LUND UNIVERSITY
School of Economics and Management

Fika and Start-ups: A Department's Role in the Process of Technology Commercialization through Spin-Offs

a Case Study of the Food Technology Department at LTH, Lund University

By

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Abstract

Purpose

The academic aim is to test the Entrepreneurial Architecture framework by Nelles and Vorley (2010a) against a department in relation to the creation of spin-offs. This is something we believe has not been done before and can add to the literature about departments in this respect. The practical objective is to present useful insights that help practitioners manage the complexity of this topic at universities.

Methodology

We perform a single qualitative case study on the department of Food Technology, Engineering and Nutrition through the tool of in depth semi structured interviews held with relevant stakeholders at different levels, inside and outside the department. The interviews are transcribed and analysed using the Entrepreneurial Architecture framework as a starting point and then developing first and second order themes.

Findings

The findings prove the general role that a department can play in encouraging the creation of spin-offs and the validity for the application of the framework to a department.

Limitations

This study is hardly generalizable due to the uniqueness of the study object and the method employed, semi structured interviews.

Implications

An academic contribution is made by showing the importance that a department can have in the creation of spin-offs and the applicability of the framework to these.

Keywords

Entrepreneurial Architecture, department, structure, systems, strategy, leadership, culture, entrepreneurial university.

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1. Introduction

1.1 Background

Innovation is part of what explains economic growth (Grossman & Helpman, 1991). It is a vital element in our world since without it, societies might not move forward. The foundation for innovation is knowledge, and in today's civilization, it could be said that one of the most important sources of knowledge are universities. Their role has developed and changed over the years, with their most significant transformation occurring in the last decades, adopting the so called "Third Mission" (Sam & van der Sijde, 2014), in addition to their two traditional missions of teaching and researching (Göktepe-Hultén, 2010). This transformation was a response to globalization, policy makers and the ever-increasing demands of the knowledge based economy.

The Third Mission, among its many activities, includes the commercialization of technology and ideas (Ambos, Mäkel, Birkinshaw & D'Este, 2008), which can comprise examples such as those given by Shore and McLauchlan (2012), start-up business and spin-offs being two of these. In this case, the concept of spin-off is to be understood as new ventures originated with a university background and founded on technology derived from university research (Rasmussen & Wright, 2015).

Much has been done around the world and in different ways to accommodate this new role, so academics have long been busy studying this phenomenon as seen in the article by Rothaermel, Agung and Jiang (2007). In this extensive work analysing 173 articles between 1981 and 2005, Rothaermel et al. (2007) highlighted the fragmented nature of this research and underlined the fact that they considered the topic complex and still under researched. Following this, they described 4 emerging research directions and proposed a framework with the entrepreneurial research university at the centre of it. The work by Rothaermel et al. (2007) as such, also highlights the array of elements and challenges that had been considered and studied so far from different angles as to how universities could be made more entrepreneurial.

The institutional change to adapt to this new role with its internal challenges as studied for example by Ambos et al. (2008) makes it an interesting topic for us, as students of

entrepreneurship and innovation at one of the largest research universities of Sweden, Lund University. Particularly, since this embrace of more entrepreneurial and commercial activities by universities as described by Sam and van der Sijde (2014) has led to much criticism given that it is perceived by some academics as detrimental to the university's original missions of education and research (Nelles & Vorley 2010c)

Additionally, we believe that the case of Sweden has some further characteristics that make it singularly interesting and which add additional complexity; in particular, the professor's privilege. The professor's privilege offers the intellectual property rights to idea generators as opposed to most European countries or the US and, as reported by Borlaug and Jacob (2013), researchers in Sweden indicate this right to own inventions as the single most important incentive to engage in commercializing their research. However, at the same time, the administrative staff involved with the technology transfer office (TTO), believe that all research done at universities should belong to the university, granted that the researchers have been employed by the institution (Borlaug & Jacob, 2013).

Such differing individual perceptions from stakeholders, as described in the previous two paragraphs, add to the complexity of this phenomenon inside of universities, which made up of smaller structures and finally individuals, attempt to enact the Third Mission. A complexity, which also Nelles and Vorley (2010a) describe, consider interlinked, and suggest that can be analysed for better understanding using a framework called Entrepreneurial Architecture.

1.2 Purpose and Objectives

With this thesis, we attempt to make both academic and practical contributions. First, we want to test the Entrepreneurial Architecture framework's flexibility and applicability (Nelles & Vorley, 2010b) against a department. Doing so will be quite novel, since from the research that we have done, we have so far only found the Entrepreneurial Architecture framework applied to universities as a whole in studies like that by Vorley and Nelles (2008).

Second, we will be adding to the literature concerning the importance of departments, which are considered to be influential on how technology gets commercialized (Bienkowska, Klofsten & Rasmussen, 2016) and described as a link between the relevant stakeholders within universities (Nelles & Vorley, 2010a). A link and structure that are seldom homogeneous (Nelles & Vorley, 2010b).

Regarding our practical contributions, the choice of our department can be of interest to practitioners. The Food Technology, Engineering and Nutrition department of the LTH Faculty at Lund University, is unique for several reasons: It is in a region with a strong funding for food innovation, but especially because it has been very successful in the execution of the Third Mission, specifically in the creation of spin-offs such as Proviva and Oatly.

This success in spin-offs is of special interest since these are considered to be the most difficult commercialization activity to assimilate for researchers when it comes to their daily practice (Borlaug & Jacob, 2013) and a "marginal phenomenon among academics" (Wigren, Grabrielsson & Kitagawa, 2011, p. 486).

All reasons for which, we will perform a qualitative case study of the Food Technology department through a series of in depth semi structured interviews with significant stakeholders at different levels such as a member of the Faculty management, a business developer of the TTO, the Department Manager, several researchers and PhD students from the Food Technology department, to explore the following research question:

How do the different stakeholders perceive the department, in general, encouraging technology commercialization through spinoffs?

Our objective with this research question is to describe and explore the potential perception differences from different stakeholders, in terms of the current and potential contribution that a department makes to incentivize spin-offs and analyse them in relation to existing theory.

We will look at perceptions per se, of the different elements from the Entrepreneurial Architecture since we take a constructivist approach under the assumption that "truth is relative and that it is dependent on one's perspective" (Baxter & Jack, 2008, p. 545). Therefore, looking at different stakeholders is important to better understand the complexity of the phenomenon. Besides this, perceptions have also been considered to matter and affect entrepreneurial intentions and ultimately planned behaviour (Krueger & Carsrud, 1993), something relevant for practitioners targeting academics.

1.3 Research Limitations

We acknowledge this study suffers from various limitations that make it difficult to generalize our study's findings and conclusions.

The first limitation is that we are looking at a specific department within Lund University in Sweden. This brings with it both the national and regional context with all its implications regarding a specific legislative system, intellectual rights, external support systems, politics, government objectives, etc.

Another limitation is the specific discipline and research field that comes with choosing of the department of Food Technology. This is important to consider, since it does in fact influence how a department may be open to technology transfer activities overall, as expressed by Kothari and Handscombe (2007).

Besides this, our intentional focus on spin-offs is a limitation that we are completely aware of and something to account for, because it could mislead the reader to think that all the other activities are perceived as secondary, even though it usually is the opposite in departments (Borlaug & Jacob, 2013).

Furthermore, other significant limitations resulting from the chosen methodology will be elaborated on in Chapter 3.

1.4 Outline of the Thesis

This thesis will continue in the second chapter by performing a condensed review of theories and concepts that have contributed to the research done on the topic of the entrepreneurial university. We will also look into the specifics of the Swedish context and explain the Entrepreneurial Architecture framework that we will use for the analysis.

Hereafter we will proceed with explaining the method employed to choose the candidates, collect the data and analyse it. The analysis will be then laid out and the findings discussed in relation to the theory and existing literature.

Finally, we will summarize the findings and offer a set of suggestions for further research and make suggestions for policy makers and practitioners.

2. Theoretical Review

To set the stage for our analysis we will start by introducing some of the main concepts used to analyse the phenomena and which we believe are necessary for our study. However, we intend by no means to provide a full review of the research done on the topic of the entrepreneurial university nor the Third Mission. Researchers have been very active for over 3 decades in analysing it from all different levels (Rasmussen & Wright, 2015) and the amount of research generated, makes this by far an impossible task given our limitations.

The review will hopefully serve to guide and help the reader in understanding four things. First, what has triggered the change that universities are going through and the resulting situation. Second, how some of the elements and factors included have evolved. Third, in which way the Swedish context is distinctive and lastly the framework of Entrepreneurial Architecture, what it is, and how it is relevant for our study.

2.1 Universities Change

Higher education institutions in most of the countries have changed and adapted to provide for the constant growth in requirements of knowledge based societies around the world so that the different models of established universities evolved (Sam & van der Sijde, 2014). This change was triggered by policies that initiated the redefinition of the universities' roles (Nelles & Vorley, 2010a).

The initial missions of universities were two, research and education and in the last decades they have incorporated the so called Third Mission (Göktepe-Hultén, 2010). Rothaermel et al. (2007, p. 692) describe the Third Mission as an "economic development mandate". Jongbloed, Enders and Salerno (2008) describe the concept as all the activities carried out by university institutions other than teaching and researching. On the other hand, Hackett and Dilts (2004) describe it more narrowly as technology transfer, and Ambos et al. (2008) as developing the capacity to commercialize technologies and ideas.

2.2 Commercialization Activities and Criticism

As already mentioned, the concept of Third Mission is open to interpretation with different opinions and, while it is understood as a necessary task to facilitate knowledge transfer, it has also been criticised for turning institutions away from conducting basic research (Nelles & Vorley2010c). Another critic is the conflict of interests with the traditional academic missions that rises from a more commercially oriented university, putting pressure on the independent role of universities as critics of society (Krimsky, Ennis & Weissman, 1991).

In other words, the independent role as research and education centres is being questioned due to the active pursuit of heightened levels of interactions with external stakeholders on commercial terms to create new revenue streams by the institutions as such (Shore & McLauchlan, 2012). Some examples of such activities would be, among others, spin-offs, incubators, start-up businesses, commercial patenting and licensing, etc. (Shore & McLauchlan, 2012).

2.3 University Entrepreneurship and the Entrepreneurial University

Much research has been devoted since 1981 to university entrepreneurship (Rothaermel, et al. 2007). The focus of research up and until 2005 as highlighted by Rothaermel et al. (2007) can be divided into four research streams which they coined as a) the entrepreneurial research university, b) the Productivity of technology offices, c) new firm creation, and d) the environmental context including networks of innovation. The entrepreneurial university being at the centre of it as shown in the next figure.

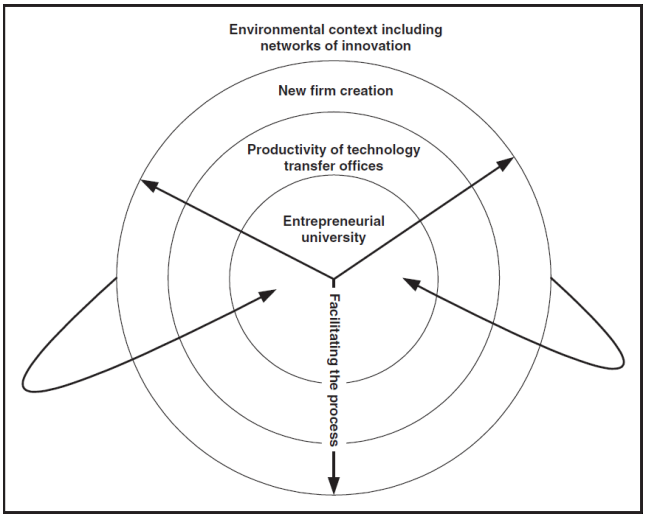

Figure 01: Conceptual framework of university entrepreneurship (Rothaermel et al. 2007, p. 707)

Universities around the world differ in fundamental ways, as a result of their historical and surrounding local - national context (Sam & van der Sijde, 2014). However, what would be a concise definition of the entrepreneurial university? Sam and van der Sijde (2014) for example, state that the mere fact of performing entrepreneurial activities does not guarantee a transformation from a university to an entrepreneurial university, but to be considered as such, a university should be able to take on several roles in society and in the innovation ecosystem. These roles include the provision of human capital, knowledge understood as research, and the provision of space for new enterprises such as incubators (Marques, Caraça & Diz 2006).

For our analysis, we will use the definition of entrepreneurial university as a university that generates technology developments and enables its diffusion process through intermediaries such as technology transfer offices, by creating incubators and/or science parks that ease the creation of new firms (Rothaermel, et al. 2007).

2.4 Support Structures, Intermediaries and the Technology Transfer Office

As mentioned by Nelles and Vorley (2010a), the first visual expression of the universities entrepreneurial effort are the support structures put in place to allow for socio-economic engagement. There exist different types and different intermediaries which have been studied such as technology transfer offices, science parks, and incubators (Rothaermel et al. 2007). Out of these, however, the most common appears to be the Technology Transfer Office or TTO, according to Nelles and Vorley (2010a) which is supported by Rothaermel, et al. (2007, p. 740) when they describe it as the "often regarded formal gateway between university and industry".

Given the importance that has been attached to this structural element of universities as part of their entrepreneurial conversion, TTOs have been extensively studied, especially in terms of their productivity (Rothaermel et al. 2007). However, to briefly define it for this study, a technology transfer office as such is as an office or department dedicated to help in the transfer of university knowledge for commercial purposes (Göktepe-Hultén, 2010).

2.5 The Swedish Context

Sweden ranks as one of the leading countries on the European Innovation Scoreboard (2016), but on the other hand, its effective productive output is still behind their research creation (Bitard, Edquist, Hommen & Rickne, 2008), which is the so-called innovation gap or "knowledge filter" as described by Audretsch (2014, p. 316).

Factors such as the impact of policies, both internal to the universities (Powers & McDougall, 2005), as well as external such as laws, incentives and country specific intellectual property rights (Grimaldi, Kenney, Siegel & Wright, 2011), have been considered to be of importance. Therefore, the context is important and necessary to be addressed in any study. We will now list different characteristics which are relevant for the reader to know in relation to the study.

2.5.1 Government Funding and Policy

In regards to universities, research, and entrepreneurship, government policy is important in Sweden. First, universities in Sweden are all public being financed by the state (Karlsson, Wigren-Kristoferson & Landström, 2015). Secondly, their mission regarding technology transfer and communication of their research and results was framed as a law in 1997 (Wigren et al. 2011). Thirdly, additional public funds are made available on a reward base through so called innovation agencies for research in strategic areas which are considered key for Sweden's competitiveness and future, defined by the government (Wigren et al. 2011).

Examples of these are the Swedish Research Council, Vinnova, which then co-finance research, entrepreneurship, and other institutions such as Livsmedelsakademin. This latter being directly engaged in everything related to food, one of the government's strategic goals as published by Sweden's Ministry of Enterprise and Innovation (2016).

However, if we look at the total public funds which are supplied for instance for research they are about 28% (Borlaug & Jacob 2013), with the rest coming from other external sources such as large corporations.

2.5.2 Intellectual Property Rights and Commercialization

Intellectual property rights (IPR) are essential for the commercialization of research and ideas, having different setups around the world. In the USA for example the rights of

inventions belong by defect to the university instead of the researcher or inventor (Grimaldi et al. 2011). In Sweden, this is the opposite (Borlaug & Jacob, 2013), any idea or research belongs to its creator, who can then commercialize it in any form he desires (Wigren et al. 2011).

Academics in Sweden do commercialise actively to fund their research (Wigren et al. 2011), but they do not always report it (Borlaug & Jacob, 2013) for different reasons. One being that these activities are a common element of their daily work and fully accepted. The other however, the opposite, because they are not approved by colleagues (Borlaug & Jacob, 2013), since scholars have differing views on the Third Mission's contribution to the other two (Vorley & Nelles, 2008).

2.5.3 Spin-offs and Academics

Spin-offs as such when compared to other forms of research commercialization and technology transfer can be considered a marginal phenomenon (Wigren et al. 2011). Something that can stem from one of the following reasons. First, that academics consider them a riskier option with many disadvantages (Borlaug & Jacob, 2013). Second, that they are the most difficult commercialization activity to assimilate for researchers when it comes to their daily practice (Borlaug & Jacob, 2013). Third, because they may fall into the category of activities that are not reported because they are not approved by colleagues (Borlaug & Jacob, 2013). Last, because sometimes researchers' ability to see viable business opportunities is dependent on prior commercial experience (Rasmussen & Wright, 2015).

2.6 Entrepreneurial Architecture

The Entrepreneurial Architecture framework as proposed by Nelles and Vorley (2010a) fills a gap they perceived existed in the literature surrounding university entrepreneurship and the entrepreneurial university.

The Entrepreneurial Architecture framework and its concepts are not new and previous scholars researching organizations of all sizes have developed them. What is new however, is how they adapt and suggest it to be used. The framework is divided into five groups of

institutional elements and focuses on their interaction that is considered essential given that these either effectively contribute to or take away from the setup and implementation of a university's goals to commercialize knowledge (Nelles & Vorley, 2010a).

These categories, as they also call them, are interdependent, of equal importance and supportive of each other. This particularity stands in contrast to most of the previous literature about university entrepreneurship and the entrepreneurial university, characterized by either a too narrow or too broad focus of analysis (Nelles & Vorley, 2010a).

The first of the elements is Structure. It is "the most visible of the Third Mission" (Nelles & Vorley, 2010a, p. 170). It comprises all the internal and support structures created as part of the university context to help with the transfer of knowledge and commercialization activities. Some examples are the already mentioned TTOs, science parks, incubators, etc. connecting the university with external actors such as companies.

Systems are the next element. They represent the formal and informal means of communication within the institutions. Such means come in many shapes with the aim of helping internal organization and external knowledge transfer (Nelles & Vorley, 2010a). Some examples would be formal procedures of operation, information routines, or setting up networks for knowledge transfer, all meant to transmit and manage strategy to meet organizational goals and execute them (Nelles & Vorley, 2010a).

Hereafter, comes Leadership. As an Element, it can comprise managers, staff, researchers or any other who have a vision and affect structures, processes and perceptions in order to lead the way towards strategic goals. Leaders must not always be in a managerial position but are involved in putting into motion the different elements of the framework to reach based on their vision, a human driving force (Nelles & Vorley, 2010a).

> *"Leadership … is concerned with setting direction, communicating and motivating." (Burns, 2008, p. 86)*

The next element is Strategy, representing the goals, measures and incentives put in place to reach the vision set by the leaders in an organization (Nelles & Vorley, 2010a). Such strategies, to be relevant and applicable need to take into consideration the context and specific characteristics of the institution (Nelles & Vorley, 2010a). Strategy can therefore be described as an assessment of what needs to be done based upon what there already is and

where one wants to go. Such strategies are then often expressed formally in corporate plans with specific goals and timelines and then communicated to each of the involved stakeholders such as faculties, departments, staff, researchers, etc. reflecting the interrelation of all its components.

The last element, Culture, describes the values which are defined through norms and daily interaction and reflect what is acceptable or not, an example would be what is perceived as natural, good and bad in relation to the Third Mission (Nelles & Vorley, 2010a). Another example could be any preconceptions regarding the roles and obligations perceived to exist as a group of people within the different levels in an institution.

> *"The cement binding this organization together is its culture. The essence of … culture is the values and beliefs shared by the people in it." (Burns, 2008, p. 88)*

2.6.1 Applicability

The Entrepreneurial Architecture framework with each of its different elements was first conceived by Paul Burns (2005). He proposed it to analyse large corporations and how the different elements were of significance to achieve entrepreneurial objectives within larger companies.

Nelles and Vorley (2010a) build upon Burns (2005) work and advocate their approach as a pragmatic framework that is adaptable to any type of higher education institution to contribute to the management of the Third Mission and all its related activities such as commercialization of technology in its different forms. According to them, it can be applied taking into consideration the mentioned architectural elements as a whole by looking at how they relate and support each other, something that had not been done before within a single framework.

The approach proposed by Nelles and Vorley (2010a) and their statement that it can be applied to any form of higher education institution makes sense to us. We believe that any institution be it large or small faces similar challenges in the implementation of its goals. This is especially the case when one looks at publications meant for business practitioners in renowned magazines such as the HBR, where practical examples and approaches are given.

In the article by Laurie and Harreld (2013), the challenges faced by corporations and innovation through entrepreneurial ventures are addressed. We think that this article is a good example for how elements such as leadership, strategy, support systems, communication and structure, all need to be set up to innovate and bring entrepreneurial ventures into existence from within corporations. It describes in fact the six most significant ways the authors Laurie and Harreld consider, make entrepreneurial intentions fail.

Through using the five elements of the Entrepreneurial Architecture and systematically analysing how different stakeholders perceive the different elements contributing to the creation of start-ups or spin-offs from within a university department, one can possibly get a better picture of what is perceived as contributing and what is not.

The way people perceive these elements has an impact on how they relate to, think of, and support new ventures created out of research ideas generated at university departments. By establishing what is important, what is perceived differently, who the important players and role models are one can possibly highlight possible mismatches or positive exceptions to the norm and bring more insight and maybe suggest some positive changes.

3. Methodology

The methodology chapter is aimed at motivating the reasons behind the focus and chosen method of the study. With the intention of clarifying the choosing of the Department of Food Technology, Engineering and Nutrition at LTH (from now on Food Technology) as Case of study, the approach section will cover some of the reasoning behind this. Subsequently, in the design section, the level of analysis focusing on the chosen Department will be discussed. Later, the sampling section will create a description of the interviewees stating how they are of relevance for this study. Towards the end of the chapter, the data collection method will be debriefed, followed by an analysis of the relevant data gathered and concluding with validity and reliability of the method itself.

3.1 Research Approach

For this study a qualitative approach is used to acquire valuable information straight from different sources at the Food Technology department of the LTH Faculty at Lund University. This approach follows some of the procedures stated by Bryman and Bell's book Business Research Methods (2011). By conducting a series of semi structured interviews with personnel at different organizational levels within the mentioned department of LTH, fruitful insights are provided to later build a case study with its own complexity. In addition, the Faculty of LTH and the TTO are also included in the analysis to help add a more general perspective on the subject.

The fine-grained approach on only one Department of one Faculty of Lund University is a response to the inherent timeframe limitations of the study coupled with the need identified by Bienkowska et al. (2016) for studies aiming at explaining differences within universities rather than between them and the importance of the department level. According to Nelles and Vorley (2010b), universities are rarely homogeneous organizations, therefore reinforcing the need for this study level. However, this narrowing also works in favour of this thesis since by focusing on only one department, external factors such as different environments or educational policies which could bring distortion to the study are isolated.

Based on the previous theoretical review we produced a series of interview questions acting as a guide when meeting the interviewees. We expect this will help establish what this department is currently doing to commercialize technology, specifically creating spin-offs, by looking at how different stakeholders perceive it internally from within the department but also from the TTO's viewpoint, producing more general findings.

3.2 Research Design

Yet again, the focus on only one department from the LTH Faculty could be seen as narrow, but there is a certain rationale behind this. Existing evidence suggests that science and engineering faculties are more prone to adopt an entrepreneurial culture (Bienkowska et al. 2016; Kalar & Antoncic, 2015). Furthermore, the study by Bienkowska et al. (2016) also examines internal perceptions, concluding that PhD students at those faculties recognise their departments to be more supportive regarding the commercialisation of research.

The reason behind the selection of the Food Technology department of LTH was to follow an in depth descriptive case design while taking advantage of the aforementioned isolation. In this way, the study concentrates on one department at one of the faculties recognised to stimulate the commercialisation of research. In addition, including other departments belonging to other faculties or even LTH may have had a distorting impact on the findings, given that different departments possibly have different institutional contexts influencing how commercialisation is interpreted, encouraged, and taken into practice (Bienkowska et al. 2016).

As mentioned, besides the TTO and the Faculty, the study covers a variety of levels within the selected department. The final motivation for targeting the department level can be identified with Rasmussen and Wright's (2015) observation, stating that universities are frequently large and complex organizations where the influencing artefacts towards spin-off creation are often more prominent at a local department level, rather than at the main university or faculty level.

3.3 Sampling

The study is aimed at covering the relevant levels in the internal structure of the Food Technology department, as well as its Faculty, LTH, and an external supporting organization. In this case, the supporting organization is the TTO represented by LU Innovation, analysed at the business developer level. The Faculty level, LTH is represented by an interviewee at managerial level, then the focus moves to the department itself, represented by a managerial position, two researcher positions and five PhD Students. The following subsections will explain why each of the interview subjects or levels are considered relevant for this study. However, in the subsequent chapter, a brief description of each of the interviewees at a personal level is presented.

3.3.1 TTO - Lund Innovation

As mentioned, the TTO is represented by LU Innovation as defined by itself, Lund University's hub for innovation and commercialisation. The TTO was established in 1999 and they define their aim and responsibility as making research available to society, thereby contributing to growth (LU Innovation, 2016). LU Innovation is divided into two sections, a

public authority, and a holding company, both working as one unit sharing a mutual mission and management.

The holding company, LU Holding AB, is owned by the Swedish state but managed by Lund University. Through these two institutions, the university operates to bring innovations to the market in different ways such as becoming part owner of research based companies, or assisting with licensing research results to existing companies. Support is provided both operationally and financially. Over the years they have invested in over 99 companies in different areas and as of the published information from 2016 held the following portfolio:

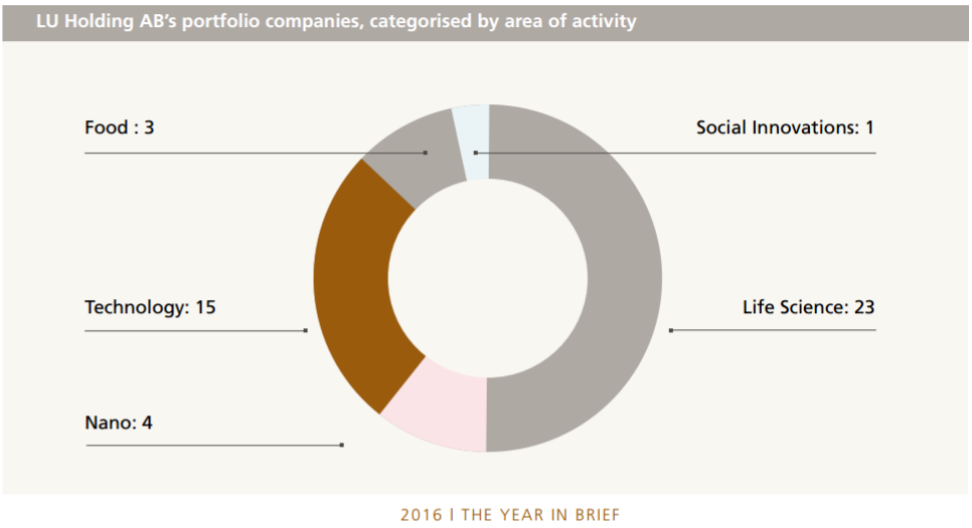

Figure 02: LU Holding AB's portfolio companies (LU Innovation Year in Brief, 2016 p. 27)

LU Innovation is the structure created with the purpose of fostering commercialization activities departing from knowledge at the University (Karlsson et al. 2015). Therefore, studying LUI's perspective is of importance for this study. Within the organization the attention is drawn to analysing the business development level. This allows for a more pragmatic approach, since the business developers are the ones in direct contact with the ideas and researchers.

3.3.2 Department of Food Technology, Engineering and Nutrition

As seen in the previous figure, about 50% of the companies have a technological background originating from LTH. Of these, three companies are food related, representing almost 14% of the technology based portfolio, centring on this evidence, it could be inferred then that this

department produces, in fact, applicable research. The Engineering Faculty (LTH) at Lund University has a total of 19 departments and about 75 divisions belonging to one of those departments but due to the aforementioned, we focused on the department of Food Technology for this study.

The food technology department concentrates on understanding the chemical and physical design of health-promoting food. This approach covers the physical and chemical changes taking place in food, from its origin to its final consumption, and the effects it has on our health. The location in southern Sweden is considered an advantage since it is where most of the Swedish food production and packaging industries are concentrated. Furthermore, food is a proposed strategic goal of the government (Ministry of Enterprise and Innovation, 2016), with the region hosting a variety of public support structures. Among them, the Skåne Food Innovation Network (Livsmedelsakademin), a cluster with focus on being an open innovation arena that aims to develop Skåne and Sweden into a European food centre.

Education at different levels from undergraduate, to master's and postgraduate levels is practiced at the department, as well as research within subjects involving the design and production of foods. The department has produced several spin-off successes that are considered from within as role models such as Proviva, Oatly and OptiFreeze. Due to this, we consider this department of particular interest for this study. This organisation will be represented in the study by different levels. The institution itself, by an interviewee holding a managerial position at the department, and then two interviewees at the researcher level, and five interviewees at the PhD student level.

3.3.3 Researchers

Researchers are of interest since they are the ones who are actively producing knowledge at universities and their ideas are possibly the likeliest to have potential for commercialization. In addition to this, Borlaug and Jacob (2013) mention that knowledge transfer activities as such are deeply fixed in their everyday work and many do so consciously, among others spin-offs. The researchers chosen were the ones who answered our emails, which we got from the department's website. At the time of the study they were active within the department as well as in their own spin-offs.

3.3.4 PhD Students

In line with Bienkowska et al. (2016) we believe that the PhD student level is of particular interest for this study. This level of education has been increasingly becoming a significant part of most universities. Adding to the interest in this level in general is the fact that PhD students are progressively transforming from being students to becoming future researchers, and possibly having positions of influence at the university. This gives today's PhD students the opportunity of becoming the means of knowledge transfer in the near future, making them a relevant group for studying.

3.3.5 LTH Faculty

The Food Technology Department is part of the LTH Engineering Faculty of Lund University. As such, the Faculty influences and passes on strategic goals considered of importance by the University. Bienkowska et al. (2016) also view the culture allowing collaboration with external actors and organisations to be established by the Faculty. Moreover, Bienkowska et al. (2016) consider there to be a synergy between the different levels, individual Faculties, their departments and students. Therefore, we think it was of importance for this study to include the perception of a stakeholder from the Faculty's managerial level, in this specific case we interviewed one of its Vice-Deans.

3.4 Data collection

The study resorts to comprehensive semi structured interviews done face to face at the chosen location by the interviewee as data collection method. During the interviews, the purpose of the study is raised, then a guide containing the interview question is followed, lasting from 45 minutes to an hour. The interviews are recorded with the permission of the interviewee and later transcribed and analysed as debriefing.

Four interview guides are used (see Appendix A01, A02, A03, and A04), one for the management level at LTH, one for the department management, another for the business development at LUI and the fourth one for the researchers and PhD Students at the department. The guides cover the different elements considered relevant in the framework of Entrepreneurial Architecture proposed by Nelles and Vorley (2010a). The questions are

intentionally open-ended so as for the interviewee to elaborate on them, but the guide is followed to maintain the focus on the areas considered of importance by the interviewers. However, following Bryman and Bell's (2011) techniques, there was still room for flexibility in asking further questions to inquire on notable replies by the interviewees.

3.5 Data Analysis

As previously stated, the focus on one department within the LTH Faculty of Lund University allowed us to isolate distorting factors. Furthermore, this single case study allowed for an in depth and holistic analysis of the characteristics of the case, given its complexity.

The transcriptions from each interview were analysed using a coding approach (Bryman & Bell, 2011) and then summarized as groups for each one of the variables that we established derived from the Entrepreneurial Architecture framework proposed by Nelles and Vorley (2010a), standardizing the data acquired.

Adopting, in part, the methodology mentioned in Gioia, Corley and Hamilton (2013), and once the data was categorized within our variables –Structure, Systems, Strategies, Leadership and Culture- we started looking for recurrent subjects within these categories, which we called first order themes. The final amount of first order themes was overwhelming and therefore, had to be reduced. We then identified the main themes in each variable that were repeated along our different interview levels and were relevant for our Research Question, generating second order themes.

To conclude, an exhaustive and comprehensive analysis was performed to try and generate relationships among both the variables and the stakeholders. Nelles and Vorley (2010a) state that theoretical development is complicated by the institutional specificity, however, they then concede that an analysis of the broad relationships among variables is in fact possible. For this purpose, we mapped out the different Elements' themes and established what we called links and weak links between them. The links being clear connections which influenced one another and the weak links being links which either had been considered deficient or dependent on specific individuals.

3.6 Trustworthiness and Authenticity

The credibility of the study stems from the appropriateness of the chosen method to explore the research question in addition to following the “canons of good practice” and triangulation (Bryman & Bell, 2011, p.396). A single case study, through a set of qualitative semi structured interviews, made up of open ended questions can facilitate the free dialogue with the interviewees and have them answer freely about their perceptions. The findings from the interviews were then summarized, and if needed, they were contacted again to clarify and elaborate on certain points that had been left incomplete or needed further explanation.

Additionally, the study has been built upon existing frameworks and concepts, explained in the previous Chapter, and that are the starting point for this study. We believe they present a brief, but necessary overview of the phenomena and explain the variables of analysis that define the nature and composition of the questions.

The dependability and trustworthiness of the study has been insured by having all research phases and generated data documented and, the most relevant, included in the study. In addition to this the research limitations in point elaborate on the issue of bias from the authors and how it has been attempted to be reduced to insure the study's confirmability.

Regarding the authenticity of our findings, the intentional combination of individuals at different levels with secondary data help reduce the potential bias when analysing the different variables. This approach we believe can provide a simplified but fair assessment of the phenomena and current situation at one department.

3.7 Methodological Limitations

As a result of the limitations posed on chapter 1.3, a single department is analysed within a specific university in Sweden. We are aware that if we wanted to contribute generalizable conclusions our study would have to have covered a larger pool of departments across Lund University’s faculties and if possible compare them to others from other universities.

Also, two additional contrasts would have been of particular interest. The first one being the comparison to a non-public university, namely the Chalmers University of Technology. Even though it has about a fourth of the number of students, it is operating in a similar environment, it has a comparable international ranking, and being a technical university it offers the same opportunities for spin off creation as the LTH Faculty of Lund University. The interest lies in that Chalmers University functions as an Aktiebolag, with the shares owned by a private foundation, this contrast with a public university is of certain attractiveness to analyse if there are additional pressures over the technology transfer office commercializing knowledge to improve the revenue streams of the holding.

The second interesting contrast would have been generated when incorporating the University of Copenhagen to the study. While in the same geographic area, and sharing both similar international ranking and student count, it offers one distinctive characteristic, the professor's privilege. In the year 2000 Denmark was the first in a set of European countries to abolish the professor's privilege, granting Intellectual Property Rights over research to universities. This difference with the Swedish model would have generated interesting contrasts with this study when analysing the university´s knowledge commercialization output efficiency.

Adding the above-mentioned cases to this study would have generated an enormous amount of data, which drawn conclusions would probably have been possible to extrapolate, generalizing them to other environments. But as mentioned, for the sake of our own limitations in generating a properly in-depth analysis, we leave that to a greater endeavour.

4. Empirical Data

For our interviews, we covered different levels within the Food Technology Department plus LU Innovation, and the Faculty of LTH. The following table presents the structured groups of interviewees, followed by a brief description of each one of the interviewed individuals at a personal level.

LEVEL	DESCRIPTION	TITLE	INTERVIEWEES	ROLE
PhD Students	Food Technology & Nutrition PhD Students	PhD Students	A	PhD Student
			B	PhD Student
			C	PhD Student
			D	PhD Student
			E	PhD Student
Researchers	Food Technology & Nutrition Researchers	Universitets Lektor	Federico Gomez	Master's program director and supervisor
		Professor Emerita	Eva Tornberg	Supervisor
Department	Food Technology & Nutrition Management	Prefekt Professor	Yvonne Granfeldt	Head of department
TTO	Lund Innovation Systems	Business Developer	Helena Ljusberg	Associate Professor at Food dpt
Faculty	LTH Management	Associate Professor	Charlotta Johnsson	LTH Vice Dean

Table 01: Interviewees by Level of Analysis

4.1 Interviewees

We approached the whole population of PhD students at the Food Technology department via email, a total of sixteen. Of these, we got five replies accepting to meet us, four of which were part of a sandwich program of international collaboration, and the fifth one was fully aware of this program as well. This reflects the diversity within the department, where it is estimated that more than half of the students are foreigners. Part of this group of interviewees requested to remain anonymous, following this request and realizing that some of the information provided may be considered sensitive or generate controversy, we chose to keep the whole group anonymous.

The two professors whom we interviewed were Federico Gomez and Eva Tornberg. Federico is a professor at the department where he arrived over 20 years ago as a master student. His title on the department's website is that of "universitetslektor" with the responsibility for the international master program of the department. His time is split between his task description

at the department as 35% education, 45% to research and the rest not being specified, which he dedicates among other things to his own spin-off OptiFreeze AB. Among his educational obligations, he is a lecturer and responsible for the supervision of several PhD and master students.

Eva has also been at the department for over 17 years, before this she had been working at the Swedish Meat Research Institute until it closed down, which was when she came back to the department as a contract researcher. She is retired and a "professor emerita" at the department, entailing that she has no formal obligations, supervising her two PhD students without receiving any salary for it. She does it because she loves it, going there almost every day. Eva is an entrepreneur who has had several spin-offs and is currently involved in one.

To represent the managerial level, we interviewed the head of the Food Technology Department, Yvonne Granfeldt. At the moment of the interview she had been at this position for the past two years, with her previous role being the head of one of the two subdivisions of the same department, until these were merged. In her current position she is responsible for everything that happens at the department regarding the employees and at the lab, as well as for the budget.

For the TTO's perspective, we interviewed Helena Ljusberg, a senior Business Developer at LU Innovation facilitating collaborations between academic and industrial teams. She described herself as working on the field helping people in different types of projects, mostly experimental. She is also an adjunct professor in Pharmaceutical Technology, more specifically, drug delivery and an associate professor at the Food Technology department with five publications. She has more than fifteen years of industrial experience in senior positions, keeping then a close connection with researchers and the industry as well.

Lastly, the LTH Faculty was represented by Charlotta Johnsson, who has held a senior position at the university since 2004. She is currently an associate professor at LTH within the Automatic Control department and the Faculty's vice dean in charge of external collaborations and innovations.

4.2 Data Categorization

Each interview was analysed according to the Entrepreneurial Architecture Framework by Nelles and Vorley (2010a) as defined in the second chapter, with each element of the framework used as variables. As mentioned in chapter three, part of the Gioia et al. (2013) methodology was used to establish first and second order themes. The following table presents the first order themes arranged by interviewee levels and variables from the Entrepreneurial Architecture, followed by the developed second order themes (from now on just themes) in each of these variables.

Level \ Variables	Structure	Systems	Leadership	Strategies	Culture
PhD Students	TTO, Spin-off's resources, Collaboration, Courses, Supervisor	Formal-Informal communication, Community support, Supervisor	Supervisor style, Role models, Communication, Competences	Industry collaboration, Applied research, Job placement, International Collaboration, Spin-offs	Spin-offs, Motivation, Working structure
Researchers	TTO commercializer, Research Group set up, Search for funding	Industry networks, Fika, TTO path, Missing support system, Missing formal sharing system, Missing system for master project development	Professors Initiators, Difficult department leadership, Department council	Main Goals Research & Education, Funding & Commercialization, Spin-off byproduct benefit	Acceptance of commercial activities, Freedom to explore this path, Spin-offs part of community
Department Management	Resources provided to Spin-offs, Collaboration, Course	Internal reporting, Community, Communication	Role models, The department as leader	Mission, Benefits from industry relationships, Spin-off perception	Community, Collaboration, Spin-off perception
TTO - LU Innovation	TTO role, Courses, Scarce resources, External support, Systems	TTO communication, Research overview, Industry networks, Community, Courses, Supervisors, Formalities, Motivation, Research overview.	Supervisors as role models, Spin-offs, Industry collaboration, Research initiatives	Industry collaboration, Applied research, Government objective, Placement of qualified people, Speed of technology transfer, Spin-offs	Community, Internal collaboration, Acceptance, Nature of research, Role models, Motivation
LTH	Structure reflects Strategy, Support Elements, Department resources	Managerial communication, Procedures to use department's resources, Support structures awareness	Collaborative leadership, Supervisors	Missions & Goals, Spin-offs, Motivational Environment	Spin-off acceptance, Motivational Environment

Table 02: List of First order Themes

4.2.1 Structure

When studying our interviews using the Structure variable we identified three themes:

The Technology Transfer Office – LU Innovation

The TTO is perceived differently within our group of PhD Students, this of course, is based upon their own personal experience. However, in this particular theme we found a lot of variance considering that some PhD students had never interacted with, or even heard of LUI while on the other hand some were completely aware of its existence, its role, and even in which way their peers were involved with this office. Going deeper into this theme with the

interviewees that were most informed, we discovered differences in their opinion as well, since some of them saw it as more supportive than others, who saw its perceived lack of proactiveness as a consequence of being under resourced.

> *"I think that LUI is under resourced. I don't know how do people, who are barely managing to handle these projects are going to be able to create some kind of cyclical system and routines" (PhD Student)*

This is supported by a remark our interviewee from the TTO, business developer Helena Ljusberg, made regarding her schedule being always packed and her not having any time. We can then guess that she was referring to the same understaffing problem.

Regarding our group of researchers, both professors perceived LU Innovation as the institution in charge of helping the spin-offs at the university, including those resulting from their department, among others their own. The TTO, rather than the department or anyone within, was perceived as the main facilitator of spin-offs. This was again supported by Helena since according to her, the TTO is the university institution that exists to help in the commercialization of technology in its various forms. They are the ones whose role it is to take students, researchers and professors by the hand and help them engage in entrepreneurship or the commercialization of technology.

As for the help they received, both researchers were very satisfied. However, one thought that it would be interesting if the TTO promoted itself more actively with seminars and he regretted that unfortunately all of the projects from a product development course at his Master's had only ended on his shelf and not gotten any further.

Lastly, our interviewee at LTH management level considered LUI as an important contributor to their effort to bridge the gap that she perceived existed between research and its introduction into society by any means, including spin-offs. But, in her opinion, there was still work to be done by LTH and the university as institutions to alleviate this.

Entrepreneurial course

Most of the PhD students mentioned courses, which some of them had taken, about entrepreneurship. These courses are given to them jointly with LU Innovation, but they need approval from their supervisor to actually take it since it is not mandatory. It was suggested

that due to constraints in their schedule and too much focus on their research, said courses should be compulsory, in this way giving PhD students more information about the actual possibilities they may engage in and making them aware of how much the existing structure can be of support.

Reinforcing this, our TTO interviewee also mentioned this course, organized in collaboration with other departments at the university to create awareness and motivate PhD students to engage in the different forms of technology commercialization. However, she believes that many PhD's supervisors do play a significant role in approving PhD students to take this course. This depends on the priorities set by the supervisor regarding the research, thesis, etc. representing thus a formal system of access to this information.

The department Head also mentioned this course, currently given by a researcher at the department. Although the course is aimed at starting a new company, she acknowledges there is no official communication of this course at the department, ultimately catering to people already interested beforehand in following this path.

This goes in line with LTH's view on the subject, being our interviewee's impression that most of the support structures existing at the university were mostly used by those who already had an interest in the area rather than the larger community.

> *"I think that there are a lot of good structures but I think that a lot of these structures are mainly used by the students or people, who have already an interest in this area."(C.J.)*

Resources provided to Spin-offs

The last identified theme were spin-offs and the resources made available to them. This time, the perception between our PhD students was somewhat more homogeneous as they recognised the department to be, in general, more supportive to spin-offs. There was also consensus in the fact that spin-offs, while widely supported, are neither forced nor hindered, so their fate is ultimately depending on the thrust of the researcher or idea generator at a personal level.

> *"I'm not forced and I'm not hindered but I know that the path is there and that they will support me if I wanted to…" (PhD Student)*

As a common factor in this theme for this group, was also the fact that the department was supportive in the resources made available for spin-offs. Some examples were repeated as for how equipment and materials were made easily available within reason always according to budget. Moving to non-physical resources, time was mentioned and appreciated as a valuable resource as well. Not without some controversy, a minor part of our interviewees stated that they perceived a difference in the support given to Swedish and international Students.

Following the PhD students' perception on time as a resource, the head of the Food Technology department, pointed at time as a valuable resource as well, as our interviewee approves for the researchers reducing their time at the department to increase the time dedicated to their spinoffs. Then she added for more tangible resources that both students and researchers at the department can use the labs and the pilot plant to test and develop their ideas. At the beginning they can pay a reduced rate or nothing for the equipment and then at a later stage move to the science park. Lastly, it was indicated that although resources allocated to spin-offs could be more, the university should not do it exclusively focusing on creating new companies.

To conclude, our interviewee from LTH thought that department's resources and usage should be open to initial testing of ideas, by any member at the department given that these are part of research per se. Nevertheless, there was a "grey zone", where testing ideas on an initial level was acceptable. On the other hand, if this were done with the purpose of financial gain it should not be free given that all resources should be there also other for external companies to use them on the same terms. The resources as such should be open to other people and not just the members of the departments and arranged so that they were used fairly and preventing any damage.

4.2.2 Systems

Regarding the Systems element, we recognised two main themes:

Formal-informal communication

As in every organization, the department has both formal and informal channels of communication. Conversely, several of our interviewees in the PhD level thought that the weight of the informal communications surpassed the counterpart using the more formal channels. The cultural Swedish Fika was perceived to play a vital role in the department's

communication system since it provides an informal channel for its members through which a considerable volume of information flows. Most of them also described a semi-formal Fika on Fridays which the department used to make communications and it was also noted that after it the most relevant information discussed is sent in English via email.

> *"I don't think there was a formal presentation, I think it's something you pick up when talking to people. So when there is Fika, socializing, or you can often read, people have maybe websites. And also I think with PhD students if there is one working with a company then you very quickly become aware of it because you're talking to them, a sort of word of mouth." (PhD Student)*

Both interviewed researchers shared this view as they saw a benefit in the departmental Fika which, even though informal, was perceived as an important element for the community. Eva for instance clearly stated that it was an excellent way to get new ideas.

Furthermore, Yvonne from the department's managerial level, had the same view of the department holding a vast amount of informal communication, with Fika playing a vital role.

> *"Fika is very important, everybody is there, we are also having lunch together and if you have just had a call or were reading something then you take it out and you never know where the discussion will go. You can do that if you're close in a not very large environment" (Y.G.)*

On the other hand, formal communications are done via email, both within the department and with external parties. Looking into general communication, she acknowledged the department was not doing a good job, particularly with their website which she qualified as a "disaster". This explained to her in a way the lack of communication of the aforementioned course, she reckoned this is, in part, due to the lack of budget to hire a communicator.

In addition to this, the TTO interviewee made an interesting remark regarding the informal network which existed with the industry. This network being connected through the former members of the department, such as PhD students and Master students, who often got back to the department through their former supervisors and the people whom they knew, to look for help or collaboration, contract research, etc. Internally she mentioned Fika as well, stating that members deal informally with the people whom they like and trust, but on the other hand they are very structured when it comes to research and education.

At the Faculty managerial level the communication is slightly more organized. Charlotta mentioned LTH has a dean and three vice deans, the four of them work together as a team, meeting frequently and getting an overall perspective. The Faculty management meets as well with the management of each department on a regular basis to assure the overall goals are aligned with the department's goals. However, each department still defines certain goals themselves.

Charlotta also though there should be certain formalities for collaboration with the industry, which also apply for those parties looking to make use of the departments' resources such as the labs and the pilot plant. Charlotta also mentioned spin-offs coming from the different departments already knowing about their department resources, so they can ask to use them and pay for the time used.

One remark both researchers made regarding the spin-off creation and other commercial activities was that they perceived that there was no system in place at the department. Instead, the common path was to contact LUI where a specific process was followed, which the two had experience with and had had good results with, so they saw working through the TTO as the correct way to channel one's personal interests in commercialization.

Community

Our second identified theme for the Systems element is the sense of community observed by the department's members. All our interviewed PhD students perceived the department to be very social to its members, acting as a community. Taking advantage of the informal flow of information within the department, the initial request for information regarding commercialization processes was done to colleagues in the same group, which acts as a first support structure. If this first approach failed then it was stated that much information was available at the department, but only on request.

We noticed the same view in the department's managerial level when interviewing Yvonne. She perceived the department staff to be very open and supportive to each other, acting as a community. Problems and opportunities were most often talked within the department and with each other before looking for external support at LU Innovation.

The previous notion ties in with Helena remarked, as the department communication and links are based on human relationships, describing how she saw the department as a "community". This is also reflected in the way the department behaves internally and engages with other departments and external actors with whom it works.

> *"…it's a community of undergraduates, graduates and senior researchers. In that community, several of the senior researchers have a known fair amount of how to be part of both working with the industry and start-ups." (H.L.)*

4.2.3 Leadership

Analysing the PhD interviewees using Leadership as variable led us to two themes:

Professors and Supervisors:

A greater part of our interviewed PhD students had the same perception about the existence of different supervising styles, some being closer and others more distant. It was pointed out as well that this fact is closely related to the relationship between the PhD student and supervisor, ultimately affecting the helpful disposition of the latter. However, a common standpoint was that all supervisors were in that role to guide but not help, in this way the PhD students are forced to learn on their own with the supervisor only suggesting different methodologies, giving in the end the achievement to the PhD student.

Industry experience, whether in an existing company or in an own venture was pointed out as a differentiator to what could be brought to the department by professors, researchers, and supervisors:

> *"I found out my best lecturers were those who had industry experience or their own companies, so they can pass on so much more information to students in those cases. It is because of the quality of your peers and the experience they can bring and share" (PhD Student)*

However, some lack of competences were also noticed, an example of this was one of the PhD students going through the entrepreneurial process of funding a company without support of someone who had done this before and could be of guidance step by step. In this way avoiding some mistakes or wasting time by doing things out of order.

The supervisor also was expressed to have a role in connecting the PhD students with external networks and resources both for their research and the exploration of their entrepreneurial ideas. In fact, several of the PhD students perceived the guidance to the TTO as something a minority of supervisors and professors did. The minority being those which involved themselves with the students more and were more interested in their progress and had an open mind to entrepreneurial activities, being also engaged in them.

Given the importance the supervisor has for the PhD students we then looked at our interview with the Department's head on this subject. The supervisors were seen by her as role models and were considered to be very important since they affect how people perceive their possibilities of commercialising technology. Many examples are good proof of the leadership when it comes to effective commercialization, such as collaboration with the industry and the many spin-offs which are currently co-existing at the department involving many of its members.

In the present days, any of the examples of company owners within the department can be considered role models for students to consider this path. In a more specific matter, she pointed at Federico Gomez, a researcher and supervisor at the department who owns a company and gives a course aimed at developing a product and starting a new venture. From outside the department, she mentioned Helena Ljusberg from LU Innovation for being helpful to the department and the researchers. Federico reflected on his own experience:

> *"I had never been a businessman. I was happy with a publication and then after suggestions came to patent it, I said: Why not! We did it always as a team, 8 to 9 years ago. The idea in fact came from the department professors." (F.G.)*

This subject came up while talking with Charlotta about role models within departments when it came to pushing technology, innovations and being entrepreneurial she said that these were to be found in various positions. For instance, academic supervisors as such were a group which could exert a positive influence to encourage their students.

> *"I think for example a supervisor can speak with a PHD student about it, and I think they should, and not only about the technical solutions but also what role does that technical solution have in the society, what is the need for that solution, how could we bring it out so that there are a lot of things that are not only the*

specific technical solution but that also should be discussed by the supervisor. I think that discussing those would help the students understand how he or she can actually do something with it." (C.J.)

Academic Leadership

Another interesting theme to notice was the department's head perception on the department itself, putting it as leader. According to her, it is often that the department plays an important role in consortiums driven by the industry with more than fifty partners, representing Lund University. She considers this to be key for reputation, after all, she reckoned, Lund University is within the 100 best universities in the world. This leadership was also present later when she mentioned she was being contacted by people from Linköping and Stockholm, giving us the idea that the department is considered as a good judge and point of reference. However, she regretted not being able to also help these people, ultimately helping the food industry and the society.

When we talked about goals with LTH's management, Charlotta highlighted the fact that academic leadership was in some aspects different from what she defined as industrial leadership. When it came to industrial leadership she indicated that strategy and goals were defined at the top but in an academic setting like theirs it was different, looking for collaboration and consensus within the different levels. According to Federico, internal politics and objectives got defined internally through the official department council where all the different groups within the department are represented, such as professors, management, PhD students, etc. Something that also one of the PhD students and the department head highlighted.

For Charlotta, this difference stemmed from the origin of funding, which to a great extent came also from researchers and research projects, thus it was necessary to enter into a bidirectional dialogue about goals in a collaborative setting. She compared the leadership style to that of a volunteer organization since they, as management, did not have money as a means of control like at companies. Their leadership therefore was more about "engagement and driving from an ideological perspective" (C.J.).

4.2.4 Strategies

Studying the interviews with the focus on the element Strategies, two clear themes became present:

The department's goal, funding and technology transfer

When going through our interviews with our PhD students considering this theme, we found that industry collaboration was highlighted by all of them, which was considered to be "exemplary" in the way it engaged with the industry. It was common in the eyes of all of them to see companies at the department and actively involved in meetings and participating in research and that the department derived funding from this.

> *"I think that their point of view is exemplary, therefore they work directly together with companies and obtaining financial backing from companies…"(PhD Student)*

When we asked the researchers about the perceived goals of the department, both interviewees cited research and education. Eva, however, added funding and elaborated on the topic of spin-offs, which both considered to be a welcomed by-product of the daily work. She also pointed the management as being very much concerned with obtaining funding to finance the other two goals. However, regarding commercialization of knowledge, she perceived the department to be especially focused on start-ups.

> *"… Start-ups is the main thing within the commercial side." (E.T.)*

Surprisingly, the department has not set up a mission and vision, however, our interviewee representing the department's management stated they have clear focuses.

> *"We don't have set up any mission and so on. Now we are focusing on the global challenges, food and health, security, and sustainability."(Y.G.)*

Our TTO interviewee repeated and underlined several times that the most important goal the department had, was to collaborate with the established industry through applied research projects to bring technology as fast as possible into society. For her, the work in applied research in collaboration with the industry was the purpose that the department was pursuing in line with what was expected from universities by the government. The department was

doing what it should be doing, the goal is not to set up spin-offs, but to get the technology out as fast as possible. This was mostly done through already existing companies, achieved through the applied research in collaboration with the industry through the mentioned collaboration programmes as well as contract research done by the department.

The three missions were mentioned as well by Charlotta Johnsson, according to her, LTH has three goals, to provide basic education up to master level, to have an outstanding performance in research, and to interact with society. For the third goal she considered this was done by technology transfer, innovation and external collaboration. However, she recognized these goals interrelate with each other and this was reflected on the Faculty's organisational structure. Each goal is represented by a vice dean all working together and interacting with each other and with the Dean towards the Faculty's vision, being the leading Faculty in Engineering.

Spin-off perception and benefits:

The creation of spin-offs as such within the department was also perceived as an objective, even though one of lesser importance, by two of the five PhD students, since it was described as "not forced and not hindered". According to these two, the main incentives, which they saw that the department offered and supported this view of theirs, were the many examples which already existed, the freedom and easy access one had to resources within the department and the possibilities for support that were available if you had an idea and wanted to explore it. However, one PhD student who already had a spin-off, added that having a system for researchers being able to have some more spare time to work on their own spinoffs, while still earning their same salary would further incentivize spin-offs. Both of our interviewed researchers considered spin-offs as a beneficial by-product, and thought they were accepted because they strengthened the department's image.

The department's management deemed the reputation brought by the many successful examples of industry integration, whether it is through spin-offs or contract research, to be a beacon for students from all over the world. This influx to the department generates the proper environment to create new ideas for new applications. Another benefit she saw was the personnel at the department whose salary is paid by the industry or spin-offs, at the moment four adjunct professors and two adjunct lecturers. The professors sit at the department twenty percent of their time, which makes it once a week, to work at the

department making lessons and giving lectures, ultimately bringing industry knowledge and experience to the department. In this line, there are also PhD students whose tuition was being paid by the industry or even by spin-offs coming from the department.

Although she perceived that they do bring the department some benefits and she stated the department is doing a lot to support them, she remarked this help should not be too much. Entrepreneurship should not distract from the other two goals, research and education, an equilibrium is needed. Ultimately, this interest should come from within, as she observes some people much more eager to start a new venture than others.

Viewed from the TTO's perspective, spin-offs are good when the technology is too innovative for an existing company:

> *"It's not that they prefer something, it's more like getting innovation out ASAP and in some cases if it's technology that is novel, like Federico's, then they start a company because it doesn't fit into an existing company." (H.L)*

She perceived the department does sufficient to incentivize such spin-offs. Their attitude, the current support and structure are sufficient, with several examples of entrepreneurs to prove this at the department, like Eva Tornberg and others who are running companies.

As for the Faculty's view, Charlotta stated that spin-offs were not an explicit goal, but rather something that happened because of an individual's own drive. She perceived starting a company around research as positive, though she acknowledged many researchers consider this to be a big risk. From her point of view, researchers consider the time investment required to be too much for the risk involved, comparing it to for example writing journal articles, whereas if they fail as entrepreneurs, this process may not be considered a positive thing. Her reflection on this was that the acceptance of the entrepreneurial process and failed attempts could improve.

Being the learning acquired through the process an incentive on its own, she considered further incentives should be made more explicit and with less risk for researchers to engage in non-academic activities such as spin-offs. It was her belief that creating explicit incentives to create spin-offs should also be the department's role, since it can benefit from the spin-offs as a trademark, showcasing the department as being the source of success.

4.2.5 Culture

Lastly, using our defined Culture element two new themes came up:

Spin-offs as part of the department:

It was pointed out by the whole group of PhD Students that professors and researchers owning companies was a well-known and seen fact. However, it appeared that they do not openly talk about their own companies unless asked. At a more personal level, it was mentioned by one interviewee that starting a company is a way to demonstrate that one has actually done something with the PhD, and lack of commercialization was viewed as a flaw by another one.

For the researchers, the department's acceptance of commercial activities was considered to be evident in that it engaged in many activities, which had either a direct commercial purpose, such as the development of a product, or that they had links to the industry such as contract research. Links with the industry in fact was something that the two indicated that they all had. When it comes to freedom to explore entrepreneurial activities the two interviewees expressed it in the following way:

> *"Well, they do not make it difficult so to say. You have the freedom to do it. You can do other activities. The percentage allocated for it is what is officially on the paper, but if you do your work and perform, it is more how you distribute your time, there are no restrictions from this side." (F.G.)*

> *"Yes, they don't hinder, but they don't care, they care about the science, the budget and the education." (E.T.)*

However, this was not always like this, according to the department's head, there was a change in the department's perception on Spin-offs. This change was towards working closely with the industry and helping researchers with their own ideas. This new paradigm was later capsized to the departments in a process that took over twenty years. Through time they went from being negatively perceived to viewed favourably and being well accepted.

> *"When I was a PhD student, in that time it was not so well seen that the researchers had their own companies and took time away for that. But it has changed totally, nowadays we don't look at it that way."(Y.G.)*

However, she accepted spin-offs eventually depend on the idea originator, with some being more eager to follow this path than others. The department doesn't consider them as a purpose, but they provide them with help if sought, thus not pushing nor hindering their development.

The TTO shares this view of spin-offs being part of the department. When talking about the community within the department, Helena mentioned that spin-offs are a regularly conversed topic during Fika time, where this is discussed with an open mind-set as adults and in collaboration.

Motivational Environment

In a general consensus, our interviewees at the PhD student level perceived the number of entrepreneurs within the department to be a good means of becoming aware of this possibility and as an incentive to consider this option. Part of this group of interviewees belonging to the sandwich program were aware of some cases of former participants of this program setting up their own companies, giving assurance to this program students that this is, in fact, possible. This was also the case for the business developer, who thought the many in house spin-offs acted as role models, since they were proof of it and incentive enough to consider them as a good option by its members. Nevertheless, it was also stated by several PhD interviewees that ultimately, motivation comes from within, fact is that one of them clearly stated that she was not made for entrepreneurship and she loved the academic environment.

This goes in line with our interviewed researchers' perception, both agreed that the internal motivation to become an entrepreneur had to come from yourself but that there were two elements necessary for this: acceptance of commercial activities and freedom to explore the spin-off path.

For Charlotta at LTH, two environments mattered to motivate people to become entrepreneurs. The first was one's private and the second your professional surrounding. The key for her was being exposed to examples and perceive a positive and accepting attitude for it. She believed that it was a combination of both contexts, but in case that one did not have these examples in the private context, the department could trigger this motivation. She elaborated on her previous perception of hers when we asked if she considered departments as playing an overall role in encouraging spin-offs:

> *"I think that for each individual, the environment a person is in has to be positive to spin-offs, and the less positive the environment around is the less are the chances that you pursue something..." (C.J.)*

She then added that students at a master level are also coming with ideas with potential market applications that could also benefit from this motivational environment from an earlier stage.

The point made by Charlotta and many others that the environment was important in creating the awareness, that ignited the inner motivation was also clearly highlighted by Yvonne. Yvonne gave two professor examples that underlined the different interests or needs for fulfilment of these academics. The first, not interested at all in creating a business out of research, and the other very motivated to do so. The first example also happened to be mentioned by most of the PhD students as an intellectual eminence, devoted to his work and helping the students with their research. The other example was also mentioned as an example of a professor who was helpful and interested in discussing the market potential of ideas, also considered a motivator to engage in spin-offs.

5. Analysis and discussion

We will now proceed with the analysis, testing the Entrepreneurial Architecture framework using our main findings and looking at these in relation to our research question:

How do the different stakeholders perceive the department, in general, encouraging technology commercialization through spinoffs?

Given that Nelles and Vorley (2010a) claim that the concepts of the framework have to be taken into account and looked upon in relation to each other to capture the complexity of the phenomena we will now continue with this task.

5.1 Stakeholders' Roles, Perspectives, Influence and Leadership in the Studied Context

In order to be critical when looking at our research question we have to first think of the different stakeholders themselves and their role, inside or outside of the department, to better understand their point of view.

> *"Truth is relative and that it is dependent on one's perspective."*
> *(Baxter & Jack, 2008, p. 545)*

Depending on their role and obligations, they have different priorities and influence that very likely shape how they ultimately perceive and think of the department, its role, what it does, what is important, and its effectiveness doing what it should.

Therefore, if we look at the different levels of analysis there are basically two groups. The "influencers" and the "influenced". The "influencers", in this case the management of LTH, the department, and the TTO, who want the researchers and students to engage in Third Mission activities. Each one of these groups being different in the form of influence they have, and the behaviour they adopt to implement their objectives. The "influenced", are those who are expected to do as is expected of them, which in this case would be the researchers and students.

By looking at the interviews, and more specifically at the themes on Strategy and Leadership, we clearly see the relevance of funding interdependency of the different stakeholders. In our

case the different parties are very dependent on each other, since they all contribute funding. Our interpretation is that LTH supervises the Department's budget and distributes a certain amount of funds insufficient to cover all the expenses. With these resources the department pays salaries and funds research and education. In collaboration with their researchers the department works to obtain funds to cover the rest of the budget.

As already mentioned, in the case of research funding, over 70% comes from non-public sources (Borlaug & Jacob, 2013) mostly companies, however the way we understand it the researchers themselves are the channel for most of it from the remarks made by Charlotta and Yvonne.

This characteristic in our eyes, sets the base for much of the complexity in establishing goals from the top and is the raison d'être of a collaborative academic leadership style as indicated by Charlotta, from LTH with the department and the department with its members. Leadership style being a result in our opinion to the situation (Burns, 2008), and contextual due to the consensus approach that is so common in Sweden (Lämsä, 2010).

5.2 Strategy

Academic leadership influences Strategy and Structure, as well as the decision-making process, which is shown by the department council with a representative of each group. It is a decision-making structure or organization process created that also influences culture (Burns, 2008). In this case through this structure the leadership is accommodating of its integrants' goals and perspectives.

The fact that there is no uniformed goal or vision as expressed by the different interviewees, and the two by comments by Eva regarding the department management's funding goal, in addition to the impossibility to enact a common vision, let's us make an assumption in this respect. It is very likely that the fostered academic leadership style also allows for many personal research agendas. Individual researchers or groups seek funding for their own areas of interest, joining forces with the department, achieving their personal objectives, aligned through the common need for funding. In essence, they all win from helping each other as a team, the researchers interested in research per se and the department in research and education, for which funds are needed and commercial activities are the tool to obtain them.

Accommodating the interests of its members and creating win-win solutions is reflected also in the acceptance and positive attitude shown towards spin-offs. In fact, most of the interviewees in all groups assigned great benefits to hosting spin-offs at the department which were: additional in house experience, generation of ideas, reputation, industry relevance, success indicator, keeping good academics close, branding for international students, and finally also funding. In Yvonne's words a "win-win" when she mentioning for example Eva's role and contribution as professor emerita supervising two PhD students and the benefit she gets from working with students on her company's problems.

Nevertheless, Charlotta and Yvonne also agree on the following remark, that spin-offs are a good form of tech transfer, but are more of a by-product, not being the main objective of the department. This is supported by Göktepe-Hultén (2010).

However, the fact that there are many spin-offs at the department and that it is perceived as natural and beneficial shows the full acceptance of this activity. This is key since it reflects the attitude that now permeates the department towards spin-offs and commercialization in general.

5.3 Systems, Community and Structure

When analysing the Systems element through the different perspectives it is evident that most agree on the importance of informal communication systems, which are especially represented by the traditional Fika. Fika is where conversations happen, it is seen as an important meeting place for relevant department news, such as new opportunities for projects, obtained funding, solving problems or creating new ideas. Fika is a meeting place where things happen in a relaxed social manner and you can address anyone. It is in fact, another organizational process, which adds to the culture (Burns, 2008) since it is a form of social routine that contributes to the open flow of communication. A flow however, not very structured and controllable, something that for example Federico misses, and would like to have for internal research sharing, as he knows is being done at other departments.

The Community, very much like the word, is a community of adults who collaborate and work together, based on trust and relationship both inside and outside the department including former colleagues and students who already left the department. A community that spans outside into a network with the industry. Federico, in fact, highlights this point by

saying that everybody has this network and it explains much of the collaboration with the industry. This comes naturally, since many in the industry are, in fact, former members of the community.

The industry as such connects with the department in exchange for funding, master theses, possible job openings, associate professors, industrial PhD's, etc. and can use the department's resources, experience, and collaborate with it on projects. Again, a win-win situation for all the parties involved.

Another example of this informal sense of community, but dependent on the individual, is the willingness to help others in the sense that Helena underlined. Interaction is very much social and based on trust and liking, as it happens in any human relationships, which also may explain why one of the PhD students possibly may have felt somewhat excluded, this however, is possibly due to him defining himself as not very social.

Professors, and specifically supervisors, in the eyes of the PhD students played a significant role besides the academic. Most PhD students saw them as motivators helpful to explore ideas, discuss commercialization possibilities and careers options. An example of this is how Yvonne made it possible for a professor at the department to reduce her involvement at the department to test out her ideas and become an entrepreneur to set up a spin-off which is now also at the department. Again, accommodating and obtaining a win-win for all parties.

In addition to this the department resources, such as the labs and the pilot plant were perceived as great tools to test out ideas by the PhD students who referred to them. The way they say it, the possibility to do prototyping and actual testing of their ideas was seen as a great advantage and unique to have at the department. The way how the department makes use of all its resources is remarkable, since they are available to its current department members for free to test ideas and later at a reduced cost if they want to engage in entrepreneurship. This characteristic is significant since it reduces the risk and capital expenditure for a potential spin-off tremendously something that Yvonne also refers to and is mentioned. This characteristic of daily used resources which double up as prototyping structures is remarkable and likely to be very difficult to replicate at other departments, but nevertheless a great incentive to try out ideas for those at the department.

5.4 Motivational Environment and Culture

To better understand why many of the interviewees, independent of the group they belonged to, perceived the department, in general, as encouraging for spin-offs we studied the different connections and tested the core statement from Nelles and Vorley (2010a) that these were all linked and supportive of each other making a visual analysis as shown below.

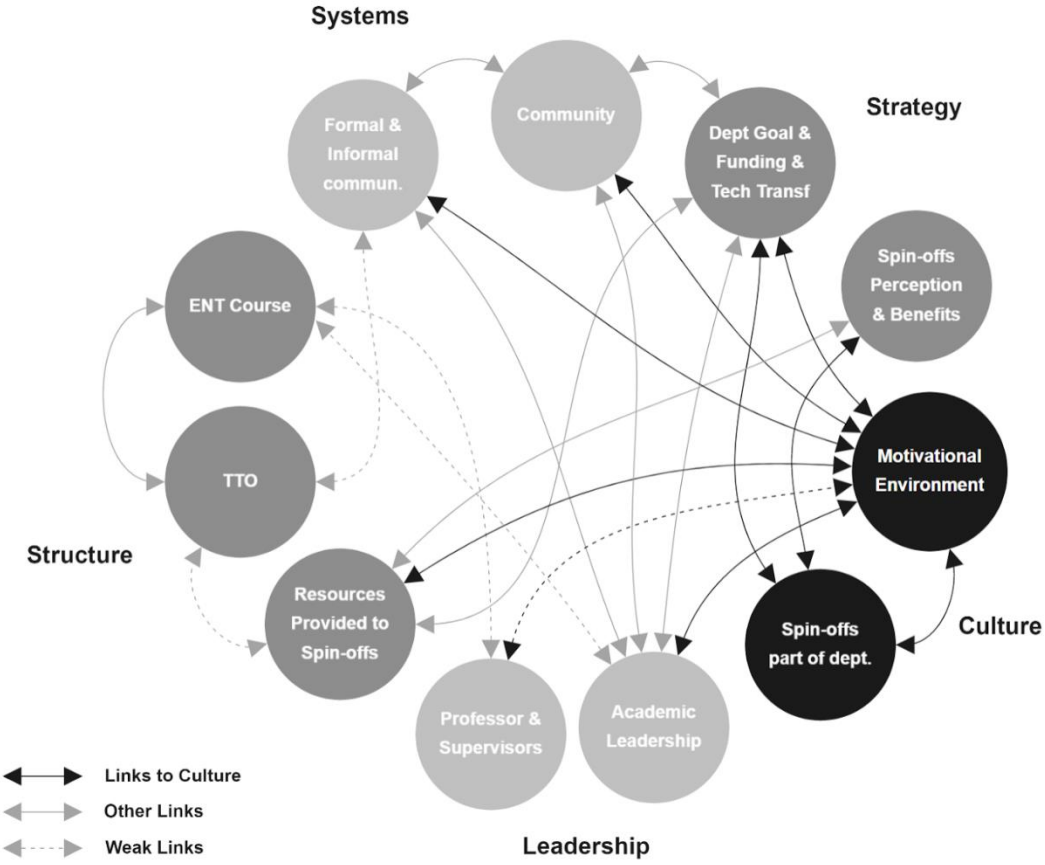

Figure 03: Connection between Element's Themes

From this figure there are two things to highlight. First, all the different Elements are connected to each other, whereas some themes are not. The disconnect of the Entrepreneurial Course and the TTO can be explained, since neither one is perceived as an essential daily element within the department community, but only tools to engage in entrepreneurship, a welcome by-product but not a priority as expressed by Yvonne. In addition to the fact that, possibly due to lack of resources, the TTO's communication does not seem effective or proactive.

Second, the most connected elements are Leadership and Culture, out of which the themes are Academic Leadership and Motivational Environment. Academic Leadership defines the Strategy element, since the leaders define the goals to reach their objectives, but also how people communicate and treat each other (Systems), what is good and what is bad , in essence what the values are (Burns, 2008), influencing the Culture element and in this case creating the Motivational Environment, where Spin-offs are welcome, people have access to resources, freedom to test their ideas, and an opportunity at a lower risk to engage in creating their own business.

All the above, create the foundation for the Culture within the department and make it a motivational environment that "neither forces nor hinders" (PhD Student) the creation of spin-offs. The department as such, can be seen as exemplary as an environment where personal interests are respected, tried to be accommodated, helped and developed in the shelter of a group of people, who are connected through common interests, social ties, and not strict bureaucracy.

6. Conclusion and Implications

6.1 Conclusion

One of the aims of this study was to test Nelles and Vorley's (2010a) Entrepreneurial Architecture framework's flexibility and applicability. In this regard, we consider the framework to be, in fact, applicable. Moreover, its flexibility, and consequently, its adaptability to the organisation in our study allowed us to better understand the case and manage its complexity. Giving the framework a pragmatic approach and using it as tool to analyse how an organisation works, also let us conclude that each of the Elements in the framework works, in reality, interlinked with each other, in concordance with Nelles and Vorley (2010a). This sometimes makes distinctions between them more a subjective rather than an objective matter.

This interplay of the elements leads us to our second conclusion, that the Department fosters spin-offs and, under several Elements, can be considered exemplary in this. The studied department plays an important role in general motivating people to engage in entrepreneurship through creating the awareness, offering support and resources, provided they want to explore the entrepreneurial path and create their own spin-off. Much of this has to do with the department's Culture itself. Some of the identified key aspects for this, as discussed in the previous chapter, are the acceptance of spin-offs at the department and the overall facilitating and motivational environment. Excluding the problem described by Borlaug and Jacob (2013), that some researchers do not commercialize their work because of disapproval from colleagues.

Some of these key aspects can be arranged according to Maslow's (1943) hierarchy of needs, starting by the more basic needs at the bottom, such as the physiological needs and moving upwards towards self-fulfilment needs. These aspects, coupled with the interconnected Elements of the Entrepreneurial Architecture, shape what we consider to be the motivational environment in the department for the creation of spin-offs:

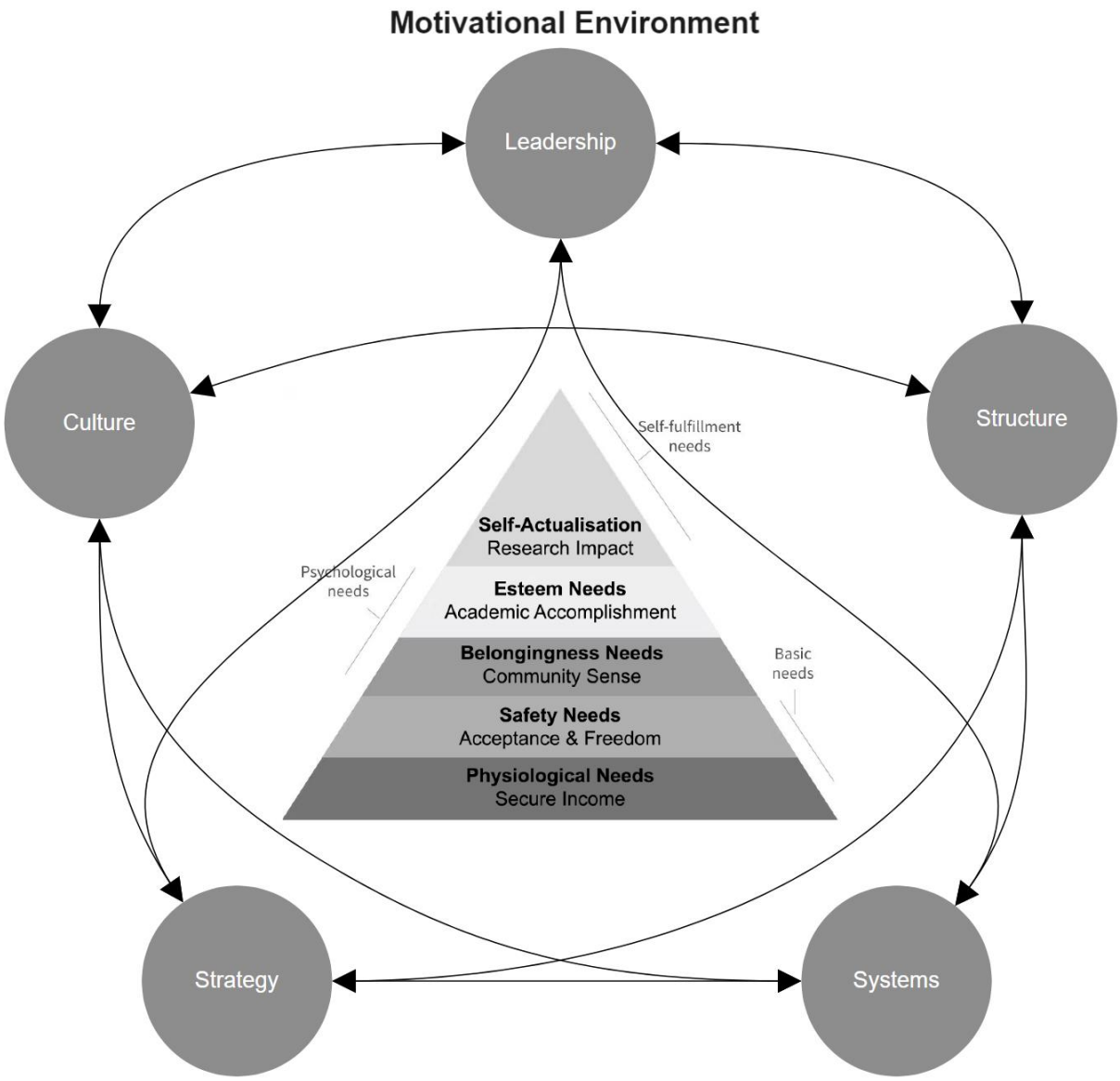

Figure 04: Motivational Environment for Needs with Interlinked Elements.

When looking into the components forming the hierarchy of needs for the motivational environment it is interesting to consider what each of these components actually mean. At the base level, all the staff at the department, including PhD students and Researchers, receive a salary (Borlaug & Jacob, 2013), securing an income and therefore what we consider to be comparable to the physiological needs.

Moving up to the following two levels, we find acceptance to a wide variety of projects, including spin-offs, the freedom to pursue them, and the sense of community within the department. From our interviews, we concluded that these two components are deeply embedded in the department's culture. The Department at all levels allows for all types of

industry collaboration and commercialization, and although at some levels spin-offs may be considered a by-product, they are accepted as well. The sense of community was widely described and identified by all our interviewees at the department, with the addition of the external TTO, since each member perceived an extensive support from the group within the department.

Next, Academic Accomplishment, inferred in this case as academic publications. This, even though it was not one of our main themes, was mentioned by several PhD students in admiration of specific professors at the department, which also happened to be entrepreneurs and excelled at academic publications. As pointed out by Wigren et al. (2011), there is a positive correlation between researchers engaged in knowledge transmission and their scientific output. This is a challenge both faced and craved by people at the department.

Lastly, Research Impact can be understood as a new theory or practice that can be capsized into the market or industry, shifting an existing paradigm. This would be the last step towards the commercialization of research or an idea, and it is deeply tied with the personal desire of reaching this stage and goal (Borlaug & Jacob, 2013).

6.2 Implications for Practitioners and Researchers

To conclude, we would like to reflect on what it would take to leap from one level to the next following the spin-off path, what constructs are in place now to facilitate this, and what would be needed if entrepreneurial activities wanted to be further incentivized.

Starting by the first level, having a system providing researchers spare time while earning their same salary to focus on their spin-offs could create the necessary conditions for people to contemplate taking the entrepreneurial path at an early stage. This was pointed out and suggested by one of the PhD students we interviewed and it is supported by Borlaug and Jacob (2013) when they argue this is one of the risks to overcome.

As previously stated, the two following levels are significantly covered by the department, with the culture it promotes and how its members interact. However, the Academic Accomplishment level raises an interesting opportunity. It was mentioned at the PhD student level and then at the Faculty management level in our interviews that part of the risk is that failure at an entrepreneurial process is not perceived as a positive thing. To put it in other

words, there is no academic reward system (Wigren et al. 2011) to foster trying the entrepreneurial path. As there is evidence supporting that entrepreneurial attempts resulting in failure can be indeed valuable (Politis & Gabrielsson 2009), we believe that this would be an important fact to take into consideration.

The top of the pyramid, as mentioned, is related to a personal desire and ambition. This was supported by several of our interviewees stating that this motivation to take the final step has to come from within. However, we consider this can be improved by working on the awareness of this path. But then again, as stated in the beginning of this section, this ultimately depends on the goals of the Institution and if there is a desire to further incentivize entrepreneurial activities. As it was mentioned by the Department's management, entrepreneurship should not distract from the other two goals, an equilibrium is needed, the interest has to come from within.

To conclude, we would like to remind the reader that this study refers to one unique case at one department and therefore the findings may be difficult to extrapolate. Some conclusions, however, may provide valuable information applicable to other cases.

For further research, in line with Nelles and Vorley (2010a), we propose the Element of Culture, but focusing specifically on its connections with Leadership. Furthermore, we think it would be interesting to conduct studies looking at commercial activities performed at departments considering which of them require a TTO and which do not, but also bearing in mind those activities benefitting departments as a group and those only benefitting individuals. We underline this point since it may lead to interesting conclusions both for academics and practitioners, and maybe, once these questions have been answered, it will make it easier to create environments such as the studied department. An environment where personal interests are respected, tried to be accommodated, helped and developed in the shelter of a group of people, who are connected through common interests, social ties, and not strict bureaucracy. In this way making departments and universities more successful in the distinct activities part of the "Third Mission" but especially in the creation of spin-offs.

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Appendix

A01 - Interview Guide – Researchers and PhD Students

Department Researchers and PHD Students

	QUESTION	ELEMENT
1	Please introduce yourself, state how long you have been at the department, your role, and what you do and your responsibilities within the department?	INFO
2	How would you describe the departments objectives, mission and goals, regarding research, education and technology transfer? Who do you think is in charge of these?	STRAT
3	Do you think that the management is commited to all these goals? - How come?	LEAD
4	Do you think that the department is working towards a long term vision? - How come?	LEAD
5	What about commercial activities as a department are they important? How did you know about them? How often have these been communicated to you?	STRAT
6	Which do you believe are the activities that it engages in and encourages its members to engage in? Are spin-offs one of them? Why so?	STRAT
7	Are there any people involved in Spin-offs right now? What do you think of this?	STRAT
8	What do you think made them consider this option?	STRAT
9	How do you feel about this option?	CULT
10	Do you think that there is good collaboration between the department and you? Why?	SYS
11	Do you feel that the department has incentives to foster spin-offs?	STRAT
12	Would you describe the departments as contributing proactively to this?	SYS
13	What options does the department offer to engage in this activity? What do you think of this?	SYS
14	How do they communicate them?	SYS
15	How would you describe the resources that have been dedicated to this effort by the department?	STRUC
16	Are they sufficient? Why?	STRUC
17	Do you feel that the department makes it easy or offers incentives for someone to engage in this activity? Why?	SYS
18	Are ther any formalities that you know of that one must comply with do do so? What do you think of this?	SYS
19	Is the option of starting or engaging in a new venture while at the department openly discussed?	CULT
20	Do you know how many are engaged in companies right now? What do you think of this?	CULT
21	How open and supportive are the department and its members to this activity?	CULT
22	Would you say that the necessary structures are in place at the university and the department to encourage the creation of spin offs?	STRUC
23	Do you perceive that in the department people are eager to help you with your ideas and connect you with others who can help you? Why?	CULT
24	Do you think that there the collaboration between the department and the TTO is also focusing on spin-offs as such? Why?	SYS
25	Does the department have connections with other departments or institutions that you have been told about and believe that could help you with this?	SYS
26	Do you think that the department and its members in general play a role in encouraging technology spin-offs? Why? Are there any specific persons you would see as role models?	SYS
27	How can the department make a difference for you to consider this option?	SYS
28	Do you think that the department should take greater part in encouraging spin-offs? Why?	STRAT
29	Is there anything else you think that I should have asked you regarding this topic?	Open

A02 - Interview Guide - Department Management

Interview Guide

Department Management

	QUESTION	ELEMENT
1	Please introduce yourself, state how long you have been at the department, your role, what you do and your responsibilities within the department? Are you doing any specific research? How much time do you spend researching?	INFO
2	Could you briefly describe how the department organized? Who does what?	STRUC
3	How would you describe the departments mission and goals, regarding research, education and technology transfer? Who and how are they established?	STRAT
4	Do you think that the management is commited to all these goals? - In which ways?	LEAD
5	Do you think that the department is working towards a long term vision? - In which ways?	LEAD
6	What about commercial activities, like contract research, consulting, etc. as a department are they important for it? Why? How do people know about them? How often are these communicated?	STRAT
7	Which believe are the activities that the department engages in? Encourages its members to engage in? Are spin-offs one of them? Why so?	STRAT
8	Are there any people involved in Spin-offs/Start-ups right now? How many? What do you think of this?	STRAT/CULT
9	What do you think made them consider this option?	STRAT
10	Is there anyone in the department to discuss this type of option if one is considering it? Is there any formality involved in this?	SYS
11	Does the department have incentives to foster spin-offs? Why?	STRAT
12	Would you describe the departments as contributing proactively to this?	SYS
13	What options does the department offer to engage in this activity are there any incentives systems in place? Do you perceive that it is made easy? What do you think of this?	SYS
14	How do they communicate them?	SYS
15	Have there been any specific department resources been dedicated to fostering spin-offs? How would you describe the resources that have been dedicated to this effort by the department? Time, freedom, support, information sharing, outside connections, etc?	STRUC
16	Are they sufficient? Why?	STRUC
17	Is the option of starting or engaging in a new venture while at the department openly discussed?	CULT
18	How open and supportive are the department and its members to this activity?	CULT
19	Would you say that the necessary structures are in place at the university and the department to encourage the creation of spin offs?	STRUC
20	Do you perceive that in the department people are eager to help each other with their ideas or help connect others with people who could help? Why?	CULT
21	Does the department have connections with other departments or institutions that you believe help with this?	SYS
22	Do you think that the department and its members in general play a role in encouraging technology spin-offs? Why? Are there any specific persons you would see as role models?	SYS
23	How can the department make a difference for others to consider this option?	SYS
24	Do you think that the department should take greater part in encouraging spin-offs? Why?	STRAT
25	Is there anything else you think that I should have asked you regarding this topic?	Open

A03 - Interview Guide - Business Developer

Interview Guide

LUND INNOVATION (TTO) BUSINESS DEVELOPER

	QUESTION	ELEMENT
1	Please introduce yourself, state how long you have been at the department, your role, and what you do and your responsibilities within the department?	INFO
2	Do you perceive that the department shares your objectives regarding technology transfer? What about the faculty's?	STRAT
3	Do you think that the department is working towards a long term vision which includes technology commercialization? - In which ways? Spin-offs?	LEAD
4	Which commercial activities do you think that people within it engage most often in? Are spin-offs one of them? Why so?	STRAT
5	Are there any people involved in Spin-offs right now? What do you think of this?	STRAT
6	What do you think made them consider this option?	STRAT
7	Who do you perceive people talk to in the department to discuss this type of option before coming to you?	SYS
8	Would you describe the departments as contributing proactively to this?	SYS
9	What options or help does the department offer to engage in this activity? What do you think of this?	SYS
10	How do they communicate them?	SYS
11	How would you describe the resources that have been dedicated to this effort by the department? Are they sufficient? Why?	STRUC
12	Are they sufficient? Why?	STRUC
13	Do you feel that the department makes it easy or offers incentives for someone to engage in this activity? Why?	SYS
14	Would you say that the necessary structures are in place at the university and the department to encourage the creation of spin offs?	STRUC
15	Do you perceive that the departments culture is open to the creation of spin off?	CULT
16	Do you think that there the collaboration between the department and the TTO is also focusing on spin-offs as such? Why? Are there any systems in place for this?	SYS
17	Does the department have connections with you and other departments that you know and which contribute to this purpose?	SYS
18	Do you think that the department and its members in general play a role in encouraging technology spin-offs? Why? Are there any specific persons you would see as role models?	SYS
19	How can the department make a difference for others to consider this option?	SYS
20	Do you think that the department should take greater part in encouraging spin-offs? Why?	STRAT
21	How many researchers take the courses about technology commercialization?	SYS
22	May it be possible to get access to the powerpoint presentation or the material of the course?	SYS
23	How often is the course offered?	SYS
24	Is there anything else you think that I should have asked you regarding this topic?	Open

A04 - Interview Guide - LTH Faculty Management

LTH Faculty Mgmt

	QUESTION	ELEMENT
1	Please introduce yourself, state how long you have been at LTH, your role, what you do and your responsibilities?	INFO
2	How would you describe the faculty mission and goals, regarding research, education and technology transfer? Who and how are they established?	STRAT
3	Could you briefly describe how the faculty is organized as an institution? Who does what?	STRUC
4	Do you perceive that the faculty is working towards a long term vision? - In which ways?	STRAT
5	How commited are they to these goals? - In which ways?	LEAD
6	Are these goals translated to the individual departments within LTH or do they have their own? Are they evaluated in any way?	STRAT
	Do you know the department of Food Technology, Engineering and nutrition in case that you do not whenever we say department we mean departments in general.	
7	How would you describe the different department mission and goals, regarding research, education and technology transfer?	STRAT
8	What do you think of their involvement in commercial activities, like industry collaboration, applied research, etc.?	STRAT/CULT
9	What about spin-offs? What do you think of this?	CULT
10	What do you think makes the people consider this option as a department?	STRAT
11	What about as individuals?	MOTIV
12	Do you think that there are any incentives systems, or formalities in place? Do you perceive that it is made easy? What do you think of this?	STRAT
13	Do you think that is is part of the role of the department to do this? Should they be encouraged more?	SYS
14	Do you think that the department and its members in general play a role in encouraging technology spin-offs? Why?	SYS
15	Are there any specific persons you would see as role models or leaders for this?	LEAD
16	Is there anyone in the department to discuss this type of option if one is considering it? Is there any formality involved in this?	CULT
18	Is the option of starting or engaging in a new venture while at the department openly discussed?	CULT
17	How open and supportive are the department and its members to this activity?	SYS
18	Would you say that the necessary structures are in place at the university and the department to encourage the creation of spin offs?	STRUC
19	Is there anything that could be improved to in how the different elements collaborate to reach common goals?	STRUC
20	Is there anything else you think that I should have asked you regarding this topic?	Open