2015:64)

To clearly articulate and design my case I will use Thomas & Myers (2015)'s proposed typology (See Figure 7). As the authors explained, defining a typology requires researchers to analyse and reflect on both subject and object, which urges them to consider the implications of using theoretical or illustrative approaches, and take decisions in regard to both the methodological choice and process definition (Thomas & Myers, 2015). I will start by defining my single subject of study, which is ALPHA, a German health teach start-up that follows my AE definition. This subject was chosen for local knowledge, due to the fact that I worked at ALPHA as an intern for 12 weeks and had the opportunity to relate to them in a more intimate way. At the beginning of the study, neither my purpose nor object where predefined, thus my approach to the case was exploratory and theory seeking.

In regard to the data collection techniques, by immersing myself in the organization during a 12-week internship I was able to collect different types of data. I gathered primary data by writing some personal field notes (Appendix 3), carrying out seven interviews, and a survey with different members of ALPHA (see Appendix 4). It is worth noting that, by asking

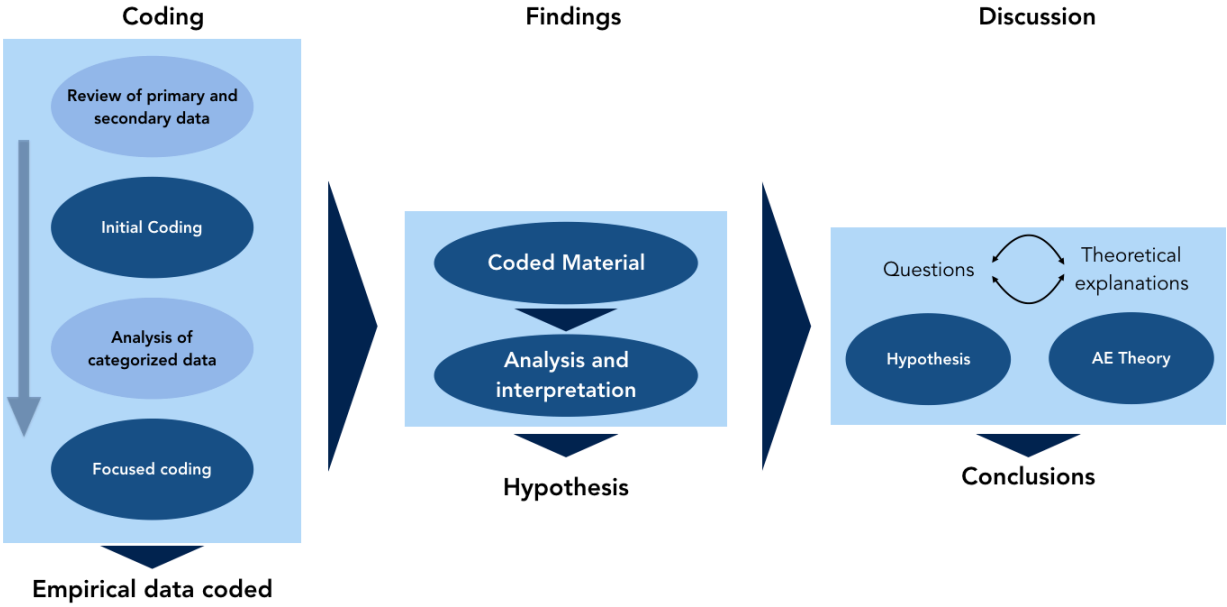
the interviewees to recall the experiences and events that got ALPHA to where it was at the time of the interview (see Appendix 6), I used a retrospective approach to study the case in its historical integrity. Inspired by grounded theory, the empirical material was analysed using line by line coding. In order to identify the underlying structures that could help me explain how ALPHA got to where it is today, I needed to make sense of the different interviews and documents gathered. To facilitate this sensemaking process, I decided to "code" the material which is common practice in grounded theory-inspired research. Charmaz (2006:65) explained that in order to code empirical material, the researcher must break the data up into its component parts, define actions, look for tacit assumptions, explain implicit action and meaning, compare the data, and identify the gaps.

By carrying out an initial coding, I was able to classify the empirical data in order for me to analyse, interpret, and discuss. Based on the interviews, presentations and company internal reports, I identified six initial codes: Stakeholders, Organizational culture, Brand, Organizational Development, Team composition, Identity, Technology development (Appendix 7). In a second phase, and after establishing some strong analytical directions through the initial coding, I initiated a synthesis process in order to explain larger segments of the collected data. As a result of this focused coding, I defined the following categories: Scholar motivations for AE; Team complementarity; Shareholder management; Internal identity and vision alignment.

After the focused coding, and through a three-step process, I made sense of some of the underlying structures in APLHA (Figure 8). First, I reviewed the coded material and selected those quotes or facts in particular that indicated tensions for further analysis. Second, I reflected on the data and the tensions, and developed some specific hypothesis that guided my literature and theoretical analysis. Finally, and based on the discussion between

my hypotheses and the literature I was able to, critically, make sense of my observations and indicate some needs for future research.

Figure 8. Analytical process



Source: Own elaboration inspired by Charmaz (2006); Eisenhardt (1989); Glaser & Strauss (1967); Saunders et al. (2006); and, Thomas & Myers (2015)

By utilizing the case study analysis method, I set the boundaries of my case and research design. The case typology sets the parameters and processes outcomes of my study. The next section will describe both the subject (i.e. ALPHA) and its context. It is important to understand, that when analysing the case, and in line with Thomas & Myers (2015:58)'s disagreement with Yin (2009), I don't assume that the context of the case is typical for AE. This means that "while these [dynamics] may in some way be of interest by virtue of the analytical object of the study they would not be of interest by virtue of the street's [subject] typicality, since the next typical street [subject] would, in terms of such dynamics, in all probability, be very different" (Thomas & Myers, 2015:58). Thus, I will describe the general context of the company not to frame it as a typical AE context, but to describe the setting were the study is being carried out and to help us frame ALPHA's unique case.

Case description: ALPHA – The German health tech company

ALPHA is based in Germany, a country known for its stable economy and innovation. Germany has a GDP of 1.7% (The Economist Intelligence Unit, 2019), with gross domestic spending on R&D being at 3.02%[12]. In regard to IP, Germany is in the top 5 of the countries with the most cited articles in the world (OECD, 2017). Moreover, German public investment in tertiary education is around 82%[13] of the total investment in education, which is similar to the investment of countries such as Sweden (84%)[14] and Belgium (83%)[15]. Finally, Kollmann, Stöckmann, Linstaedt, & Kensbock (2015) observed that Berlin has been developing into a major regional hot spot in the European Start-Up community, which is beneficial for attracting investors, potential employees, and other partners. This macro-economic context provides a high-level background for ALPHA.

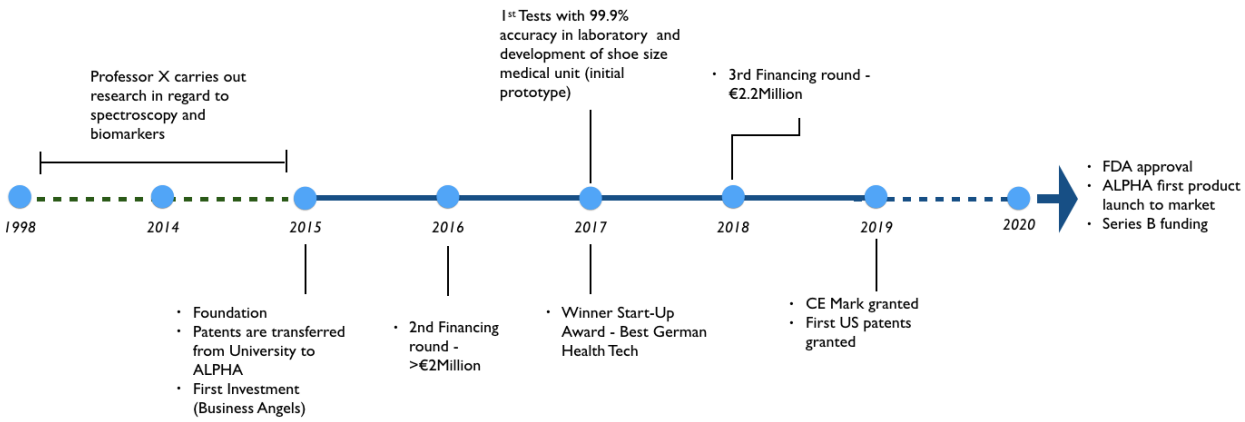
[12] Source: OECD, 2019. Retrieved from OECD data bank the 20th of April/2019. https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm. The number is expressed as % of its GDP

[13]Source: OECD, 2019. Retrieved from OECD data bank the 20th of April/2019 https://data.oecd.org/eduresource/spending-on-tertiary-education.htm#indicator-chart. The number is the country's expenditure on public education as a percentage of total country's expenditure on education.

[14] Source: (OECD, 2019); The number is the country's expenditure on public education as a percentage of total country's expenditure on education.

[15] Source: (OECD, 2019); The number is the country's expenditure on public education as a percentage of total country's expenditure on education.

Figure 9. ALPHA timeline



Source: Adapted from Alpha Internal Documents

ALPHA is a health-tech start-up founded in 2015 by a team composed of a university professor and a serial entrepreneur. ALPHA has developed a new medical device that can measure blood glucose non-invasively, without finger pricking, pain, or blood[16]. ALPHA began as a collaboration between Professor W, professor for biophysics and director of the biophysical institute at the department of physics at a German university, and Thomas, entrepreneur with more than 10 years of experience leading start-ups and several successful company buyouts. Since 2015, ALPHA has been able to raise more than €5.5Million, developed a proof of concept prototype, and plans to have its first product in the market by the end of 2019. Based on the components described in Figure 1, we can identify an AE typology for ALPHA (Table 1).

Table 1. Alpha typology

Component	Description[17]
Actors	- Professor W - Scholar at a German university - Thomas: Serial Entrepreneur

[16] Definition from internal document – European grant

[17] This description is based on the interviews held in December 2018

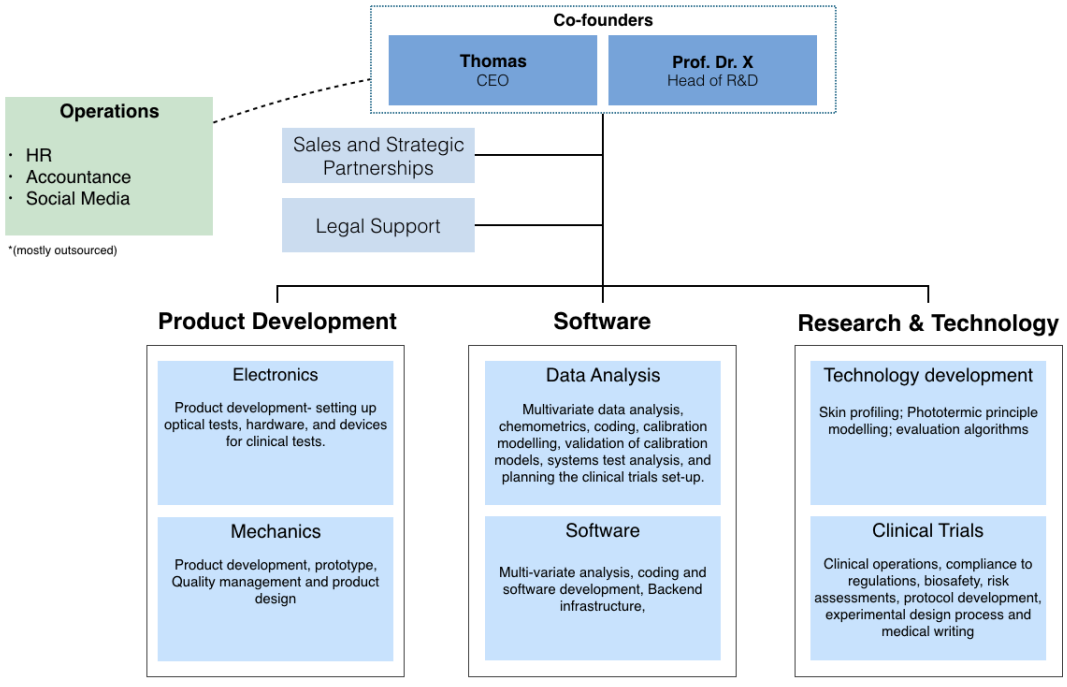
Component	Description[17]
	- No corporate partnerships
Business Model	- University Spin Off developing a product for the health tech sector
Knowledge	- Tacit Knowledge: Professor W more than 30 years of experience - Codified Knowledge: Patents granted for the technology and product development processes in Europe, US, and Asia.
Origin	- Technology developed through decades of research at the university.
Resources	- Team composition: Two German PhD students at university lab; two Latin American engineers for product development; one Polish engineer for software development; one German strategic partners manager; one Latin America business research intern (the author of this thesis); one North American social media manager (part time) - Financial: Initially funded by Business Angels. By the end of 2018, Alpha had raised a total of €5.5M from Corporate Investors, Venture Capitals and Business Angels.

ALPHA patented a photothermal detection technology, which is the basis for their disruptive product. By adapting its technology, ALPHA is currently developing a device that uses a Quantum Cascade Laser that emits light in the mid-infrared spectrum and can specifically identify different parameters in the skin, for example glucose. The device detects the variations in temperature induced by the glucose's absorption of the infrared light, to later determine the amount of these molecules in the skin. This platform technology has great potential in industry, pharmaceutics, and original equipment manufacturing, but for now ALPHA focuses on the health-tech industry. In the health industry ALPHA has defined a four-product pipeline: (1) non-invasive blood glucose monitoring; (2) blood analysis without reagents; (3) urine analysis without reagents; and, (4) drug monitoring in

blood without reagents. Due to its potential market and global impact, the non-invasive blood glucose monitoring was defined as the first priority.

By the time of the research, ALPHA had one office in Berlin and a research lab at a German University. The administrative, business development, and the product engineering were done at the headquarters located in Berlin. This office was occupied by the CEO, the software developer, the product engineer, and the business development intern. Besides them, the social media assistant and the Strategic Partnerships Manager came in on one or two days per week to work on their activities. The Product Development lab, situated inside the University, was occupied by Professor W and two researchers who were responsible for ALPHA's technology development. This lab was equipped with all appropriate facilities and devices needed for the scientific research. Activities such as accountancy and legal advisory were mostly outsourced. Figure 10 outlines an (unofficial) functional structure of the company.

Figure 10. ALPHA functional structure



Source: Own elaboration based on interviews and internal documents

III. Findings

Close reading of all the empirical material allowed me to come to the following findings in regard to ALPHA's case. Using Thomas & Myers (2015) elements for case study research (Figure 6), through ALPHA stories, this section defines the hypothesis that will guide the theory seeking process. First, and following the narrative coming from the interviews, I describe the begging of ALPHA and, through Professor W (i.e. Scholar) perspective understand some of the incentives and the motivations of engaging with AE. Second, and following the timeline that emerged form Professor W interview, I explain the challenges that ALPHA encountered to acquire legitimacy. Third, and related to how the founders compose the ALPHA story, I identify the different managerial strategies that Thomas uses to converse with actual and potential shareholders. Finally, I highlight how employees have developed their understanding of ALPHA and the challenges that emerged. The topics, or *stories*, were identified based on the coding of the empirical data and inspire my analysis of the case in the context of the AE literature in section IV of the thesis.

The ALPHA stories

The motivation story: The Professor W's career development and motivation to engage with ALPHA

The results from the coding exercise, permitted me to collect empirical material related specifically to Professor W's career accomplishments. Professor W is a former Director of the Biophysical Institute at the Department of Physics at the University, a position that requires not only tenure but also significant field recognition. A grant application developed internally by ALPHA highlights Professor W's track record, which includes "500

scientific publications" and different recognitions in the field. The document states "[Professor W] received several awards for his applied research together with industry partners, including the Hessian Cooperation Prize (…) and the Fresenius Inventors' Prize (…)"[18]. These achievements were the result of a long and committed academic career. As Professor W stated, "I have been a Scientist since the 70's (…) in the 80's I started moving all around the world (…)" and "In the early 90's I got my professorship and started my own research group" (Author's interview with Professor W., December, 2018[19]).

Professor W also explained to me his first experiences with spectroscopy, and how this later evolved into ALPHA's patented technology. As he recalled, "I have been moving between Chemistry and Physics (…)" and "I am addicted to Spectroscopy". This background led him to be "interested in medical application of proteins and understand, with Spectroscopy, complex systems like membranes (…)". As part of a research grant, Professor W partnered with a company to develop the analysis of proteins in liquids. "We started with the request of a company to study Beer. We learned to analyse complex solutions, like blood, saliva, or sweat". However, Professor W admitted that "(…) the first idea to use it for blood analysis came in the beginning 2000's (…)". He commented that "(…) patents in the university were not common. We were lucky and we got some patents about the analysis of beer, blood and other fluids (…)".

Professor W wanted to see his technology in the market while being involved in its development. He commented, "In ten years, I would like to see Diabetes' patients testing their sugar levels in a restaurant, it could be an ALPHA device or a ROCHE device with an ALPHA technology. Practically, I don't mind". However, he had a desire to be involved with the technology's development, Professor W commented, "I won't like the idea to give up

[18] Alpha's Grant application 2018

[19] For this and following quotes see. Author's interview with Professor W., 2018

the project. I want some control of the project even if we have to sell some fractions of the project to an investor".

His desire for commercialising the technology got him to explore potential business opportunities. Professor W told me that by 2012-2014 "I tried to get in contact with players in the Diabetes field. I contacted Roche and Bayern and I gave them a demonstration of how I was measuring blood glucose non-invasively and asked them for cooperation". Even though he contacted these companies, Professor W was also aware of the risks of commercialising his idea: "(…) my fear was that Industry comes, puts a lot of money, and buy's the technology, we get a lot of money and then they put it in a locker. They kill the technology and keep the old technologies". However, he thought that industry corporations would invest in developing a prototype based on his technology, but the answer was not as he expected. Professor W remembered their answer "No, too early; It is very interesting, but the risk is too high" which did not please him: "I was very pissed off because I know the money they have, so 500.000€ was really peanuts". However, he kept the confidence in his technology, as he framed it when talking about Apple's failure with non-invasive glucose measurement, "It's a David [ALPHA] and Goliath [Apple] story I felt extremely confident. David had a better technology and could use it against Goliath".

From his narrative I identified several motivations in regard to developing the technology. Based on the empirical material, it is possible to conclude that Professor W had a successful and prolific academic career. He was published in journals, received prizes for his work, and had an important level of authority in his field. However, when hearing the story about how he developed his technology it seems like he has a motivation that goes beyond money or recognition and resides in the passion or, as he phrases it, the "addiction" he had for his work. Moreover, Professor W's failed partnership stories and the "David vs Goliath" comment, suggests he perceives an almost "personal" competitive drive against big

corporations. Even though Professor W looks back at 40 years of successful academic career, he still shows a strong motivation to turn his technology into reality, which let me to develop my first hypothesis in regard to the incentives and motivations for engaging in AE.

Hypothesis 1: The scholars' personal motivations and their professional status incentivize the scholar engagement with AE

The legitimisation story: The launch of ALPHA's and the venture's legitimacy challenge

Even though there was a lack of interest from big corporations, Professor W kept working on his technology. As we can see from ALPHA's timeline (Figure 9) and Professor W's publication track record , between 2000 and 2012, he continued publishing relevant articles in the field of infrared measuring methods. However, as he stated, "This was far away from a company (…) This [the technology] is working and now I want to make a product of it, but I am a researcher and I don't know how to do that". It took until 2014, when Professor W met Thomas. He recalled "(…) by chance in October 2014, I got a call from Thomas, he was thinking about starting a new business (…) and in Nov 2014 he proposed me to develop a Start-Up".

Professor W had the experience and credibility in the *scientific world*, however he recognised this was not enough for building a venture. Professor W commented "(…) I was not confident that Business Angel's will give me the money, I was too much of a scientist (…) I am not a good CEO, I don't have the networks, I don't' have experience in raising money". He recognised the importance of the CEO: "The company needed two characters and one of them needs to know how Start-Ups works, and that is Thomas". Thomas made a comment along the same lines: "So I have (…) a compelling business case and on top of

that we have this structure of Scientist Professor (…), but he won't convince them about managing the company. And then it's me who has the experience with Start -ups and the combination of this could work" (Author's interview with Thomas, 2018)[20]. This belief can also be seen in their investors pitch deck, of which I present the relevant team slide in Figure 11.

Figure 11. Slide from pitch deck

Source: ALPHA Pitch deck 2018. Modified for anonymisation purposes

In the case of ALPHA, it is possible to observe how Professor W, made several attempts to commercialise his technology; however, he found himself struggling to obtain support from external stakeholders. When analysing the different materials, I found out that even with the status and scientific record of Professor W, this was not enough to attract investors and

[20] For this and following quotes see Author's interview with Thomas, 2018.

he constantly emphasised his lack of managerial skills. As a consequence, through the interviews and internal documents it is possible to see an important amount of work dedicated to highlighting the fit between Thomas' and Professor W's skills. This can be seen, for example, in ALPHA's pitch deck (See Figure 11), where the founders communicate their "Complementary team" in order to leverage both the scientific legitimacy of Professor W and the managerial legitimacy of Thomas. I synthesise this legitimacy scenario in my second hypothesis:

Hypothesis 2: In order to obtain support from different stakeholders, the venture needs to demonstrate managerial skills and scientific reputation; team members ought to bring complementary skills

The narrative story: Thomas approach to ALPHA narrative development

Even though ALPHA team believed in their idea and in team complementarity, there were still challenges when attracting relevant stakeholders. In the interview, Thomas shared with me his desire to get ALPHA noticed, "You talk to people, especially investors, and strategic partners, you talk to a lot of people, get the idea into the world (…) I need to tell my story". However, it was not an easy process, as Thomas said "It is hard to pitch to investors, because people don't know about us. We come from a university and this gets questioned by investors. University guys, can they really build the product?" When discussing in detail this credibility aspect, Thomas recalled: "this changed when we won an award [in 2017 ALPHA received a recognised Start-up Award in Germany]. People see us now as a real company, they now see us independent form the university (…) People are now coming to us. If you win a prize from a prestigious award there must be something in it".

Thomas also shared how he developed ALPHA's "story" and the impact both current and potential investors have on it. Thomas remarked that "the pitch deck has the product and the story" and explains me that "(…) The pitch deck has changed completely and a couple of times. (…) As you grow the discussion changes (…)". Thomas also shared with me how he worked on it, "usually in times when I start a new [investment] round, I am going to my office and I am thinking about what we have done since the last round; and how can we change the pitch deck to reflect that". Thomas also noted how he integrated the investors' perception when developing the pitch-deck "the investor is always evaluating risks: technical, organizational, marketing. What risks did we take off the table (…) and what will be the next risk that we have to address and what are the plans to do that". For example, Thomas shared with me "(…) now we are at the point that the product works, so we have to deal with questions of how to manufacture 200,000 pieces. This was not a discussion in the first round."

Based on the empirical material, I found that over the course of a company's life cycle, there are some important events and actors that shape the venture's narrative. From the award event, it seems that it is not only important to develop credibility in regard to the team, but also for the company as a whole to build legitimacy with external stakeholders, who, as a consequence, get to shape the development of the company, or at least the narrative of it. When reviewing the interview transcripts and audios, I identified how in order to make sense of his decisions and actions in regard to ALPHA's development, Thomas constantly refers to "the investors". Moreover, the fact that he shapes his narrative (i.e. pitch deck) trying to demonstrate to both potential and current investors ALPHA's achievements and predicting which risks they may see in ALPHA's future, shows the influence that these actors' expectations have on the development of the venture. Based on these findings, my third hypothesis is:

Hypothesis 3: Developing an AE venture goes beyond having a good product and team. New ventures need to manage the constantly evolving stakeholder expectations, which in turn influence the company's narrative and development

The identity story: Building ALPHA "personality"

During the interviews with different team members (for the list of interviewees see Appendix 4), we discussed their perception of ALPHA. One recurrent definition was that "ALPHA is a technology carrier company" or "ALPHA will be the Research Unit (…) then a partner comes in and ensembles". On the other hand, there were employees who stated that "ALPHA basically designs a product for the medical market" or "ALPHA is doing a concrete devise that solves concrete problems".

My interviews interpretation suggests that inside the company there are different understandings about what ALPHA does. As seen in the responses from the ALPHA employees, there are two different understandings to ALPHA's purpose. The first group of employees' definitions suggests they comprehend ALPHA as a company that focuses on technology development. The second group of employees seem to perceive that ALPHA's final goal is the development of a medical devise for non-invasive blood glucose monitoring.

I also got to know how the employees were introduced to ALPHA's technology and internal processes. During the interviews, some discussions were held in regard to the complexity of the technology, and this ended in a conversation about the training employees got when starting at ALPHA. The employees answered, "Is more like being proactive and asking questions and learning by yourselves"; "He (Thomas) gave me some information here and there, but it was mostly me trying to melt, trying to see what has to be done (…)"; "(…) In

the introduction, Thomas provided me with two or three scientific papers, other than that I did a lot of research in regard to the principles in the scientific papers. I looked up some news, books, online stuff and asked around. I did everything for myself"; "I didn't have any training at all".

This situation might explain the different employee's interpretations of what ALPHA does. In general, none of the employees received an in-depth training or onboarding, and they all agreed that most of the learning was done through independent research. However, it is possible to hypothesise that this lack of identity building in regard to what ALPHA does, might be a strategic choice by the CEO, who, being aware that the venture will change over time, avoids committing to a specific definition. Especially early stage ventures are often forced to "pivot" quite radically in the early stages, while they are trying to find product-market fit.

Besides the interviews, I carried out a survey to understand how employees perceived ALPHA's challenges ahead. During the internship I noticed some misalignment amongst ALPHA's team perspectives. As it is possible to read from my internship field notes (Appendix 3), I had a feeling that ALPHA's employees had different perceptions in regard to the milestones that were achieved and the stage of development of the company. To explore this intuition further, I found that Kazanjian (1988)'s survey for studying the organizational life cycle model in high-technology new ventures could be helpful. In general, the survey asks the interviewee to rate different strategic, product, market, and commercial challenges, to later identify the organization's life cycle stage. It is worth noting that it is not my interest to use these results to analyse ALPHA from a positivistic perspective, it would even be contradictory with my philosophy of research; for my thesis, I used this data to compare how different actors were making sense of the "same"

organization (i.e. ALPHA), a practice that is aligned with my research approach. In Table 2 it is possible to observe the survey's results .

Table 2. Survey result

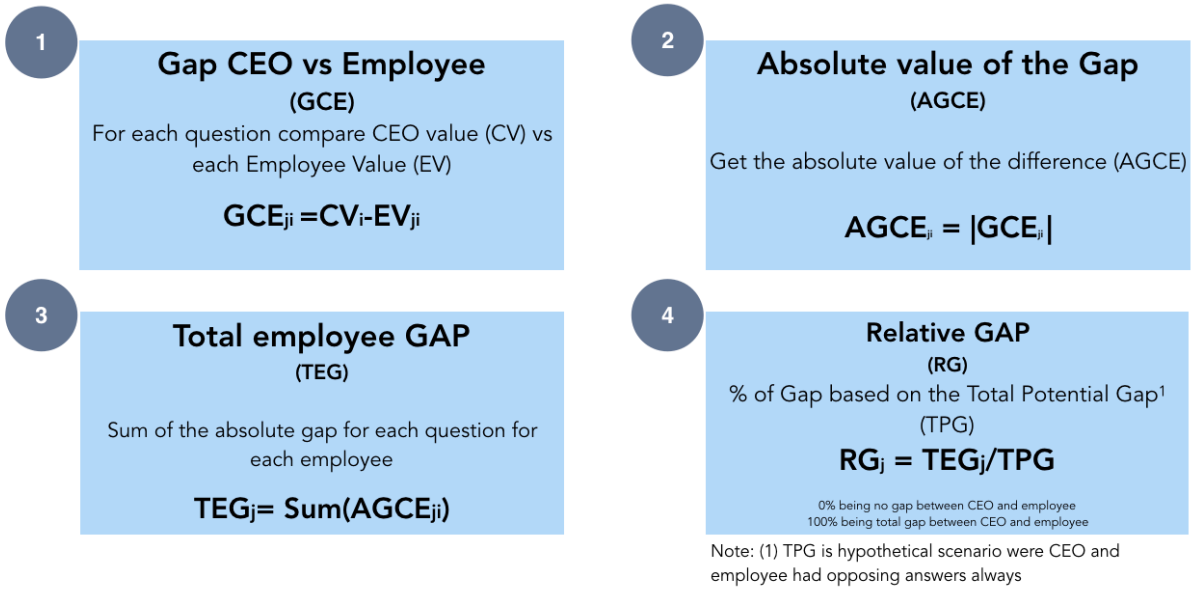
Questions/Interviewee	A	B	C	D	E	F
Developing a new product or technology application	4	6	5	6	7	7
Product support or customer service	1	4	1	1	1	1
Developing a network of reliable vendors and suppliers	4	6	3	4	4	1
Cost control	1	4	2	2	5	3
Produce in volumes adequate to meet demand	4	6	3	5	3	1
Meet sales targets	1	2	4	1	1	1
Attaining profitability or market share goals	1	2	3	2	1	1
Penetrating new geographic territories	1	3	2	2	1	1
Administrative burden and red tape	1	2	5	7	4	1
Securing financial resources and backing	4	2	2	4	6	5
Acquiring key outside advisors or board members	4	2	5	1	3	4
Attracting capable personnel	4	3	4	5	7	5
Adequate facilities and/or space	1	3	2	1	2	2
Management depth and talent	1	2	4	4	4	2
Definition of organizational roles, responsibilities and policies	4	4	6	1	2	2
Management information systems	1	5	6	1	2	2

Source: ALPHA's results based on Robert K. Kazanjian & Drazin (1989) survey

By comparing the results of the interviews, I designed an indicator that could help me make sense of the possible identity misalignment. As I briefly described before, the survey results allowed me to observe the importance ALPHA's team gave to different problems, however, this by itself did not said much about a probable identity misalignment. While analysing the data it occurred to me that I could compare the different results between the founders and the employees and interpret them as "challenge perception gaps". To calculate this gap, I carried out a four-step process that I present in Figure 12. First, and for each question, I calculated the spread between level of importance that each employee gave to the different challenges and the CEO's perception for the same challenge. Since I wanted to know the total perception gap between the employee and the CEO, I summed the absolute

value[21] of each employee's perception gap and to facilitate its interpretation I constructed a relative perception index in which 0% meant CEO and employees were totally aligned and 100% completely misaligned. This relative perception index is a proportion between an employee's actual perception gap and the total potential gap, which emulates a scenario where the CEO and the employee had total opposite answers in all the questions[22].

Figure 12. Survey result analysis



Source: Own elaboration

The analysis of the survey results suggests that there is an identity misalignment amongst ALPHA's employees. In Table 3 it is possible to observe the results of the different "challenge perception gap" for each of ALPHA's employees. On average, ALPHA had a relative perception gap of 26%. It is worth noting that interviewee "c", who has the lowest

[21] Since the spread could be positive or negative (e.g. CEO=7, Employee=2, GCE=5 or CEO=2, Employee=7, GCE=-5), different questions could balance each other value, thus by using the absolute value I could avoid this issue without affecting the result interpretation.

[22] This would be the result of (max. value-min. value) * # questions; i.e. (7-1) * 16=96

challenge perception gap, is Professor W. This could be explained by the fact that he is involved in strategic decisions and has a high-level overview of ALPHA's needs and goals.

Table 3. Gap – Challenge perception ALPHA

Employee	x	y	z	a	c
Gap vs CEO	25%	34%	31%	21%	17%

IV. Discussion and implications

This section aims to discuss further the findings based on relevant literature on the topic. With the objective to identify the theory that could help explain further the findings that emerged from my case analysis, in the next sub-section I discuss how the literature has dealt with the situations found in ALPHA's case. Later, I explain the managerial implications that might be relevant for scholars, investors, and academic entrepreneurs when engaging into AE.

Discussion

Hypothesis 1: The scholars' personal motivations and their professional status incentivize the scholars' engagement with AE

The literature recognises that scholars' involvement in new venture development is important, thus understanding their motivation to engage with it becomes critical. Due to the knowledge and experience scholars possess in regard to their inventions, their involvement is central to spinoff company development (Balven et al., 2018; O'Shea, Chugh, & Allen, 2008; Shane, 2004a). Moreover, due to the scholar's status and tenure at the university, academic entrepreneurs can get access to university's facilities and develop their technologies further (Shane, 2004a). This, as we saw from ALPHA's case, is especially important in complex technologies, when expertise becomes crucial. As one ALPHA employee shared with me "(…) with him [Professor W] we have a lot of questions in regard to the science behind [it]. None of us sitting here in this office can answer those scientific questions, but he has been working with this since what 1998? He has years of experience. We have some ideas, but we have to discuss with him how to proceed (…)" (Author's interview with Employee Product Development). Moreover, the fact that ALPHA uses the

university's facilities as a lab suggests that they have been able to leverage the Professor's reputation at the university. Due to the scholars' knowledge, experience, and status, their involvement in the venture is key, thus knowing how to manage their motivations becomes relevant when starting a venture coming from university research or wanting him/her to support the process.

One of the influence factors that the AE literature suggests for explaining scholars' engagement in a new venture is their career cycle. Shane (2004a:152) stated that during the first years of academic careers, the scholar's focus is in developing their knowledge and human capital, as a consequence, as O'Shea et al. (2008) and Shane (2004a) suggested, it is more likely that scholars will start considering AE when they have achieved their academic career goals and/or reach a more stable employment situation. The evidence suggests that Professor W has accomplished several career milestones and has developed both his knowledge and human capital. This has given him scientific credibility for developing his technology, which, in line with Shane (2004a), is an incentive to engage with AE. Moreover, Shane (2004a) argued that one of the career-oriented explanations for scholars engaging with AE is to capitalize financially on the knowledge they have developed. However, the author states that this capitalization is relevant for "star scientist" who are usually the leaders and more recognised scientist in their field (Zucker, Darby, & Brewer, 1998). Based on Professor W's career achievements I could argue he is a star scientist and, in line with the literature, has the intention to capitalize on his research, thus being motivated by money.

However, there are clearly several psychological incentives for a scholar to engage with AE. My findings are in line with Shane (2004a), who explained that along with the economic benefits of commercializing their research, scholars also aspire to bring their technology into practice. Moreover, Professor W's ambition to be in control of the project, supports

Shane (2004a) who argued that scholars are interested in creating new ventures because it gives them the opportunity to control the development and commercialization process of their innovation. However, this motivation for having control of the technology developments could later interfere with relevant decision-making inside the company. Wasserman's (2017) "The Throne vs The Kingdom" article suggested that founders face a "control dilemma" in which they have to decide how much control they want to have over their company. Wasserman's (2017:272) study of US-based start-ups shows that "companies where the founder is still in control of the board of directors and/or the CEO position are significantly less valuable than those in which the founder has given up control". Due to the close relation between universities and AE venture, the current literature has mainly focused in governance of knowledge transfer processes at the university (see Bradley (2013); Lee & Gaertner (1994); Roberts & Malone, (1996); Wright et al. (2012)) , however, it is not at all clear how this "control dilemma" affects AE ventures, which, as I found, rely heavily on the scholar's tacit knowledge, experience, and reputation when developing their product. More research will be needed to better understand the governance challenges such as "The Throne vs The Kingdom" in AE ventures specifically.

Hypothesis 2: In order to obtain support from different stakeholders, the venture needs to demonstrate managerial skills and scientific reputation; team members ought to bring complementary skills

Research has found that the team composition has an effect on ventures' development and success. In their studies of AE in Europe, Wright et al. (2007) explain how companies with both research and commercial experience grow faster than companies with teams with experience mainly in research. Moreover, Wright et al. (2007) argue that external actors might be suspicious of the venture's link with academia, and as a consequence founders are constantly trying to demonstrate more industrial and commercial expertise. Likewise,

Wright et al. (2004b:60) suggest that investors "emphasize the quality of the management team more than any other single factor as they make investment decisions". These arguments highlight the need to demonstrate both scientific skills and managerial capabilities to gain credibility from external actors; an issue that an AE venture is constantly dealing with.

The AE literature has used organizational life cycle theory to explain this legitimisation challenge in AE ventures. There have been many approaches when analysing the different processes and models for AE development (see for example Gübeli & Doloreux (2005); Lee & Gaertner (1994); Ndonzuau et al. (2002); Roberts (1991); Sharon & Jeffrey (2014); Wood (2011)), however, I will use the model by Vohora, Wright, & Lockett (2004) due to its recognition in the field[23]. The authors identified five different phases of development: (1) research; (2) opportunity framing; (3) pre-organisation; (4) reorientation; and sustainable returns. Since I will not get into the details of each phase, I refer to Wright et al. (2007) for more detail. In their model, Wright et al. (2007:118) identified that in order to make the transitions between the different phases, organizations must overcome "conflicts between their existing level and type of resources, capabilities and social capital, and those required to perform in the subsequent phase of development". Wright et al. (2007) argues that entrepreneurs usually encountered problems in demonstrating their commercialisation capabilities, and thus failed in gathering financial resources. Wright et al. (2007) called this scenario the "Credibility Critical Juncture", and I believe it is present in ALPHA, due to the fact that Professor W and Thomas have to constantly demonstrate their commercialisation capabilities to gather future resources.

[23] Most cited article in regard to AE Organizational Life Cycle

Likewise, some literature shows that scholars are aware of their managerial limitations and recognise the value of an experienced CEO. Gurdon & Samsom (2010:212) highlighted that the "majority of the scientists who succeeded believed that the quality of the science in tandem with the business capabilities of the management team explained the success of their ventures". This is supported by Professor W's awareness of his lack of managerial skills and how both Thomas and Professor W constantly highlight the importance of bringing Thomas' managerial experience into the team. It is worth noting that Professor W's acceptance of having Thomas as CEO, contradicts Clarysse & Moray's (2004:77) studies which suggest that "(…) academic spin-offs, tend to be founded mostly by homogenous teams including only engineers. Often, one of these engineers is acting as a champion and perceives himself as a future CEO of the company". Unfortunately, through my literature review I did not find any relevant study that could help me explain further this theoretical contradiction, signalling that the AE literature has not dealt sufficiently with team composition and complementarity on teams. For example, and based on the case, it would be worthwhile exploring the impact of researchers' age on his or her willingness to share control with an entrepreneur, the duration for which the technology has been around, the prior failed attempts by a researcher to commercialize a technology, as well as finally the impact of different cultural and geographic differences (as most AE research has focused exclusively on the US and UK).

Hypothesis 3: Developing an AE venture goes beyond having a good product and team. New ventures need to manage the constantly evolving stakeholder expectations, which in turn influence the company's narrative and development

In the AE development process, authors have identified the importance of managing financial stakeholders. I found Fisher et al. (2016) model helpful when discussing shareholder management. The authors developed a model that attempts to explain how

an organization's identity and legitimacy changes through time. By studying different ventures coming from universities and their development over time, Fisher et al. (2016) argued that in each of the growth stages, the organization interacts with different audiences (specifically the providers of financial resources). These audiences have specific values, norms, control mechanisms, and foci of attention (For more detail see Appendix 8) and as a consequence, new ventures needed to transform their identity and legitimisation strategy accordingly. For their analysis the authors identified three different life cycle stages: (1) Conception, in which the technology is developed, and there is essentially no organizational structure; (2) Commercialization, in which the technology is turned into a product, the organizations exists as a product development team, and a market is still to be found; and, (3) Growth stage, in which the product is ready and there is a market success. ALPHA has already developed a prototype for which is about to obtain its CE mark and has an organizational structure that goes beyond a single team, characteristics that are in line with Fisher et al. (2016) description of a company in a commercialisation stage.

By acknowledging that ALPHA is in this phase of development, I used Fisher's et al. (2016) model to identify possible explanations to what shareholders expected from ALPHA. The authors explain that, as organizations evolve into this commercialisation stage, technical problems have been identified and solved; as a consequence, the risk associated with the product decreases. In line with the authors, my findings show how Thomas emphasises in how the shareholder bring different risks to the table, and how he has to deal with them.

A commercialisation stage obliges the company to focus on lowering the risks that are related to the competitors, consumers and the market uncertainties. Organizations in a commercialisation phase usually deal with Venture Capital and angel investors as their primary audiences. In their model, Fisher et al. (2016) explain how, in a commercialization stage, audience's attention is focused on the market position, the achievement of growth

milestones; potential for a successful liquidity; and management team reputation. My findings in regard of how Thomas developed ALPHA's narrative based on shareholder expectations complements Fisher et al. (2016)'s results. However, the literature does not explain further the legitimacy cycle of stakeholders beyond financial audiences—an important topic that requires further attention, as I will detail below.

Hypothesis 4: The fact that the company's narrative changes through time and over the lifecycle of the company to gather external support, impacts the identity and vision alignment inside the organization

A possible explanation resides in what the literature calls institutional pluralism. Based on their study, Fisher et al. (2016) explain that in the transition of adjusting the venture's narrative to meet audiences' expectations, organizations are subject to institutional pluralism. Fisher et al. (2016:395) define this concept as "the persistent influence of vestigial institutional conventions from the previous life cycle stage on the identity of a venture and the gradual adoption of institutional conventions salient to the new stage". Fisher et al. (2016) explain that one of the consequences of institutional pluralism is that individuals within a venture may have problems understanding identity concepts, such as the mission and objectives of the company. Fisher et al. (2016)'s theory helps me to explain the results from both my relative perception gap index and the different definitions gathered in the interviews. Surprisingly, besides Fisher et al. (2016:403)'s suggestion of "examining the contingencies governing the choice of strategies for dealing with institutional pluralism", in my literature review I did not find any studies that dealt with institutional pluralism in AE ventures, which again led me to believe that this issue of identity misalignment is under-appreciated and requires significantly more attention that it suddenly receives. The qualitative case study of Alpha gives evidence for the importance of the issue and signals a large and unexplored research area for the future of AE research.

Implications

As I have shown through this project, AE ventures have specific challenges to be considered. Based on discussions engaged through this paper I developed some important insights that should be considered in regard to the role of different team members in an AE venture, AE legitimisation process, and the organization's internal identity. Each AE case is unique; however, I believe that my findings based on ALPHA's case do inform scholars, managers, and investors about some of the challenges and opportunities that this field encounters and invites them to consider them in their own context and experiences

Both my empirical findings and the AE literature suggest that attention should be drawn to the motivations and roles of different team members in an AE venture. When reviewing the literature, it was possible to conclude that specific characteristics of the scholars such as tenure, recognition, and status give scholars access to relevant resources. However, as I discussed earlier, control motivations can have financial impacts in the company's development and thus have to be discussed both in early stages of the venture's development and when including new partners or investors. Moreover, through ALPHA's case, I have shown that team complementarity is an important way of acquiring the managerial skills that scholars are believed to lack. In regard to complementary teams, I have found contradictions amongst the analysed AE literature and my empirical findings, however, it is important that when engaging in an AE venture, scholars realise that the skills needed to manage a company go beyond the technical expertise they have, and that bringing managerial experience to the company will both legitimise the company and complement their current skills.

In regard to sensemaking and legitimation strategies, AE ventures need to manage both external and internal stakeholders. ALPHA's narrative development is an example of the changes that AE ventures encounter when legitimising their venture. In the process of attracting different shareholders, managers need to consider the audiences concerns, thus it is important that CEO's frame their actions and narratives in a way that meet audiences' expectations and concerns. Finally, I have discussed how ALPHA's transformation through time and its current internal sensemaking practices, could have an effect on the employee's identity building. In consequence, it is important for an AE venture to design an appropriate sensemaking strategy that promotes an identity cohesion, while allowing the company to change their narrative accordingly through time.

V. Contributions to literature, limitations, and future research

In this section I summarise the contributions made to the literature, highlight some limitations on my research, and give some guides in regard to future research. First, I argue how my thesis has approached the voids identified in my literature research. Second, I highlight some of the limitations that should be considered when making sense of my results. Third, and based on my study's results, I suggest some aspects that could be approached in future research.

Contributions to literature

Through my research I have been able to contribute to the literature in four different aspects. First, I have created empirical knowledge in regard to the role of different team members in an AE venture and organizational legitimacy and identity, which I believe is relevant for management research. Second, I approached my research based on a critical realism methodology, which contrasts with the common positivist approach, and complements the social constructivist work that is slowly emerging in the AE field of research. Third, with my empirical material on ALPHA, I have complemented Fisher et al. (2016)'s study on identity and legitimisation in new AE ventures and identified the need for further studies on internal identity alignment . Forth, and in regard to homogeneity in research, by describing in detail a German case, I am offering new insights and perspectives complementing the body of cases coming from US and UK; furthermore, being the supervisor of this thesis a woman scholar, I believe my perspective on the study has been complemented and enriched.

Limitations of the research

Due to the decisions made in my research strategy, there are some limitations that must be considered when making sense of my work. First, it is important to highlight that due to the scope of this educational project, the amount of empirical material and findings are limited, and a single case study should have a longer immersion period with the subject of study (Charmaz, 2006; Saunders et al., 2006; Thomas & Myers, 2015). Second, and even though single case study research has the benefit of an in-depth understanding of a subject, each case is unique and subjective (Thomas & Myers, 2015), thus when using the findings of this research, audience should study its viability and adaptability for their own context. Third, due to the conscious or unconscious interests, experiences, and personal motivations of this research participants, the readers should be critical when interpreting the presented findings and results. Finally, as mentioned before, I briefly mention the public policy, regulations, and ethical considerations on AE, however I believe this is key in the discussion and should be approached in the proper context.

Future research

Based on the findings and discussions, I have identified four areas for future research in the AE field of studies. First, it is worth studying how to deal with the control dilemma in AE ventures where the academic founders have a great importance due to their unique knowledge on the product/technology. Second, more research should be done to deal with internal leadership in complementary teams and understand different governance mechanism that could help AE ventures develop further; to do this I could study how different founding teams in AE ventures differentiate their functions and share responsibilities and, for example, compare their financial outcomes or investment development. Third, there is the need to research further how to manage the expectations

and legitimacy beyond the financial stakeholders. As I found in my study, ALPHA's employees and CEO's have different perceptions in regard to organizations priorities, thus it would be interesting to analyse if this is a common situation in AE and how can this be solved. To analyse this misalignment, focus groups in which I discuss further the company's vision could be made and new practices could be implemented for new employees to later study if there is a difference in the challenge perception index. Finally, by understanding that organizations are composed by different actors and they not necessarily change as a "block", it is worth studying both how to evaluate the impact of institutional pluralism and how to manage the problems that emerge during the transformation of a venture's narrative. To approach this challenge, we could make a multi-case research to identify practices that emerged in different AE ventures, and discuss their applicability in different contexts. It is worth noting, that if I were to explore the topic further, both a female co-author may help me expand my perspective on the studied phenomenon and more gender diverse examples would be pursued.

VI. Conclusion

Higher education has several challenges ahead, and AE give's universities the opportunity to further contribute to society. The AE field of knowledge is being constructed, in consequence, there are many challenges that are still to be solved. In this thesis I have expanded the discussion in regard to the importance of acknowledging the role and motivations of different team members in an AE venture, identified theoretical conflicts in the legitimisation challenges of an AE organization, and through my empirical findings, contributed to the discussion in the identity troubles AE companies seem to encounter. Furthermore, I set several questions that guides further research in the AE field of knowledge. As I discussed earlier in this document, scholars need to go beyond what was expected before. AE enables scholars to contribute further to society by transforming knowledge into ventures, and impact society in different ways. So, even though there are still several legal and ethical aspects that should be discussed further, AE becomes an alternative for those scholars that, like me, understand that academia's contributions go beyond theory.

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VIII. Appendices

Appendix 1. Categorization of literature review

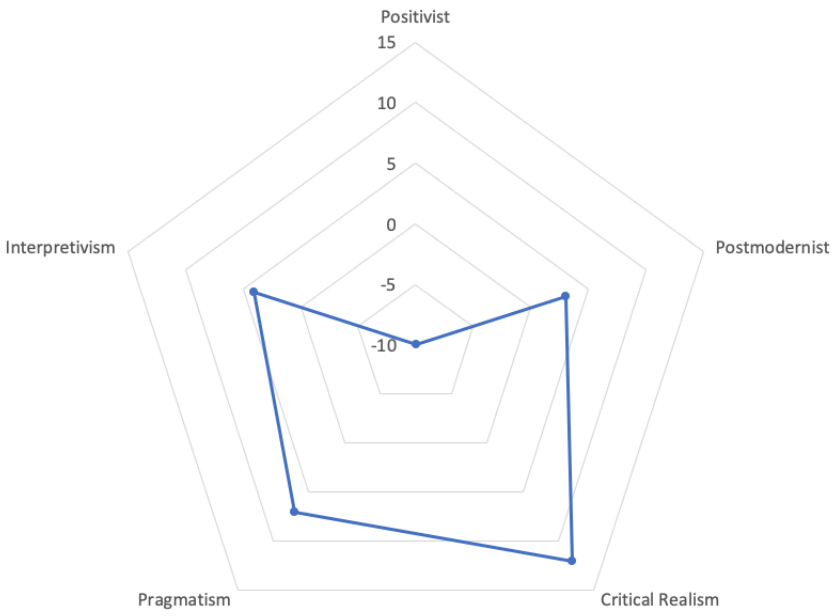
Category	Relevant research questions[24]	Selected authors
Characterization of AE ecosystem: Description of the entrepreneur, the organization related to AE, roles of the actors	- Which are the relevant actors in AE and their roles? - What are the characteristics of the scholar involved in AE? - What are the relevant resources that compose AE? - Which are the links between the USO and the academic community? - Which are the differences and similarities of the strategies that research organizations develop to foster AE?	(Allen, Link, & Rosenbaum, 2007; Cooper, 1971; Doutriaux, 1987; Gianiodis & Markman, 2016; Powers & Mcdougall, 2005; Wallmark & McQueen, 1982) Clarysse, Wright, Lockett, Van de Velde, & Vohora, 2005; Clayton, Feldman, & Lowe, 2018; Ferretti, Ferri, Fiorentino, Parmentola, & Sapio, 2019; Heinzl, Kor, Metropolitan, Orange, & Metropolitan, 2003; A. I. Journal, Schaeffer, & Matt, 2016; S. E. Journal, 2017; Lubik, Garnsey, Minshall, & Platts, 2013; Markman, Phan, Balkin, & Gianiodis, 2005; Meoli, Paleari, & Vismara, 2019; Meoli & Vismara, 2016; Munari & Toschi, 2011; Patzelt & Shepher, 2009; Wood, 2009)
Development of AE: Growth process, Organizational Life Cycle, Development stages, Technology Transfer models	- - How is technology transferred form research into markets? - What are the major changes raised by the creation of AE?	(Ambos, Birkinshaw, Ambos, & Birkinshaw, 2010; Berbegal-mirabent, Ribeiro-soriano, Luis, & García, 2015; Bjørnåli, 2010; Clarysse & Moray, 2004; Clarysse, Wright, & Velde, 2011; Gübeli & Doloreux, 2005; Hindle & Yencken, 2004; Keklik et al., 2014; Lee & Gaertner, 1994; Meoli & Vismara, 2016; Ndonzuau et al., 2002; Pattnaik & Pandey, 2014; Pilegaard, Moroz, & Neergaard, 2019; Rasmussen, 2006, 2011; Rasmussen et al., 2011; Roberts, 1991; Roberts & Malone, 1996; Sharon & Jeffrey, 2014; Smilor et al., 1990; van Geenhuizen & Soetanto, 2009; Vohora et al., 2004; Wood, 2011; Wright et al., 2012; Wright, Vohora, & Lockett, 2004a)
Definition of AE: Approaches to defining AE and Typologies of AE	- What are the boundaries and typologies in AE? in USO?	(Carayannis et al., 1998; Druilhe & Garnsey, 2011; Pirnay et al., 2003)

[24] Relevant based on more cited articles and recent publishing date

Category	Relevant research questions[24]	Selected authors
Literature Reviews	- How has the field of study evolved? - Which are the main topics, journals, and authors? - Which are the level of analysis discussed through the literature?	(Rothaermel, Agung, & Jiang, 2007), (Thérin, 2007),(Djokovic & Souitaris, 2008), (Bradley, 2013), (O'Shea, Fitzgerald, Chugh, & Allen, 2014), (Schmitz, Urbano, Dandolini, de Souza, & Guerrero, 2017), (Miranda et al., 2018), (Hayter et al., 2018), (Mathisen & Rasmussen, 2019))
Network theory and AE: Network of the entrepreneurs, social ties, Board composition	- What is the role of the entrepreneur's social capital? - Which are the mechanisms generating the different university spinout structures?	(Hayter, 2013, 2016; Heblich & Slavtchev, 2014; Huynh, 2019; Nicolaou & Birley, 2003; Nicolaou, Birley, Nicolaou, & Birley, 2003; Rasmussen et al., 2015; Shane & Stuart, 2002)
Impact of AE: Economic and social development, financial return	- What is the link between the commercialization of public science and broader societal impacts? - What are economic effects of knowledge spill over?	(Bigliardi, Galati, & Verbano, 2013; Bray & Lee, 2000; Fini et al., 2018; Guerrero & Urbano, 2014; Harrison & Leitch, 2010; Thursby & Thursby, 2002)
AE commercialization: Different Business Models of USO, commercialization strategies	- Which are the most efficient business models to commercialize AE? - How do technologies and/or business models evolve based on the stakeholder's expectations?	(Clausen & Rasmussen, 2013; Gbadegeshin, 2017; Keith M & Erin, 2016; Lehoux et al., 2014; Shane, 2002, 2004b; Sousa, Zambalde, Souki, & Veroneze, 2018; Ziaee Bigdeli et al., 2016)
AE identity: sensemaking and identity building in AE	- Which are the processes associated with identity, motivation, leadership that affect AE? - Which identity tensions arise in AE? - How does identity of USO evolve through time?	(Ambos, Mäkelä, Birkinshaw, & Este, 2008; Balven et al., 2018; Fisher et al., 2016; Huyghe, Knockaert, & Obschonka, 2016; Meek & Wood, 2016b)

In this link it is possible to access the literature review analysis, the interviews, the unedited transcripts of the interviews, and the coding exercise I carried out.

Appendix 2. HARP quiz



Source: Own results based on HARP quiz

Explanation extracted from Lewis & Thornhill (2019:151):

"HARP is a reflexive tool that has been designed by Bristow and Saunders to help you explore your research philosophy. It is just a starting point for enabling you to ask yourself more refined questions about how you see research. It will not provide you with a definitive answer to the question 'What is my research philosophy?' Rather it will give you an indication as to where your views are similar to and different from those of five major philosophical traditions discussed in this chapter. Do not be surprised if your views are similar to more than one tradition. Such potential tensions are an ideal opportunity to inquire into and examine your beliefs further. HARP consists of six sections each comprising five statements (a total of 30 statements). Each section considers one aspect of philosophical beliefs (ontology, epistemology, axiology, purpose of research, meaningfulness of data and structure/agency). Each statement epitomises a particular research philosophy's position in relation to that particular aspect. By indicating your agreement or disagreement with each statement you can discover your similarities and differences with different aspects of each research philosophy"

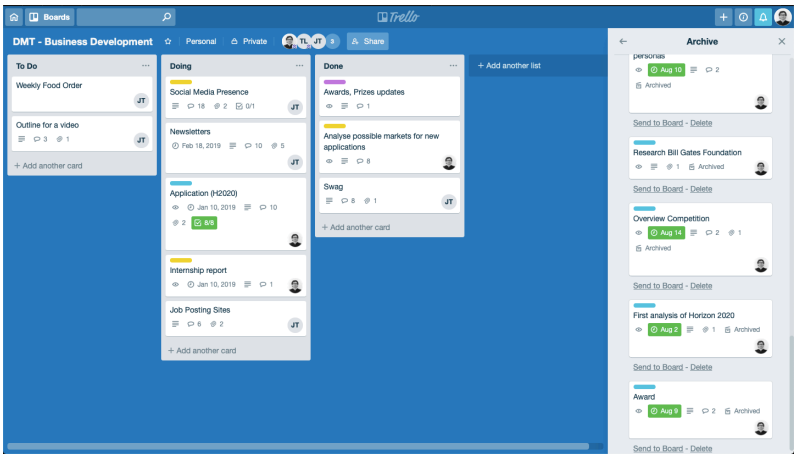
Appendix 3. Internship fieldnotes

During the Internship I had several milestones that marked my experience in ALPHA. These were moments in which I was able to develop different relationships with the members ALPHA and create my own understanding on what the organization did and how was the working environment. These were spread through time beginning with my initial interview and application for the position and ending with a thanks email and project closure.

After a couple of months back in Copenhagen, I was able to reflect on the activities I made during my internship and make sense of the different moments I had during my time in Berlin.

Milestone	Description
Skype Interview and first emails	My first Interview with Thomas (CEO) was held on May 2018. To be honest I was not very prepared for the interview beyond reading a couple of news about the company and skimming through the webpage. At that point of the year I was overwhelmed by studies, personal projects and Spring social activities. Moreover, I was not very sure what I wanted to do for my third semester and was analysing different options. When I was informed about applying to ALPHA I did it but without being aware of the company. Once in the meeting we discussed mainly about my CV and T gave me a quick overview about the technology. In which he suggested me to read the articles that were written by the Professor who had developed the technology. When I asked him what would be the projects or tasks that I would be involved with he said: "At the moment I want to know about customers and how to expand the business to other geographies, but we are a Start-up and we are evolving every day so the challenges I have today would be different by when you come, so let's talk in July and figure something out" He also made some questions in regard to my Master Thesis and I was quite nervous since they were very smart questions about a project I had 6 years ago. It was a short meeting, but I was already sensing that the work would be at a fast pace. Also, I was not very sure if he really wanted me at ALPHA or he felt it was more a way of integrating a student a showing support to the OIE program, which whom he is one of the Advisory Board members. When I read both suggested papers, I realized this were complex topics and that I was dealing with highly educated and scientific people. Since I had to send an internship request to the department, later in May we started to exchange e-mails to define which were the projects he would like to get support. He described the following projects: On 5/28/18, 11:40 AM, "Thomas Lubinski" <Thomas.l@xxx.de> "I see three possible projects for you: 1.) Application for a grant from Horizon2020 for SME: this would give you the opportunity to understand the technology and the product pretty well, because you'd have to explain it to others. 2.) New applications: we have a platform technology that can do more than „just"

Milestone	Description
	measuring glucose. Your job would be to find other applications and make a business pitch out of it. This could be (from the top of my head): blood analysis, urine analysis, therapeutic drug management, … You'd need to prove the market so a lot of internet research and talking to key persons. 3.) User centric research: we worked hard on the technology but now we need to know, what the users are and what they are expecting from a product. You'd need to find out who are possible customers of our technology and what they are looking for. Talk to diabetics, doctors in a structured way and gather information" With this as base for my projects I developed a Project Plan and defined some tasks and activities for the possible projects.
First meeting with Thomas and first day at the office	I arrived at Berlin the 28th of July and on the 30th of July I had my first interview with Thomas to define my role and get an introduction to the place. I arrived earlier since I didn't want to be late and when I was finishing a coffee nearby the office, I met Thomas in his way to the office. We walked together to the office where he gave me a brief introduction to the people, device and technology. We had a meeting in which he explained briefly the technology. Which in principle I thought I had understood. Later I pitch my project plan and the activities I would carry out to achieve the objectives. He was pleased and told me my project would be the Horizon 2020 application and that the idea was to do it good. I also asked if there was any dress code. He just laughed and said this was a Start-Up not a bank and there was no dress code. He also asked me to set a Trello for my activities, since this was the ways he coordinated employees work. Later we went to the office (this was a coworking space). I remember I went directly to the machine to look at the technology and he stopped me and warned me that I had to use some glasses. This signal me that thing at ALPHA had a rhythm and working with Germans had other characteristics. My introduction consisted in showing me the desk in which I could work and later he asked the product development team to show me the Device. I was very amused by the technology and thrilled to be in Berlin, working for a High-tech Start-up. Nevertheless, I still didn't know anything about the company, the culture, and the people. Thomas asked me to be at the office the 1st of August and informed me he was on a business trip and he would be back at the end of the week, so I had to manage. No more instructions. I understood this was a company that required a lot of independence for working and no one would take my hand and walk me through. This was nice as a challenge, but also felt somehow overwhelmed, new city, new job, new life. I arrived early that day and started researching about Horizon2020 to plan my future work. Later I had lunch with my colleagues who were welcoming and gave me their perspective about ALPHA from which I recall two important things:

Milestone	Description
	We are never informed who is coming or not, one day someone pop's up and says I will be working at ALPHA. Also, we discussed that in some sort of way they understood the power of the technology, but they felt it was far away to be developed, but the motivation was still the impact it could have in the Diabetics around the world. I felt I t was kind of a negative attitude but didn't argue too much about it. On Friday, Thomas arrived. Later in the day he asked me to look at some applications that could be interesting for ALPHA and to prepare a draft for him to check. Just after 3 days at the company I was preparing a prize application due in 4 days. TL sent some information (never more than I asked for) and with this I started to apply. 
Presenting my project to the rest of the team	During the first month I dedicated most of my time to develop applications and developing a Market Analysis to update the data that was used for pitching and investor relationships. After finishing the research on the 6th of September there was a team meeting were all the members were invited to present what was their work and get some feedback from the others. At this meeting I was able to meet the "Frankfurt guys" which were the PhD students that supported Prof. W in the research for the company and a future employ to be integrated in November. In this meeting everyone exposed their work and had several discussions. One of the discussions in regard to my work was about specifying the cases and better understanding the diabetics. But the idea as I tried to communicate was that we all had a common background for discussion Diabetes and what ALPHA was trying to solve. Also, both Frankfurt Guys presented their PhD thesis. This was very complex and to be honest didn't get too much. This was the first and only group meeting I was part of in 3 months of work at ALPHA.
Identifying possible misalignments	I usually go to lunch with my co-workers and I have been sensing different perception in regard to the milestone's achievement and development of the product.

Milestone	Description
	Some of them believe that the milestones are too tight and that its "impossible" to achieve them. Moreover, they believe that this is just the consequence of trying to get potential investors and satisfy investor needs. I have been talking with my internship supervisor about this, basically what I feel is that different "departments" of the company have different development stages. For example, the business development department is already envisioning the future with a working product which at the moment doesn't exists. In the other hand, the product development team is in a stage where the product is not working and they are constantly having issues with the companies that supply the components and ensemble the prototypes and thus, I believe there are in are earlier stage of development. However, when talking with the CEO he seems very confident in the progress and has a clear vision of where he wants to take the company at. I definitely think this is a topic that is worth researching more about, I have discussed with my supervisor the use of organizational life cycle to use this.
Going to Frankfurt to meet Consultants and ALPHA labs	I had the opportunity to go to Frankfurt and observe both the laboratory and the initial proof of concept experiment. It was impressive to see the technology and research that is behind our company. Moreover, we have a meeting with some potential partners that will research about how to make the product more efficient (e.g. battery, laser, mirrors etc.) This took all day and at the end it seems there are several opportunities to get better. It seems that Professor W is very knowledgeable, every question the consultants have he has a very elaborate and complete answer. Is quite impressive actually. I also have to highlight his human aspect; he was very kind and even though he has a great level of experience and seniority he seems as a very humble man.
Last dinner @ Cookie Cream	After three months in Berlin I was invited to a final farewell dinner. It was in a vegan restaurant in the city centre. Several things to highlight, I got a great SWAG bags with a lot of corporate material which make me proud and happy. Also, we were able to discuss future engagement in the company and the doors were left open. I feel this SWAG is a good attempt to get the company closer and develop a stronger organizational identity. At the moment the team is quite spread apart, some are not fulltime and other colleague had a parental leave.
Email saying thanks and goodbye	from: **Juan Jose Ocampo Pava** <juan.ocampo@xxxxh.de> to: W@alpha.de cc: Thomas <thomas@alpha.de>

Milestone	Description
	date: Nov 7, 2018, 10:44 AM subject: Re: 2018-10-15_H2020_Technical application_PF1-Comments-WM mailed-by: alpha.de Dear Professor XX and XXX, I want to thank you for the opportunity of doing my internship with ALPHA, it was a great experience both professionally and personally. Not only because I respect and believe in the technology you have developed, but because during this time in the company I was able to experience in a real life scenario what is the StartUp life. I was able to learn the importance of identifying and understanding your market by using both formal supports (i.e. academic papers and researches) and informal analysis (e.g. Facebook). Also, applying to different awards, reinforced my skills of knowing your "information" and being able to express the most important things in few words. Likewise, being able to record videos, making presentations, and practice some design skills was valuable for my professional skill set. Finally, I was able to work with Thomas who was an example of having a problem solving mindset and guided whenever I got stuck. Also, with B who welcomed me from the first day and integrated me to the Berlin life. Also the Frankfurt people; I always appreciated the human aspect of the Professor who showed respect for all of us, even though I was just an intern! and Al who was always ready to work and solve problems. Even though, I had limited professional interaction with D, J, O, and M I always felt welcomed and supported. Please find attached a folder with some of the most relevant derivable from my internship at ALPHA. This folder includes: H2020: In this folder you will find the latest version of the document which includes the last comments received. This follows the guidelines of the H2020 grant and it should be ready to upload via the application portal. The next application deadline is in January 2019, so this would be the document to upload when the time comes. This folder contains the worksheets that support the analysis made for the document (Finance, Work Packages and Market Valuation). Nevertheless, there are always things you can improved in this type of documents, but the scopes and times will always be a constrain. Market Analysis: One of my first tasks at ALPHA was to prepare a market analysis for ALPHA. This includes Valuations, Customer, User Analysis, Rival Analysis among other

Milestone	Description
	features. I believe it summarizes several aspects that any new comer for ALPHA could read to get a first glance of the market. RSP analysis: RSP is one of the rivals to follow, this presentation offered and updated glance of what they were doing by September 2018. ALPHA pagers: During my internship I also supported Thomas in developing and preparing both pitch decks and marketing material to share with relevant stakeholders. Amongst these documents were the Brochure and ALPHA one pager. Applications: During my time at ALPHA we applied to 3 competitions (i.e. TechCrunch, Hello Tomorrow and Zayeb prize) We were selected for TC and Hello Tomorrow but unfortunately didn't won the Zayeb prize. Market research: One of the tasks I undertook was to support both Thomas and Markus in the research of different markets. Here I analysed applications (e.g. Toxicokinetics) for the technology and was challenged with identifying business opportunities. Note: All the work, researches and documents are carefully organized in the drive which is linked to this email. I always tried to maintain high standards of quality and the responsibility in all the tasks I engage with and, from your comments and actions, I believed this was achieved. This email aims to officially close my internship, but we are still in the loop for some other activities. As Thomas knows, I will be writing a research paper about organizational development of Start-up and I will be using ALPHA as a case, and, if you agree, I would like to continue this research for my thesis. So hopefully you will allow me to get deeper into the organizational development of ALPHA. Best regards, Juan
TechCrunch event	Even though my proper internship has come to an end, I agreed with Thomas that since I had written the TechCrunch application (which we won) I could go to the event and participate in it. It was a great experience personally and professionally. Basically, it was a great opportunity to learn how to pitch the company to different people (even investors) and get to make my own understanding on what ALPHA is and does. We finally got selected as one of the companies to watch based on a journalist from TechCrunch. Great work and experience

Milestone	Description
	

Appendix 4. Interview list

Name
Thomas - CEO
Professor W – Founder
Employee BD
Employee SW
Employee PD
Employee PD

In this link it is possible to access the literature review analysis, the interviews, the unedited transcripts of the interviews, and the coding exercise I carried out.

Appendix 5. Secondary data list

Material	Description
Pitch-deck	2018 pitch-deck used by CEO when presenting ALPHA to potential investors or stakeholders
Webpage	Company's official webpage
Horizon 2020 grant application	60 pages document that explains in detail the technology, company's goals, financial forecasts and investment plan for € 2.5Million.
ALPHA brochure	Publicity material that is shared in start-up and investing events.

The access to this material is restricted for anonymity. However, if requested by the examiner, a review of the material could be scheduled.

Appendix 6. Field Work Instrument

PART I:

Open question:

Tell me how you got to the point you are now?

PART II[25]: (A)

Please read the descriptions below and place a check mark before the one most characteristic of your firm today. Undoubtedly, your firm may not fit neatly into one of the descriptions, but please select that one which most closely captures the current state of your company. Please feel free to further describe the major characteristic of your firm in your own words in the space provided below.

( ) The company has a product that performs well and meets a need in the marketplace. We have the capability to produce and sell but we have yet to firmly establish the company in the market. The president/entrepreneur is central to all functions and communications. The firm has some revenues and some backlog of orders.

( ) Within this company, the primary focus of our activities is on product development and design, securing adequate financial resources and developing a market. Most of our employees have technical tasks but could be considered more as generalists than specialists as we all perform multiple tasks. We more closely resemble a task group than an organization. Formality and procedures are almost non-existent at this firm, but the president/entrepreneur is central to all functions and communications.

( ) The company is characterized by high growth rates in both sales and number of employees. The major internal focus is around issues of how to produce, sell and distribute the products in volume while attaining profitability. Internal structure and communication is becoming more formal and increasingly individuals are assuming specialist roles. The company has a single product line.

( ) Within this company, the major internal activities include: (a) development of 2nd, 3rd generation products and/or totally new product lines; (b) securing growth funding; (c) securing or growing market share; (d) penetrating new geographic territories. The firm has a formality of organization structure, rules and procedures. A top management team composed of some individuals with broad industry experience is in place or being built.

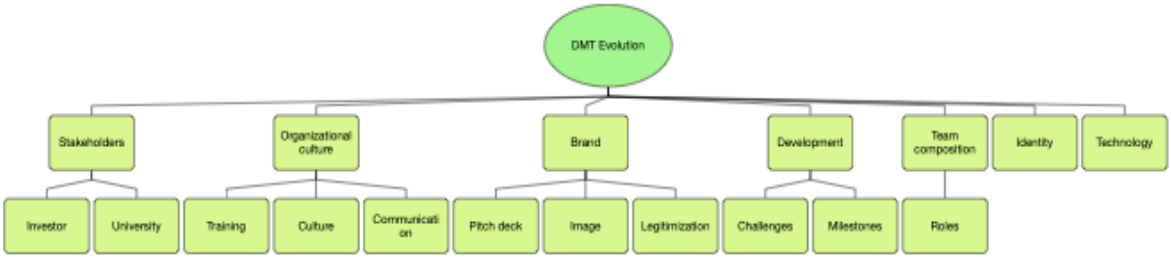
[25] Self-Categorized Stage-of-Growth Measures based on Kazanjian (1988)

PART II[26]: (B) Dominant Problem Ratings

Which the following problems are currently the focus of management attention and resources. With 1 = a minor issue of concern at this time, 4 = somewhat of an issue of concern at this time, and 7 = extremely dominant issue at this time.

1. Developing a new product or technology application ( )
2. Product support or customer service ( )
3. Developing a network of reliable vendors and suppliers ( )
4. Cost control ( )
5. Produce in volumes adequate to meet demand ( )
6. Meet sales targets ( )
7. Attaining profitability or market share goals ( )
8. Penetrating new geographic territories ( )
9. Administrative burden and red tape ( )
10. Securing financial resources and backing ( )
11. Acquiring key outside advisors or board members ( )
12. Attracting capable personnel ( )
13. Adequate facilities and/or space ( )
14. Management depth and talent ( )
15. Definition of organizational roles, responsibilities and policies ( )
16. Management information systems ( )

Appendix 7. Coding Map



Source: Own elaboration using NVivo

[26] Self-Categorized Stage-of-Growth Measures based on Kazanjian (1988)

Appendix 8. Socially constructed Systems of Technology Venture Audiences

Audience Attribute	Conception Stage	Commercialization Stage	Growth Stage
Audience providing financial resources	Grant administrators; researchers	Venture capitalists; angel investors	Institutional investors
Audience goals	Knowledge advancements; solve societal problems and challenges; support technological advancements	Medium- to long- term financial returns; exit investments in future at high multiple; participate in building companies	Short term financial returns; increase portfolio value
Audience Norms	Academic professional norms	Long term financial self interest	Short- term financial self interest
Audience Values	Openness; Collaboration; learning; knowledge as a public good	Firm value creation; competition; proprietary knowledge for competitive advantage	Portfolio value creation; risk management; risk diversification
Audience authority and control mechanisms	Bureaucracy; legislation	Equity percentages; board representation; informal reporting	Shareholder activism; meeting listing requirements; regular and formal financial report (…)
Audience focus of attention	Research progress: knowledge advancement; individuals' academic reputation	Market position; meeting growth milestones	Financial results; share price and growth potential

Source: Adapted from Fisher & Kotha (2016)

Appendix 9. Stages of growth and dominant problems

Stage	Conception and Development	Commercialization	Growth	Stability
Dominant Problems	Resource acquisition and technology development	Production related start-up	Sales/Market share growth and organizational issues	Profitability, internal controls, and future growth base

Source: Adapted from Kazanjian & Drazin (1988)