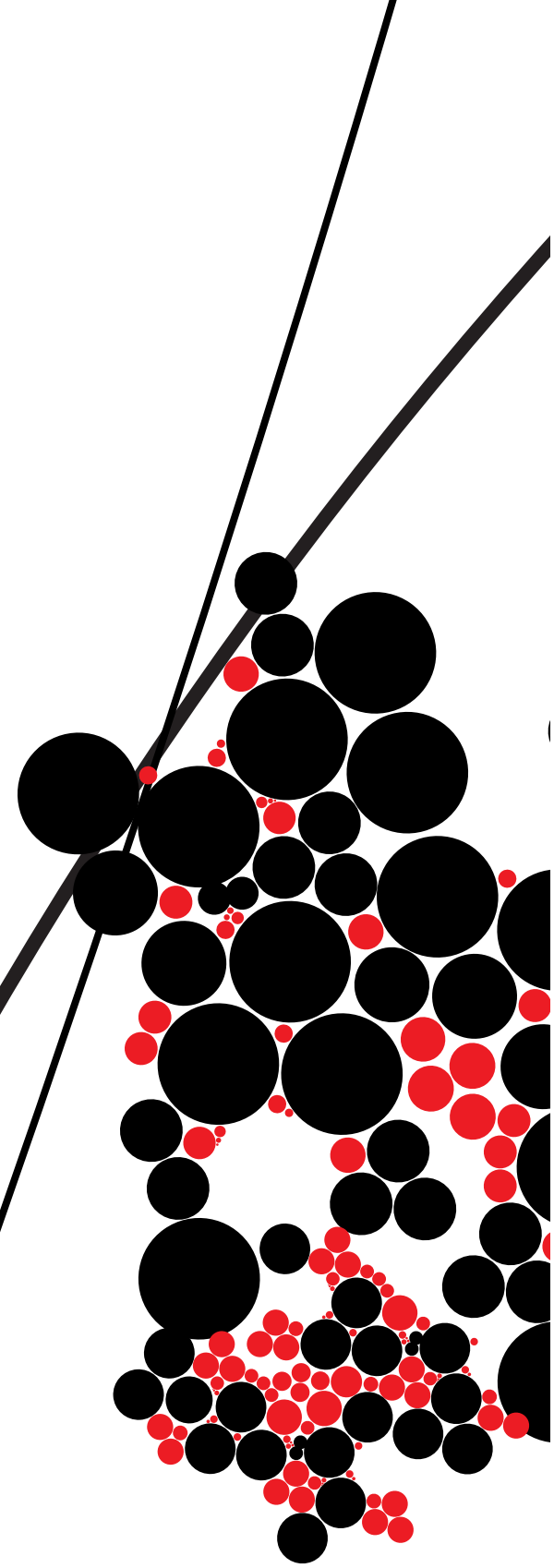

MASTER THESIS.

THE INFLUENCE OF ACADEMIC SUBCULTURES ON RESEARCHERS' INTENTIONS TO START A SPIN-OFF.

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Foreword

Academic subcultures, intentions and spin-offs, three main issues in this study. As a Public Administration Master's student, there are many objects interesting for research. Therefore, the search for a thesis subject was extensive. I have always been interested in entrepreneurship, maybe because of my farmers' background: having an own company is very normal in my family. Studying spin-offs was a logical choice, as I also am interested in higher education.

Nevertheless, I wanted to combine this field of research with my own interest in academic subcultures: the difference between technical ans social sciences. Although I study public administration, I am an active member of the Electrical Engineering study association Scintilla, where I was introduced by friends. By becoming active within the association, I started noticing the differences in culture between my own field of study and theirs. This was the start of wanting to study this difference in culture in my thesis. The result is right in front of you: this Master's thesis about the influence of academic subcultures on researchers' intentions to start a spin-off.

In this foreword I want to thank some important people who helped realising this study. First of all I would like to thank my supervisors, Harry de Boer and Hans Vossensteyn. Harry helped me keeping overview of what and when to do and gave very useful and practical advice; his feedback helped me improve the research and the report. I enjoyed our conversations. Hans joined later and helped with feedback from a fresh point of view which made me think critically about my report, choices and research overall. At the very start of the project, Liudvika Leisyte helped me find a direction for my research and write a proper research proposal.

The secretaries of the research departments helped me spreading questionnaires and gave advice about how to reach my respondents, which was very useful. Therefore I would like to thank Lilian Hannink, Sandra Westhoff and Sandra Schele. My gratitude also goes to the respondents who filled in my questionnaire; their help was crucial for doing this study and being able to write this report.

My fellow students have also helped me during my research. We discussed our research and many other things, in order to keep an overview of the research and to have some other things in mind than studying. Specifically I want to thank Maaike, Jildau and Yasmina, for the nice evenings, dinners and other random stuff we did in order to keep up with the study.

Thereafter I would like to thank friends and acquaintances from Scintilla. As I

have been working a lot in the Educafe and Westzaal, I have taken many breaks at the Scintilla Kamer, enjoying tea and talks. I would like to thank two specific people: Silke and Dieuwertje. Silke has helped me learning LaTeX, the typesetting system I used for writing this thesis, and helped me through many errors of the system. Dieuwertje helped me with "rubber ducking" and statistics. Many other friends have been helpful too, as they listened to my stories about this thesis, whether it was going well or not.

Last but not least, I want to thank my family and boyfriend Koen. My family has always been there for me, by practical advice and listening to my stories. Especially my parents, brother and sister, for sometimes giving me another point of view where I had not thought of myself. Koen has supported me throughout the process, bringing me cups of tea, helping with LaTeXwhen I got stuck and by just supporting me. To all: thank you very much.

Karin Lammers

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Abstract

The use of scientific knowledge for society and economy, valorization, is stimulated by the Dutch government. Starting a new company out of public research, a spin-off, is a method to valorize knowledge. Nevertheless, contextual factors such as culture may influence the willingness to start a spin-off. Therefore this study researches how academic culture influences researchers' intentions to create spin-offs. The literature has extensively studied academic culture and spin-offs, but has not researched the specific relationship between academic subcultures within one university and its influence on intentions of academics to start a spin-off. This study uses a behavioural theory, the reasoned action approach, to research this subject. By means of questionnaires, 36 respondents within two social and two technical departments of the University of Twente have evaluated their departmental culture and intention towards starting a spin-off.

One third of the respondents has the intention to start a spin-off. Academics within the social departments regard their culture as not entrepreneurial, while the technical academics see their culture as entrepreneurial. These academic subcultures do not influence researchers' intentions to start a spin-off; there is no direct or indirect correlation between culture and intention.

Contents

Chapter 1

Introduction

Entrepreneurship. For economic growth, entrepreneurship is regarded as being very important; without entrepreneurs no companies, no jobs, money and no economic flow. Nevertheless, current companies and entrepreneurs cannot solve all problems and challenges faced by society such as climate change and diseases, but also population's ageing and mobility problems. New solutions and products are needed to face new problems. Therefore, the development, use and distribution of knowledge is very important. "Co-creation" and "knowledge valorization" are words spread around a lot by politics lately. Scientific knowledge should be used for innovation and economy.

Dutch politicians strive for a knowledge-based society, where creativity and knowledge sharing is stimulated (Interdepartementale Programmadirectie Kennis and Innovatie, 2009, p. 7). In an increasing degree, prosperity is measured by the amount and success of innovation in the Netherlands. This has to do with the changing challenges we face, such as the population's aging, mobility problems and climate change, and the competitive position with other countries (Interdepartementale Programmadirectie Kennis and Innovatie, 2009, p. 9). To keep up with these changes, organizations have to renew constantly: innovation is essential. Such innovation comes from cooperation of local companies and knowledge institutes with regional, national and international companies, governments and institutes (Interdepartementale Programmadirectie Kennis and Innovatie, 2009, p. 10); "functional linkages" (Leisyte, 2011, p. 438), have to be created. Governments all over the world try to encourage the creation of such linkages. Since the 1980's several policy instruments have been developed to stimulate such interactions in the Netherlands (Zomer, Jongbloed, & Enders, 2010, p. 337).

According to the European Union, universities fulfil a very important role in this process (European Commission, 2013, p. 3). Higher education institutions form the engine of economy, as they develop new knowledge. With such new knowledge, new products, technical features and procedures can be developed. Communication between knowledge institutes and the product and/or service providers is needed in order to be innovative. Therefore, politics see development of new knowledge as important and encourage universities to share scientific knowledge for innovation. When such cooperation is instituted in public and private organ-

isations, it can be used more efficiently and thus be more profitable (p. 20-21); "knowledge valorization is one of the core tasks of knowledge institutes" (Interdepartementale Programmadirectie Kennis en Innovatie, 2009, p. 28). From 1996 onwards, many research organizations such as universities have implemented support for knowledge valorization structures (Zomer et al., 2010, p. 340).

1.1 Conceptualizatoin

1.1.1 What is knowledge valorization

The use of scientific knowledge for society and economy is called "valorization" (Van Leeuwen, 15 June 2013, p. 46), as the word has been introduced above. This can be practical use in business, for example a new technology used for medical goals, or use for further research by other researchers than the internal department. The interdepartmental programme direction of Knowledge and Innovation (2009, p. 8) describes knowledge valorization as "the process of value creation out of knowledge, by making knowledge available and/or fit for economic and/or societal use and transforming it to competitive products, services, processes and new companies" (p. 8). This concept is also described as knowledge commercialization, which is seen as as public-private partnerships and cooperation between research institutes and industry (Leisyte, 2011, p. 437). For this research, I will use the word "valorization", which will be regarded as knowledge that is practically translated in order to be used by organisations or companies to renew or update processes and products.

Valorization has got much to do with entrepreneurship, as that is needed to transform the knowledge toward practical use. Education and research are very important for valorization, they form the basis from which valorization can take place (p. 8). With research, new knowledge is discovered. Such knowledge is shared through education as well as through making knowledge public via conferences, publications and so on. By combining research, education and entrepreneurship, knowledge can be edited in such way that in can be used practical. This is a multidisciplinary use of knowledge that forms the basis of innovation.

1.1.2 Starting new companies as a form of knowledge valorization

The valorization task of universities can take place in two important directions. First, universities can adapt curricula by including subject material about entrepreneurship, which familiarizes students with entrepreneurship during their studies. This may widen their scope and make them see possibilities within the field of entrepreneurship. The other direction of this task is the execution of valorization activities by universities themselves, such as cooperation with current industries and starting new companies, spin-offs, that derive from research findings. For this research I will focus on this last direction: valorization activities by universities by starting new companies.

1.1.3 What are spin-offs

Such new companies are called "spin-offs". Pirnay, Surlemont, and Nlemvo (2003, p. 356) describe spin-offs as "new firms created to exploit commercially some knowledge, technology or research results developed within a university." They are companies created out of public research organizations such as universities. A difference between spin-off companies and random companies, is that spin-offs have a mother organization from which they are derived, and they keep contact with this organization (Zomer et al., 2010, p. 331). O'Shea, Chugh, and Allen (2007, p. 655) agree with this definition that spin-offs transfer knowledge or technology from public research organisations into new companies. Nevertheless, they add that the founder(s) of such company "may include the inventor academic(s) who may or may not be currently affiliated with the academic institution" (O'Shea et al., 2007, p. 655). For this research, I describe spin-offs as companies created out of public research organisations, to exploit knowledge and technology acquired at the university into new products and processes.

1.1.4 Advantages of spin-offs for universities

One may wonder: why should universities want to create spin-offs at all? Politics see valorization as very important, but universities and specifically academics have diverse opinions on this matter. Therefore, I will firstly explain what the advantages of knowledge valorization, and supporting spin-off creation specifically, are for universities, and secondly what can be seen as disadvantages. Within the advantages, three categories can be distinguished: reputation, financial resources and information.

Knowledge valorization by spin-off creation can positively influence a university's reputation, as it shows that scientific research within an institute has not only scientific relevance, but also practical and economic relevance (Zomer et al., 2010, p. 341). Research has shown that outstanding universities and researchers have started up more companies than average universities and researchers (Di Gregorio & Shane, 2003, p. 212). This suggests that the rate of spin-offs is a mirror for the quality of research at a university and thus the more spin-offs are created, the better reputation a university can have; it can thus be conducive for a university's image (Zomer et al., 2010, p. 346). Nevertheless, the more commercially oriented a university is, the more they emphasize on valorization and spin-off creation, and thus the more their reputation is positively influenced by emphasis on knowledge valorization (Di Gregorio & Shane, 2003, p. 212).

Besides reputation, financial resources can be an important reason for universities to support spin-off creation. When looking at figures of research funding, one can see that companies and the government are the major financiers: both are individually responsible for 43 per cent of research funding (Ministry of Education, Culture and Science, 2003, p. 162-163). These figures are for research institutes in general; universities receive more funding from government. Nevertheless, it can be economically attractive for universities to commercialize, as collaboration with companies generates research funding and thus secures the

possibilities to carry out research (Zomer et al., 2010, p. 339). By stimulating the creation of spin-offs, universities "gain legitimacy and thereby [...] secure resources from their environment" (Zomer et al., 2010, p. 343). These resources come from both government and industry. Government supports knowledge valorization activities financially, which means the more valorization activities and spin-offs, the more funding. Nevertheless, universities gain more income from industry than from government for valorization activities. Spin-offs pay for example for the intellectual property of a newly developed process (Di Gregorio & Shane, 2003, p. 209), or industry pays a spin-off company for research to develop a new product for them. Such research funding that comes from knowledge valorization is an important argument for universities to actively stimulate spin-off creation.

A last, but relatively minor reason to valorize knowledge is the provision of information. Spin-off companies have a unique position, as they are the link between scientific research and real-life. They therefore can provide "information to researchers about real-life issues that relate to basic scientific research questions." (Zomer et al., 2010, p. 345).

1.1.5 Disadvantages of spin-offs for universities

Although stimulation of spin-off creation can have many positive effects for universities, not everyone agrees the positive vision. Critics think first of all that valorization and spin-off creation is not a main task for universities; focus on valorization distracts from the core tasks of teaching and fundamental research. Secondly valorization activities decrease a university's reputation. These two arguments are closely connected.

Some academics see 'blue sky' or 'pure' research together with academic education as the only goals of a university; publishing and teaching students are the only ways to exploit academic knowledge (Ndonzuau, Pirnay, & Surlemont, 2002, p. 283). This is called "the 'scientific' paradigm on the academic culture" (p. 283). It has been shown that most developments and research activities result from teaching and research (McNay, 1995, p. 106). To get promotion in academic world, researchers have to publish enough: the "publish or perish' drive" (Ndonzuau et al., 2002, p. 283). From this point of view, involving in entrepreneurial activities for spin-off creation is unattractive, as it can damage research productivity (O'Shea et al., 2007, p. 659). In sum, this vision sees spin-off creation as something that distracts from the real task that universities have.

As some academics see knowledge valorization and spin-off creation as distraction of academics' real tasks, it also decreases a university's reputation: it does not focus on the main task of a university and thus does not fit in the view of top universities. As Zomer et al. (2010, p. 346) describe: "scientific reputation is acquired through publishing peer reviewed journal and conference papers, not through the creation of spin-off companies".

To understand how spin-offs are started and what motivates or prevents academics to start such companies, it is important to understand why and how spin-

offs are started and specifically which factors stimulate or undermine the creation of spin-offs. The next part of this introduction will describe basically how human behaviour can influence the start of spin-offs. Thereafter the problem definition and research aim will be given with the central research questions, followed by some more specific information about the research context.

1.1.6 Influence of human behaviour

Many factors can influence the start of a spin-off company. Human behaviour is the most important factor, as starting a company is the result of human action: a person, or a group of persons, decides that s/he wants to start his or her own company. It thus is the result of individual behaviour, where individual can be a single person or a group of persons. If we want valorization to work and thus want that new spin-offs are created, one should take a closer look into the functioning of behaviour.

To find out how spin-offs are created, and thus which factors influence this creation, one can imagine that context influences the practical outcome. Universities differ and so does the context within which a researcher may or may not want to start a spin-off company. This difference in opinion may vary between disciplines or groups that hold different cultures. The culture at one university may differ from the culture of another university. For example, at one university valorization and spin-off creation is seen as good for the university's reputation, while at another university people see it as distraction of the main tasks and thus as a deduction of its reputation. By the same token, faculty or department cultures may vary, even within the same university. As point of departure I assume that behaviour is context-dependent, and because contexts may differ, behaviour may differ as well.

1.2 Problem definition and research aim

The aim of this research is to find out how culture, as a contextual factor, influences human behaviour. Within this aim, the culture is specified as academic culture, as I am seeking to find out the influence of cultures at universities on academic behaviour. Human behaviour can be specified as researchers' behaviour towards starting a spin-off company. Therefore, the research question for this research is:

How does academic culture influence researchers' intentions to create spin-offs?

To answer this research questions, there are three sub questions:

- What do subcultures of university departments look like?
- What are researchers' intentions to create spin-offs?
- How do the subcultures influence researchers' intentions to establish spin-offs?

1.2.1 Theoretic model on behaviour

To answer this research question, I will use a behavioural theory from social psychology: the theory of reasoned action. According to the theory of reasoned action behaviour is influenced by personal and social factors, as well as potential barriers and enablers to undertake a particular behaviour (Fishbein & Ajzen, 2010, p. 22). In turn, these factors also are influenced by several contextual factors, among which organizational culture is an important one. A detailed explanation of this theory will be given in the theoretical framework, chapter 2.

One may wonder how culture influences behavioural determinants such as personal attitudes and social norms, and, according to the theory, behaviour. To discover this, I will look at the organizational culture of universities. A university is organized around its academic disciplines or field, and therefore in most cases has several faculties (or schools and institutes); it is disciplinary organized. These faculties are diffuse and have different cultures (Becher & Trowler, 2001, p. 23). This cultural diversity can cause diversity in the attitude of researchers towards starting spin-offs and thus difference in their intention. The concept culture will be further explained in the the theoretical framework (2).

1.2.2 University of Twente

For this research, I will look research departments at one specific university, which is the University of Twente. This university emphasizes the value of entrepreneurship and tries to motivate and activate students and employees to valorize knowledge actively. It was called "the most entrepreneurial university" by research of Elsevier/Scienceworks in 2013 (Van Leeuwen, 15 June 2013, p. 46), which means they have been quite successful at their entrepreneurial focus. The university has a relatively long history on entrepreneurship, as they started stimulating entrepreneurship in the eighties (Clark, 1998, p. 47). A new program, "Temporary Entrepreneurial Placements (TOP)", was designed in order to support and stimulate academics to start their own knowledge-intensive business. Since the 1980s, many new companies have been created with support of this program; in 2013 there were 924 University of Twente start-ups (Stichting Twente Index, 2013). The relationship with industry grew stronger because of these start-ups. The University of Twente was therefore called "a front runner" (Zomer et al., 2010, p. 338) in supporting spin-off creation. Nowadays, the university has the goal to become the most entrepreneurial university of Europe, as stated in their policy goals for 2020 (University of Twente, 2014i, pp. 3 & 6), which means more connections with industry and being "preferred partner" (University of Twente, 2014i, p. 4) for public and private organizations. Besides this, most employees and students should become more entrepreneurial, which means more stimulation of creating own initiatives and ideas, more education about entrepreneurship a focus on practical technological research (p. 6). Spin-offs are a very important part of realizing this policy goal, as they want to raise the amount of spin-offs as part of their policy, which is the reason I have chosen for the University of Twente as location for this research. Within this university I have selected four research

departments to study. For more details see chapter 3.

1.2.3 Variables

Academic culture is the independent variable of this research. The selected research departments have different academic cultures; two departments have a technological background, while the other two derive from social sciences. Other variables are kept as similar as possible. That is why I have chosen for departments at the University of Twente: the overall university is the same, so all departments have the same support for starting spin-offs and the same rules to obey. Academics' intentions to start a spin-off is the dependent variable in this research. These intentions determine future behaviour and are influenced by attitude and social norm, as the reasoned action theory explains. This theory, the concepts and the variables will be explained further in the theoretical framework, chapter 2.

1.3 Relevance of research

This research will contribute to the amount of knowledge about academic culture's influence on the attitude of researchers toward the creation of spin-off companies. By doing this research, current knowledge about academic culture and spin-off companies will be verified, as culture is used as basis for this research and will be checked in practice by the empirical part of the research. Thus this research has mainly theoretical contribution (Van Thiel, 2010, p. 21).

The research also contributes to practitioners, as the research will investigate the influence of academic culture on departmental attitude toward spin-off creation. Practitioners, such as managers in research groups, can gain information about how academic culture can influence spin-off creation and may receive knowledge about how they can use culture to expand this spin-off creation. Policy makers can also use it as inspiration to create circumstances that promote the start of spin-offs.

1.4 Limitations

As this research contains four cases, four departments at the University of Twente, the outcome cannot be generalized for every university, research department and academic culture. I try to keep external variables constant, but as the research looks at empirical cases there will always be differences between the spin-offs. The current economic situation may, for example, influence the success of spin-off companies, while this is not taken into account for this research. Limitations that I came across will be mentioned extensively in the discussion chapter.

1.5 Thesis structure

This first chapter showed the research goal, -questions and background of the research. The next chapter, the theoretical framework for explaining behavioural intentions, will introduce the theoretical model about behaviour which forms the basics for this research. Both the general model and the specific, for this research designed model will be discussed. Chapter three gives an overview of the research methodology: the research design, objects of research and operationalization. Hereafter the results chapter gives an overview of the descriptive results and analysis, followed by the conclusion and discussion chapter.

Chapter 2

Theoretical framework for explaining behavioural intentions

By now the research question and the problem framework have been explained. To answer this research question and thus to find out how academic culture influences researchers intentions to create spin-offs, I will use a theoretical framework that describes how behaviour and intention are set up. This theoretical framework is based on Fishbein and Ajzen (2010)'s "reasoned action approach". This model is used often by various researchers and has also had many adaptations through time. The first idea of this model is from 1975, which shows that the idea has been usable many years and thus has been both used and criticized a long time, which makes it more reliable than comparable models. This theoretical framework is mainly based on the recent model from 2010, but is supported with earlier theory such as the conceptual model of Fishbein and Ajzen from 1975.

The reasoned action model shows the influence of background factors, beliefs, attitudes, norms, and behavioural control on people's intentions. These intentions can lead to certain behaviour. As researchers' intentions to start spin-off companies are central in this research, I will start with explaining the relationship between behaviour and intention. Thereafter I will explain which factors influence intention and how they are defined. This will all be illustrated with a graphic of this model, to keep the overview of the model and to see the relations between different parts.

This chapter has three main parts: the explanation of the original reasoned action approach, critics on the model and the adapted model which I will use for this research. As said above, I will first explain the original model, by stating some basic assumptions of the model, whereafter intention and its relation towards behaviour will be explained. When this is clear, the three factors influencing intention, which are attitude, perceived norm and perceived behavioral control, will be explained. I will also give some examples of how these concepts could appear in this research. Thereafter I will explain the concept of beliefs, which are the factors influencing atittude, perceived norm and perceived behavioral control, after which the background factors close the description of the original model.

The second part of this chapter consists of three critical notes on the model as stated, and what influence they could have on this research. After describing these critics I will finally describe the adapted model for this research. Here I will explain which factors will be included and excluded in the model and why I chose to do this. The concrete design to research the intention of researchers will be described in the operationalization chapter.

2.1 Reasoned action approach

As stated before, the goal of this research is to find out how academic culture influences academics' intention to start a spin-off. It therefore is important to know what intention is and by which factors it is influenced. To explain intention and its factors, I use the reasoned action approach designed by Fishbein and Ajzen (2010). This is a behavioural theory which tries to explain how behaviour is originated and influenced by different factors, as many factors together determine what a person is going to do. With this theory, one can predict the likeliness that certain future behaviour of an actor will occur. Behaviour is caused by many factors that together determine what a person is going to do. Fishbein and Ajzen (2010) have made a schematic overview of factors that influence behaviour. Figure 2.1 shows the schematic version of the model, as visualized in Fishbein and Ajzen's book (Fishbein & Ajzen, 2010, p. 22). This theory thus focuses on behaviour of an actor, in contrast to my research, where I focus on one's intention to behave in a certain way. The difference between this focus and the concepts of intention and behaviour will be explained in the subsection 'intention'.

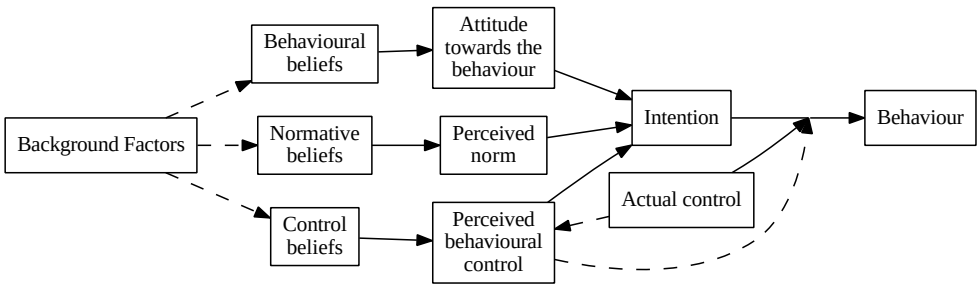

Figure 2.1: Reasoned Action Approach. Fishbein & Ajzen, 2010, p. 22

2.1.1 Basic assumptions

The reasoned action approach uses some basic assumptions, to be able to explain behaviour well. I will first set out these assumptions, before I continue towards the explanation of the factors influencing behaviour. There are three basic assumptions used in this model, which are clearly explained by De Boer (2003). Firstly, the authors assume that an actor is makes choices on a rational basis, which means he/she things about situations, considers the pros and cons and then makes a decision based on the most profitable outcome for him or her (De Boer, 2003, p. 128). Secondly, the actor's subjective perception is the central starting point of decisions made in this model (De Boer, 2003, p. 129). What a certain actor sees as a good or bad thing to do is the starting point, although it

may be that everyone around him thinks differently, of research has shown that it is not true. The final assumption of this model is the indirect influence of external factors on behavioural intention (De Boer, 2003, p. 128). Such external factors influence attitudes and perceived norms, and thus have an indirect influence on intention. The concepts of attitude and perceived norm will be explained in the similar named subsections. Before they will be explained, I will first set out the relation between behaviour and intention.

2.1.2 Relation between intention and behaviour

As stated above, the reasoned action approach tries to explain and predict behaviour. Nevertheless, this research focuses on the intention of academics to start a spin-off, which means it does not focus on behaviour itself. When someone has the intention to behave in a certain way, he or she has considered the pros and cons of certain behaviour, by looking at the personal attitude, perceived norm and perceived behavioural control and made a rational choice whether he or she wants to behave in a certain way or not. This means the actor intents to behave in a certain way, but has not yet put it into practice. It is very likely that the intention will be transformed into behaviour, as the actor has made a rational consideration on the consequences. Nevertheless, it is always possible that intention is not turned into behaviour, because for example the actor has a new thought about the consequences of the behaviour: by the time he or she wants to put the behaviour into practice, his attitude, perceived norm or perceived behavioural control has changed. Or the actual control prevents someone to put intention into practice by behaviour. This means that when one thinks he is able to do something, is socially pressed to do so and has a positive attitude towards behaviour, and thus has the intention to behave that way, he or she can be prevented from doing so because a lack of skills, abilities or circumstances that occur.It may be possible that many more academics are expected to start a spin-off, as they declare to have the intention, than realisation figures will show in the future. Nevertheless, I cannot verify this as the focus lies on the intention only; the relationship between intention and behaviour, or the realization of intentions, is not part of this research. How intention is defined will be explained in the next section.

2.2 Intention

As explained above, intention is the last step before certain behaviour occurs which makes it a very important part of explaining and predicting behaviour. Fishbein and Ajzen describe intention as the willingness of people to behave in a certain way (Fishbein & Ajzen, 2010, p. 21). Within this research, intention would be the willingness of researchers to start a spin-off company: how likely is it that these actors want to behave in such way that they are going to start spin-offs? The intention, and thus the likeliness, is a good indication of future behaviour.

Nevertheless, it is not sure that the intention to start a company will be put into practice by really starting a new company; not all intentions come true.

The greater the intention, the more likely it is that this intended behaviour will indeed be performed. When one wants to influence a person into behaving a certain way, he or she should thus influence the intention. This likeliness of behaving in a certain way is influenced by three factors: attitude toward the behaviour, perceived norm and perceived behaviour control (Fishbein & Ajzen, 2010, p. 22). These concepts are explained in the following subsections.

2.3 Background factors

Fishbein and Ajzen describe that background factors influence beliefs. Such background factors can be personal characteristics, culture and exposure to media (Fishbein & Ajzen, 2010, p. 224). Three categories are distinguished here: individual, social and information factors (Fishbein & Ajzen, 2010, p. 224). The individual factors include personality, mood, emotions, intelligence and past behaviour (p. 241). The social category exists of factors such as gender, ethnicity, age, income, religion and culture (Fishbein & Ajzen, 2010, p. 225). The information group exists of aspects such as knowledge, media and intervention (Fishbein & Ajzen, 2010, p. 22). These factors are not exhausting; many background factors are to be considered; this is only a selection used in Fishbein and Ajzen's book. The individual background factors can be classified in diverse ways. For example, information about entrepreneurship, provided by the University of Twente and the Kennispark, is a background factor part of the information factors. Nevertheless, this may also be information about funding models and financial rewards of spin-offs, that influence the financial situation of the researchers, which makes it part of the social category. Background factors influence people's beliefs, as is visible in figure 2.1.

As will be stated in subsection 2.6 about perceived behavioural control, culture can both be seen as a factor influencing perceived behavioural control as well as a background factor. In this research, culture is stated as a background factor, as culture is part of social background factors which influence an actor's beliefs. The reason to classify culture in the background factors category is the broad influence that culture has. By seeing culture as a background factor, it is visible that culture influences all kinds of beliefs and thereby all the factors attitude, perceived norm and perceived behavioural control. Conversely, when one sees culture as factor influencing perceived behavioural control, culture would only influence intention by this perceived behavioural control. Therefore, in this research culture is seen as a background factor.

To answer the research question about the influence of academic subculture on researchers' intention to start spin-off companies, it is important to know what academic culture is. Therefore, culture and academic subculture will be described in the next subsections.

2.3.1 Culture

As described above, culture is seen as background factor in the model of Fishbein and Ajzen. Nevertheless, it is not clear yet what culture is. Therefore I will explain the concept of culture: overall and specified towards academic culture and it's subcultures. Culture is a broadly discussed concept with many definitions. Becher and Trowler describe it as "Sets of taken-for-granted values, attitudes and ways of behaving, which are articulated through and reinforced by recurrent practices among a group of people in a given context." (Becher & Trowler, 2001, p. 23). Within this concept, values, attitudes and behaviour are reason for people to group. Hofstede describes this as "collective programming of the mind which distinguishes the members of one group or category of people from another" (Hofstede, 1994, p. 5). This collective programming can thus be seen as the collective values, attitudes and behaviour, as Becher and Trowler described it. Nevertheless, Hofstede adds the notion that these values distinguish one group from another. Two other authors, Herbig and Palumbo, describe culture as "Over a period of time useful behaviours, values and artefacts become institutionalized and incorporated as part of cultural traditions."(Herbig & Palumbo, 1994, p. 83). When looking at these three descriptions of culture, it is clear that collective values affect behaviour. These values and behavioural facts become institutionalized without concrete notice by several people in a certain context, which makes them a group that can be distinguished from another group. Therefore, culture can be described as collective values and behaviour that are institutionalized and lead to the grouping of people in a certain context, which distinguishes them from other groups.

Culture can be found in many surroundings: the culture of land or district, the culture within a group of friends, or the culture within an organization. This organizational culture is important for this research, as I will look at culture within a university. Organizational culture can be described as the collective values and behaviour within an organization, that are institutionalized and lead to the grouping of people within an organization. This distinguishes this group from a group people within another organization. One can thus say that, looking at the definition of culture as a whole mentioned above, the organization is the context within the people group.

As organizations differ, their organizational cultures differ too. For this research I am interested in a specific sort of organizational culture: academic culture. This is the culture within academic organizations such as universities. As stated before, I want to find out the influence of academic cultures on the intention of researchers to start a spin-off company. Therefore I will explain what subcultures and specifically academic subcultures are and which features determine these cultures.

2.3.2 Subcultures

The former definitions of culture and academic culture all show that common cultural values can form a group. This means that individuals can also form sub-

groups within an organization: within one organization, several subgroups with diverse cultures can exist. Rowe and Struck state that cultural values form the basis of subgroups within an organization (Rowe & Struck, 1999, p. 164). Rokeach describe such cultural values as "an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence" (Rokeach, 1973, p. 5). Individuals are thus connected by a common preference on a certain object, which makes them a group and distinguishes them from individuals with other common preferences. One can thus say that when subcultures are identified, the similar cultural values between the individuals within that group can also be identified (Rowe & Struck, 1999, p. 164). These shared cultural values do not have to be totally similar, there can be small differences. Nevertheless, the overall implication of the cultural values are similar enough to group individuals and divide them from other groups of individuals. A subculture can thus be described as a group of individuals within an organization with similar cultural values, which distinguishes them from other subgroups.

2.3.3 Academic subcultures

Within universities there are also various subcultures, which Becher and Trowler call "academic tribes" (Becher & Trowler, 2001, p. 23). This are "distinctive cultures within academic communities" (Becher & Trowler, 2001, p. 23). Academic subcultures are thus determined by the departments or disciplines, which have diverse objects of research. This means that departments within a university differ from each other as they have various cultural values. Corresponding with the overall definition of culture, Becher and Trowler describe that cultural elements of disciplines support the integration of the people within the discipline (Becher & Trowler, 2001, p. 47). They describe such cultural elements as "their traditions, customs and practices, transmitted knowledge, beliefs, morals and rules of conduct, as well as their linguistic and symbolic forms of communication and the meanings they share." (Becher & Trowler, 2001, p. 47). Discipline culture is thus formed by common personal values and knowledge, as well as by practical common behaviour.

Becher and Trowler distinguish four different kinds of disciplinary grouping within universities: hard-pure, hard-applied, soft-applied and soft-pure (Becher & Trowler, 2001, p. 36). Within the hard-pure group the so called pure sciences, such as physics, are grouped. Hard-applied sciences are the technological disciplines that apply their scientific knowledge, which are disciplines as mechanical engineering, electrical engineering and clinical medicine. Humanities studies such as history, and pure social sciences like anthropology belong to the group of soft-pure sciences. Finally, the soft-applied group consists of applied social sciences such as education, law, psychology and social administration. This distinction cannot place every discipline in its categories, but gives a clear direction for different disciplines.

The distinction between these so called "academic tribes" are expressed by tradi-

tions and customs, as stated above, but also by factors such as gender, language and artifacts (Becher & Trowler, 2001, p. 46). For example, a discipline within the hard-applied field of science such as mechanical engineering can have more men than women, who use a lot of intricate technical words in their sentences and may have posters of historic figures in their field of research. Another discipline such as law, which belongs to the soft-applied group, may have more women than men and also use difficult words, but these words may come from law itself. The disciplines thus differ in gender, language and other factors.

For this research, the difference between hard and soft sciences will not be researched empirically, as this has been done by other authors such as Becher and Trowler. I will therefore assume that the disciplines differ in background, as described above. Becher and Trowler have distinguished the four categories and categorised disciplines. I have chosen to research four research departments, where two are categorised as hard-applied and two others as soft-applied.

By now academic subculture has been explained as the common values, knowledge and practical behaviour within a discipline, where a discipline is a subunit within a university. These subunits can be classified in four kinds of disciplinary grouping, which are hard-pure, hard-applied, soft-pure and soft-applied sciences. For this research, I will use this classification to choose four departments within a university to research their researchers' intentions to start a spin-off company. To research this well, it is important to know whether the culture within such departments is seen as entrepreneurial or not. Therefore, I will explain how an entrepreneurial culture is described in the next subsection.

2.3.4 Entrepreneurial culture

In this research, entrepreneurial culture is expected to influence attitude and social behaviour and thus a researcher's intention to start a spin-off. The assumption is that the more entrepreneurial the culture, the more stimulated the researcher can be to start his own company by means of a spin-off. It therefore is important to find out in which degree the subculture in a department is entrepreneurial.

As stated above, I assume that the departments studied have a different academic cultural background: hard versus soft, as described by Becher and Trowler. In this research I want to find out to what extend these hard and soft departments are entrepreneurial. Therefore I will describe which cultural values indicate an entrepreneurial culture. Cultural values distinguish cultures from each other. To find out whether a group has an entrepreneurial culture or not, it is important to find out which values determine such culture. Hofstede distinguished four dimensions that divide diverse cultures from countries. One of these dimensions, uncertainty avoidance, is relevant to measure in which degree a culture is entrepreneurial. Uncertainty avoidance can be described as the natural state to avoid risk taking and uncertainty. Hofstede states that people within a culture with much uncertainty avoidance tend to look for structure and rules, so that daily life is clear (Hofstede, 1983, p. 53). An integral part of entrepreneurship is the uncertainty of work and income and the necessity of flexibility (Rowe & Struck,

1999, p. 165). Taking risks thus a very important part of starting one's own company, which means that entrepreneurship and uncertainty avoidance do not go together. An entrepreneurial culture can thus be recognized by the absence of uncertainty avoidance.

In line with this reasoning, O'Reilly, Chatman, and Caldwell found out that innovation and risk taking are also characteristics that are part of an entrepreneurial culture (O'Reilly et al., 1991, p. 502). Risk taking was already mentioned as a non-characteristic of uncertainty avoidance, but it can also be seen as part of innovation. Bird describes innovation as commercializing new ideas and modify current systems or products (Bird, 1989, p. 39). Additionally, innovation is described as "discovering new opportunities" and turning inventions into marketable products (Mueller & Thomas, 2001, p. 57). Innovation can thus be seen as the discovering and commercialization of new possibilities, ideas and inventions as well as the modification of current systems and products. Whenever this discovery and commercialization of new possibilities and/or the modification of current products and systems, and thus innovation, are an integral part of an organization's culture, the culture could be described as entrepreneurial. Rowe and Struck use this factor too, but describe it literally as "entrepreneurship"(Rowe & Struck, 1999, p. 165) instead of innovation.

Therefore, to find out how entrepreneurial the culture at departments are, I will look at the amount of uncertainty avoidance, risk taking and innovation as cultural values. These factors can lead to a prediction of a culture described as entrepreneurial or not. The operationalization of these concepts will be given in chapter 3. In the following section I will explain the concept attitude.

2.4 Attitude

Intention is directly influence by three factors: attitude, perceived norm and perceived behavioural control. In this section I will explain the variable attitude. This is a concept with many different defintions, as scientists do not agree on an overall definition. Fishbein and Ajzen (2010) describe it as "a latent disposition or tendency to respond with some degree of favourableness or unfavourableness to a psychological object." (Fishbein & Ajzen, 2010, p. 76). This definition focuses on the evaluative nature of attitude: a person has an invisible classification toward a certain subject. This appreciation or evaluation lies on a bipolar scale, somewhere between liking and disliking and the person tends to act towards this degree of appreciation. In their definition from 1975, Fishbein and Ajzen also mention that such predisposition is learned by past experiences of an actor (Fishbein & Ajzen, 1975, p. 10). The evaluation towards an object is consistent, which means that intention is to react in similar ways when similar situations occur (Fishbein & Ajzen, 1975, p. 6). Nevertheless, the authors may have a contradicting definition here: the consistency of intentions to react in similar ways are questionable, as attitudes are created by past experiences and new experiences can replace past experiences and thus change attitudes. One may thus assume that, when similar situations occur in similar timing, actors intend to react in similar ways. De Boer

confirms the overall definition of Fishbein and Ajzen and adds that attitude has the important goal to structure and order information, which is called the knowledge function of attitude (De Boer, 2003, p. 122).

When looking at these definitions, one can see some similarities and some additions. Evaluation is mentioned by all authors and can be seen as the core of the concept attitude. The goal of such evaluation is structuring knowledge and information, so attitude makes an actor evaluate certain objects in order to structure information. An actor evaluates something and intends to react in a certain way consistent with this evaluation. This intention to react is similar in similar situations, as long as there has been no change in evaluation. This summary leads to the definition of attitude as a tendency to evaluate certain objects in order to structure information, where the actor intends to react in a way consistent with this evaluation.

In this research, the object of evaluation is the start of a spin-off company. An occurring attitude could be a researcher evaluating the start of a spin-off company very positively, because he can start his own business, will have more freedom, will gain prestige and will earn more. By evaluating these different parts of starting a spin-off company, he/she structures information and finds out his attitude towards this object is positive. As a consequence, the actor intents to react in a positive way, which means he/she is more likely to have the intention to start a spin-off company. Nevertheless, attitude is not the only factor influencing intention. In the next subsection I will explain a second factor: perceived norm.

2.5 Perceived norm

When looking at the factors that influence intention, attitude can be seen as a personal norm. Perceived norm by contrast can be seen as how the actor perceives that s/he should act in the eyes of relevant others, e.g. colleagues, family, friends, boss. An actor decides whose opinions are important for him or her; these persons are called relevant others. Fishbein and Ajzen define the norm of relevant others as the social pressure that people experience to behave or not to behave in a certain way (Fishbein & Ajzen, 2010, p. 130).

This definition has two parts that need some more explanation. First, there is the social pressure that can influence an actor in two ways. Second, there is the motivation to confirm to such social pressure. The social pressure is produced in two ways. The first way is by what other people think one should do, which is called "perceived injunctive norm" (Fishbein & Ajzen, 2010, p. 131). For example, within a research group everyone thinks that person x should start a spin-off company. The second way is called a "perceived descriptive norm" (Fishbein & Ajzen, 2010, p. 143), which means that a social pressure is produced by other people are actually behaving in a certain way. In case of the example it would mean that everyone in a research group has started a spin-off company, which gives person x the pressure to also start a spin-off company. The motivation to confirm to such social pressure decides the weight of the social pressure. The

total influence of a perceived norm is determined by the perceived injunctive and descriptive norm, calculated with the motivation of an actor to confirm to these norms.

In case of this research, a researcher sees his/her family, some friends and direct colleagues as relevant others. When they are all very positive about starting a spin-off company, both in opinion as in action, they may influence the actor positively. Nevertheless, when the researcher is not motivated to confirm to these opinions, they will not influence his intention very much.

2.6 Perceived behavioural control

Actors are also influence by the expected capability to do something. Fishbein and Ajzen call this "behavioural control", which they describe as "the extent to which people believe that they are capable of performing a given behaviour, that they have control over its performance" (Fishbein & Ajzen, 2010, p. 154). This includes the presence or absence of personal skills, information, resources, barriers and facilities that may positively or negatively influence future behaviour (p. 64 & 155).

These factors that influence the perceived behavioural control can be separated into two categories: internal behavioural control and external behavioural control (De Boer, 2003, p. 141). Internal factors are personal boundaries such as the absence of certain skills or too little time to succeed in something. External factors are influences from the outside, such as limited resources or surrounding people opposing the actor (De Boer, 2003, p. 141).

One can discuss what is included and what is excluded from these external influences. Outside influences always have to do with an actor's surrounding. In this research, culture has an important role, as I research the influence of academic culture on researchers' intention to start a spin-off. When looking at culture, one can describe it as an external influence, as a culture is always in someone's surrounding and thus influencing him or her. For example, when there is a very strict culture in a research department, where individual researchers have no abilities to develop personal ideas, a researcher may see this culture as an external factor that restricts him/her from starting a spin-off. Hereby culture is an external factor, part of the perceived behavioural control. Nevertheless, culture can also be seen as background factor. In this research, culture will indeed be seen as a background factor, as it indirectly influences attitude, perceived norm and perceived behavioural control by beliefs. A description of background factors, beliefs and their relationship, and an extension of the choice to see culture as background factor will be given further onwards in this chapter.

By now it is clear what perceived behavioural control is and by which factors it is influenced. Nevertheless, it has an important relationship with attitude and perceived norm, which I will explain. A positive perceived behavioural control means that an actor thinks he is able to do something, because his personal skills and his surrounding are not adversing: he/she has perceived behavioural control to

perform in a certain way. Such positive perceived behavioural control makes it very probable that an actor intends to behave in a certain way in line with his/her attitude and perceived norms (Fishbein & Ajzen, 2010, p. 68). When a researcher has a positive attitude and perceived norm towards starting a spin-off company, and thinks he/she has the abilities to start such company, it is very likely that he/she has the intention to start a spin-off. Conversely, a negative perceived behavioural control can prevent someone from having a real intention. In this case, although the researcher thinks it would be good to start a spin-off, and his/her relevant others also think so, if this persons thinks he is not able to do so and/or his surrounding is opposing this and thus there is little perceived behavioural control, it is unlikely that this actor really intends to start such company. The influence of attitude and perceived norm thus decreases when perceived behavioural control is small (De Boer, 2003, p. 141).

2.6.1 Perceived behavioural control versus actual control

The preceded subsection has explained what perceived behavioural control is and that it influences the weight of attitude and perceived norm towards an actor's intention. Perceived behavioural control, perceived norm and attitude are cohesive and influence each other. Nevertheless, as figure 2.1 shows, there is also a factor "actural control" (Fishbein & Ajzen, 2010, p. 22) that influences both perceived behavioural control, and the relation between intention and behaviour. This actual control is the real lack of skills or abilities to perform certain behaviour. This may also be environmental limitations that influence the transformation of intention into behaviour negatively (Fishbein & Ajzen, 2010, p. 21). Where perceived behavioural control is the expectancy of an actor to have constraints that prevent him/her to really perform certain behaviour, actual control is the real lack of abilities. The difference between those two factors is thus the expectancy of an actor versus the reality: the first is about beliefs, the second about real control in practice. As stated in subsection 2.1.2, actual control can prevent the transformation from intention into behaviour.

2.7 Beliefs

As visible in figure 2.1, attitude, perceived norm and perceived behavioural control are influenced by beliefs. Such beliefs are described as "subjective probabilities" (Fishbein & Ajzen, 2010, p. 221), which means the opinion of an actor on the likelihood that a certain thing will or will not occur.

Within beliefs, there are also three categories to distinguish: behavioural beliefs, normative beliefs and control beliefs. Behavioural beliefs can be described as the experienced positive or negative outcome of a certain behaviour (Fishbein & Ajzen, 2010, pp. 20 & 221). As these kind of beliefs are about personal experience, they influence an actor's attitude, which is the personal norm. Normative beliefs concern the opinion and behaviour of important people in one's life. This means that a person thinks important people around him, such as friends, family

or idols, will approve or disapprove certain behaviour and that these people will or will not perform that behaviour (Fishbein & Ajzen, 2010, pp. 20-21 & 221). These beliefs are thus only about what an actor believes that other relevant persons think and do. Such normative beliefs influence the perceived norm of an actor: the social pressure experienced to perform in a certain way. Finally there are control beliefs. These are the beliefs of the actor about his/her actual ability to behave in a certain way, which makes it the believed presence of factors that can support or oppose certain performance of behaviour (Fishbein & Ajzen, 2010, pp. 21 & 221). Control beliefs influence the perceived behavioural control. Such control beliefs are thus the expected availability of factors of an actor, while perceived behavioural control is the expected ability to perform certain behaviour.

Behavioural beliefs, normative beliefs and control beliefs influence thus attitude, perceived norm and perceived behavioural control. Nevertheless, these three kind of beliefs are influenced by background factors. What background factors are and how they influence beliefs (and thus indirectly the other factors) will be described in the next subsection.

2.8 Critique on the Reasoned Action Approach

After many researchers having used and discussed this theoretic behavioural model, there are also critics on the model. It is important to mention such critique, as, together with the preceding information about the model, it gives a balanced view of positive and negative sides of the model and a deliberated choice for its use in this research. I will therefore mention three important critical notes made by diverse authors.

The first critical note is the rationality of an actor's action. As mentioned in subsection 2.1.1 about basic assumptions of the model, Fishbein and Ajzen assumes that a person acts rationally. This means that an actor thinks about positive and negative consequences of possible behaviour and chooses the option that benefits him/her most (De Boer, 2003, p. 128). Nevertheless, an actor can never act totally rational; he/she can only see a few future consequences of certain behaviour (De Boer, 2003, p. 132). This assumption of rationality it thus not always correct and can make the reasoned action approach as described by Fishbein and Ajzen less reliable. At the other hand, one can never make a theoretical model that totally fits reality; a theory is always a simplification of reality. Therefore it is very important to notice that the assumption of a person acting rational may not always be true, but it nevertheless is a good approach of reality and way to research how behaviour and intention are influenced.

Secondly, the intensity of the relationship between intention and behaviour, as explained in subsection 2.1.2, is questionable as behavioural intention is not always converted into behaviour (De Boer, 2003, p. 133). For this prohibited conversion are, among others, three reasons. A first reason is time: when an actor wants to convert intention into behaviour, he/she may have renewed his/her attitude, perceived norm and/or perceived behavioural control because something

has changed during that time. An intention as determined earlier may thus not be relevant anymore, which prevents the implementation of that former intention. A researcher may want to start a spin-off and have the intention, but when he suddenly becomes bankrupt and thus thinks he cannot afford the start of a spin-off anymore, his/her perceived behavioural control has changed. His/her intention will also change: he/she does not intend to start a spin-off anymore. A second reason for preventing the implementation of intention into behaviour can be that certain behaviour is just not realistic. In case of the example, a researcher wants to start a very large spin-off company that produces human robots. This person has a positive attitude, relevant persons around him/her agree on this being a good idea and he/she thinks he has the abilities to do this. Nevertheless, it is not possible to really start such spin-off, as such robots do not exist yet, there is no demand for these products and the company would be way too large. This actor will thus not turn intention into behaviour, because the behaviour is not realistic. The last reason that the intensity of the relation between intention and behaviour is questionable, is custom behaviour. Some behaviour is performed so many times that it has become a customary, which means the actor does not rationally think about the conversion of intention into behaviour, but just behaves in a certain way without thinking about it. Nevertheless, just as with the first critique, a model is always a simplification of real life. In order to study something, models are useful additions to find out relations between factors.

The last critique to be mentioned here is the coherence of attitude and perceived norm. In the former description of the reasoned action approach, attitude and perceived norm are described as two individual factors influencing intention. Nevertheless, one's personal norm can of course be influenced by norms of relevant others, as perceived norms can be internalized into personal norms, which means that attitude can be influenced by perceived norm (De Boer, 2003, p. 136). One could thus substantiate that attitude and perceived norm should be taken together and should be seen as one factor influencing intention. Nevertheless, for this research I keep these concepts divided, as this gives more insight in the different influences on intention, as Fishbein and Ajzen also recommend.

Concluding, there are three critical notes made by diverse researchers: rationality of behaviour, the relation between intention and behaviour and the coherence of attitude and perceived norm. It is important to know these critiques, as they can influence the study. Nevertheless, the advantages of this model outweigh the disadvantages, which makes the critique rejected and this model used as theoretical basis for this research. Now that the critique on the model is clear and it has been mentioned why I still use the model, I will show the adapted model that will be used for this research. I will also explain why some factors are not mentioned and used in this adapted model.

2.9 Summary

As stated above, the reasoned action approach forms the theoretical basis for this research. Nevertheless, some adaptations are made. As the relationship

between intention and behaviour has been explained in subsection 2.1.2 and discussed in section 2.8, I have not mentioned the real behaviour in the model. The assumption is that intention will lead to behaviour.

Intention is influenced by attitude, perceived norm and perceived behavioural control, which are important factors that are also used for this research and thus visible in my model. The different beliefs and their importance form the basis for these three factors. These beliefs and their importance are measurable by asking people what they think about something and how important this is. Atttitude, perceived norm and perceived behavioural control are not directly measurable. The coherence between the beliefs, their importance and their following factors is therefore emphasized by putting them together in one square.

Finally only entrepreneurial (sub)cultures are mentioned, instead of background factors overall. This was a logical choice for this research, as I want to find out the relationship between academic culture and intention to start spin-offs. Other background factors are kept as similar as possible and form the control variables in this research. Age and gender are examples of such control variables.

This leads us to the overview of the specific theoretical model that will be used for this research, as visible in figure 2.2. It shows that intentions are influenced by behavioural beliefs, their importance and attitude; normative beliefs, their importance and perceived norm; and by control beliefs and perceived behavioural control. These combination of factors are influenced by culture. How these factors will be measured will be explained in the research methodology chapter (3).

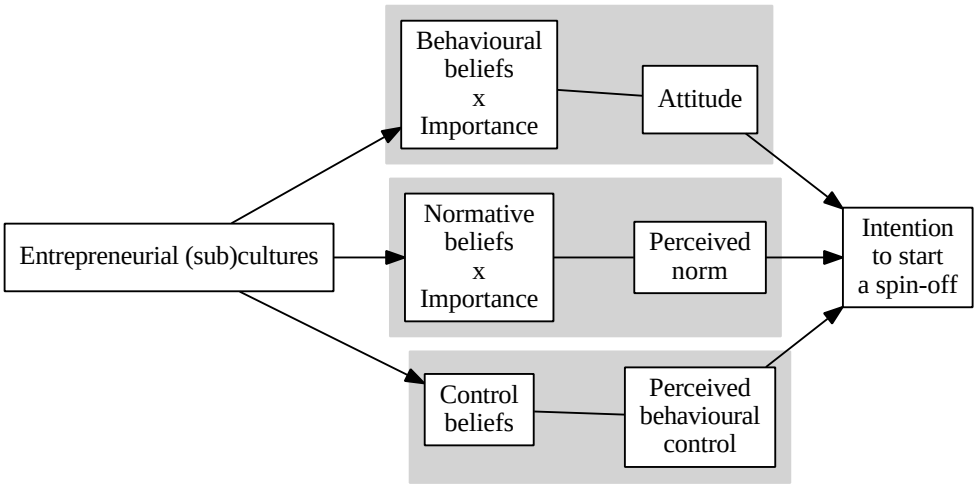

Figure 2.2: Theoretical model

2.10 Hypothesis

The expected outcome of this research is that the more entrepreneurial the academic culture of a research department is, the more positive researchers' attitudes, perceived norms and intentions towards the creation of spin-off companies. I will look at four departments: two departments which I expect to be very entrepreneurial, and thus have successful spin-off companies, and two of

which I expect no entrepreneurial attitude and thus little spin-off activities. To keep the research as reliable as possible, the chosen departments vary in cultural background, which mean they have a different technological and academic background. Two departments have a technological background, while the other two derive from social sciences. Nevertheless, they are part of the same university and have the same basic possibilities and support from this university to start spin-offs. This way, possible differences between the departments can be explained by the difference in cultural background.

Chapter 3

Research methodology

As stated before, the goal of this research is to find out what influence academic culture has on researchers' intention to start a spin-off. Therefore, the reasoned action approach, the concept culture and the theoretical model used for this research have been described in the former theoretical chapter (2). It showed that intention is influenced by attitude, perceived behavioral norm and perceived norm. These factors by turn are influenced by a person's beliefs and the importance of these beliefs. Such beliefs are influenced by background factors such as culture, which is the main background factor for this research.

In this chapter, I will first describe the methods used for the research. The research is quantitative, results will be gathered by means of questionnaires. In the research design section I will describe why I chose this method and the practical use of it. Thereafter I will give an overview the objects of research: what is the research population, why did I choose these groups and how did I reach them, followed by the questionnaire design. The chapter will finish with a description of the sample, where the first general results and an explanation of how the results will be described analyzed will be given.

3.1 Research design

In chapter 2 the theoretical framework for explaining behavioural intentions is expounded, where culture, attitude, social norm and intention and their coherence are theoretically explained. Nevertheless, these theoretical concepts have to be tested empirically, in order to be able to make conclusions about the influence of academic subcultures on researchers' intentions to start a spin-off. In this section I will therefore explain which methods will be used in this research and why I have chosen for these methods.

3.1.1 Quantitative research

For this research several data collection methods can be used. Interviews, observations and questionnaires seem to be the most common ones for this research,

as I want to find out how respondents think about starting a spin-off and how the culture at their department is (Van Thiel, 2010, p. 69)(Field, 2009, p. 12). Nevertheless, observation is not suitable for this research because it would take a lot of time and it is difficult to measure culture this way. Interviews give in-depth information about one person, which mean I could get much information about departmental culture, attitude, social norm and intention. Nevertheless, this will take quite some time and can still be biased, as not all persons of a department can be approached for an interview. Therefore, I have chosen to use questionnaires to gather data for this research.

Using questionnaires has several advantages. First of all, many respondents can be approached, as a questionnaire can be spread easily through post or e-mail. This makes it also anonymous, as the results of one respondent cannot be leaded back to that respondent. The anonymity may lead to more representative and less social acceptable answers, because the researcher cannot influence the respondent during answering. Besides this, the respondent can fill in the questionnaire at any time. Last of all, answers are well comparable and have no interpretation bias, as every respondent receives the exact same questionnaire.

Nevertheless, using questionnaires has also got disadvantages. First of all there is a risk of low response: not every person will fill in the questionnaire, which may effect the representativeness negatively (Van Thiel, 2010). Furthermore, there is no possibility to answer questions of the respondents directly or to add some extra explanation whenever things are not clear, as the researcher is not physically present. There is also no control on the answering.

Nevertheless, the negative effects of low response and difficulty in answering questions can be counteracted by a personal approach and by sending the questionnaires to many persons. The advantages of reaching many respondents within limited time, anonymity and flexibility to fill in the questionnaires then overcome the disadvantages, which makes the use of questionnaires suitable for this research. Which departments I have chosen and the argumentation behind this choice will be described in the next subsection.

3.2 Objects of research

As the goal of this research is to find out what the influence of different academic subcultures is on the attitude, perceived norm and perceived behavioural control of academics toward starting spin-off companies, it is important to find two diverse groups of academics with a culture that differs from each other. Hereby the cultural difference between soft sciences and hard sciences will be the basis for this research. In the following paragraph I will explain the basic research population for this research and explain why I have chosen this population. Thereafter I will explain the departments studied.

As described in subsection 2.3.3 about academic subcultures, Becher and Trowler distinguish four different kinds of disciplinary grouping within universities: hard-pure, hard-applied, soft-applied and soft-pure. For this research, I use the hard-

applied and soft-applied disciplines as basis for the different objects of research. By choosing these two groups, the division between hard and soft, technical and social, is made. This division is more obvious than the division between pure and applied sciences (Becher & Trowler, 2001). Besides, applied sciences are focused on the application of research. These sciences are thus more likely to do research that can be commercialized. By choosing hard- and soft-applied sciences, they are similar in focus on application but different in research area.

In order to research the difference in academic subculture, it is important to keep many factors as similar as possible, so that the differences in research outcome are more likely to come from the academic subcultures. I therefore have chosen to look at research departments at the University of Twente. By choosing departments within one university, their overall institutes, rules and surrounding are the same. As mentioned in the introduction chapter, this university has a focus on entrepreneurship and wants to become the most entrepreneurial university of Europe. Spin-offs are also very important for realizing this goal, which is an important reason for choosing this university for my research.

Within the University of Twente, I look at two hard-applied (technical) research departments and two soft-applied (social) research departments. For the hard-applied sciences, I have chosen research departments from electrical engineering, part of the faculty of electrical engineering, mathematics and computer science (EWI). Becher and Trowler describe this field of research as hard-applied. Within the soft-applied sciences, I will look at departments that combine research from psychology and educational sciences, part of the faculty of behavioural, management and social sciences (BMS). These fields of science are also mentioned by Becher and Trowler. The departments chosen are known to have at least some spin-offs, which makes it likely that the researchers within that department are familiar with the concept of spin-offs. Furthermore I have chosen for departments that are comparable in size, so that there will be a comparable amount of respondents from both the hard-applied and the soft-applied science departments. Ideally, I will thus research two research departments from electrical engineering and two from psychology-eductional sciences, who are comparable in size and all have some (knowledge of) spin-offs.

As stated above, I will look at research departments within the Electrical Engineering field of study, as hard-applied sciences. Within this field, researchers focus on the development and improvement of electronics-based systems (University of Twente, 2015b). They thus use scientific knowledge, received from research, to make and improve electronic systems. The research departments studied for this research ar the Telecommunication Engineering group (TE) and Robotics and Mechatronics (RaM). The first group focuses its research at Electromagnetic Compatibility, Microwave Photonics and Short Range Radio, which is summarized as research activities that focus “on the physical layer of communication systems” (University of Twente, 2014f). Within this department there are 24 academic staff members (University of Twente, 2014b). 16 persons are PhD students within a specific field of the department.

The second department within the hard sciences is Robotics and Mechatronics

(RaM). This group focuses on investigation of' "the applicability of modern systems, imaging and control methods to practical situations in the area of robotics." (University of Twente, 2014d). This means their focus lies on robots, electromechanical machines. They design new robotic systems, produce some designed robots and refine them. The robot applications are for example used in the medical field, where they help surgeons. The department is big compared with TE, as RaM has 44 staff members (University of Twente, 2014e), of which 25 are PhD candidates. There are diverse functions within this department. Besides the scientific staff (9 persons) and the PhD candidates (25), there is technical staff (3), temporary staff (9) and some individual persons who are engaged with specific projects.

Within the soft-applied category I will look at two research departments that combine knowledge from the field of educational sciences and psychology. Educational sciences focus at "the design and evaluation of teaching and learning programmes in schools and organizations." (University of Twente, 2014c). Psychology has its focus at the overall behaviour of human beings and how this can be influenced (University of Twente, 2015a). The combination of these two fields gives research areas that focus on how people can learn best, seen their behavioral background and how learning programmes can be utilized and adopted.

The first research department within this field is the department of Instructional Technology (IST). Researchers within this group investigate the development of knowledge. They design instructions to support the best way to gain knowledge, for which they also research which psychological processes are used to gain knowledge (University of Twente, 2014g). Their main field of study is "technology-enhanced learning environments for inquiry learning"(University of Twente, 2015d). They study, for example, how serious gaming works and how its functioning can be improved. The size of this group is comparable with the size of TE: 19 persons (University of Twente, 2014h). Five persons are PhD students, the other persons are part of the scientific staff.

The second research department within the soft-applied sciencies is Onderzoeksmethodologie, Meetmethoden en Data-Analyse (OMD) (University of Twente, 2014a). This department does research on and development of methodology within the combined field of Eductional Sciences, Psychology and Communication Sciences. They thus focus on the organization, collection and interpretation of methodology, specifically statistics. This department is bigger than IST, as OMD has 35 staff members of which 14 are PhD candidates (University of Twente, 2015c).

In order to reach as many respondents from these departments as possible, I asked the secretaries of the departments how I could best reach these persons. The questionnaires have been send to the respondents in different ways, online and on paper, dependent on this advice of the secretariats. The technical departments TE and RaM have first been approach per e-mail with the online questionnaire; this e-mail has been send by the secretaries of these departments. One to two weeks after this e-mail, a paper version of the questionnaire has also been given to some respondents, by the secretary and by myself in the lunchroom. Within the social departments, IST has received a paper version of the question-

naire only, which was put in the personal pigeon holes. The respondents of the other social sciences department, OMD, have received the questionnaire online only, by means of a personal e-mail from myself. Two weeks after the first e-mail I have send a personal reminder to the staff of this department. By using the advice of the secretaries and combining digital and paper versions of the questionnaires, I have tried to increase the response.

3.3 Design questionnaire

By now it is clear that I have chosen for questionnaires to find out the influence of academic subcultures on academics' intentions to start a spin-off and who are the objects of research. In this subsection I will describe how the questionnaire is designed and which choices I have made in this design process. I will therefore first explain the overall design and categories used, where after I will describe the process of finding the salient beliefs, or most important factors, for this survey and how I have tested the questionnaire before real use.

Within the questionnaire there are seven categories of questions. First there are some general questions, which are followed by the categories attitude, importance, perceived norm, perceived behavioural control, intention and entrepreneurial subculture. These categories will be explained in detail in the operationalization section. In total there are 44 questions or statements, divided over the seven categories. Except for the general questions and the question about intention, I have used statements with a five points Likert scale to test the respondents' opinions. By using a five points Likert scale, the respondents can make a considered choice of answer, but do not get lost in possibilities (Van Thiel, 2010, pp. 92-93). In the next paragraph I will explain how I chose the most important questions, or salient beliefs (Ajzen & Fishb, 1980), within the categories.

3.3.1 Salient beliefs

As attitude, perceived norm and perceived behavioural control are formed by a person's beliefs, these beliefs form the operationalization of attitude, perceived norm and perceived behavioural norm. Therefore it is important to find out which are the salient beliefs: the most important beliefs for respondents (Ajzen & Fishb, 1980, p. 63). To find out the salient beliefs for this research, I have made six open questions about attitude, perceived norm and perceived behavioural control, which can be found in appendix C. These questions were send to twelve persons, who are all friends or family of mine; most of them are students. I received eight reactions with extensive answers, which formed the basis for choosing statements within every category for the questionnaire.

3.3.2 Pilot

After having designed the questionnaire based on the salient beliefs, I have done a pilot: I have tested the questionnaire (Fowler, 2002, p. 114). Therefore, a paper version was given to five students from student association Scintilla, to test the paper version. The online questionnaire has been tested by six students and by my supervisor. After their comments I changed some small things, such as spelling and overview of how far the respondent is in the process of filling in the questionnaire. As a last test I downloaded the results to find out how the results look like, where after the questionnaire was ready for sending to the real respondents of this research.

By now it is clear how the questionnaire has been designed, what it contains and how I decided to use these statements and questions. The final design of the questionnaire with the chosen statements can be found in the appendix (D). In the next section the operationalization of the variables will be described.

3.4 Operationalization

3.4.1 Intention

Within the questionnaire, there was one question about intention: which of the following options does imply to you? Where they could answer I currently have a spin-off; during the past three years, I did seriously intend to start a spin-off; within five years, I seriously intend to start a spin-off or I have no intention to start a spin-off. Every respondent who answered he/she has a spin-off or has/had the intention to start one is summarized in the category 'yes'; the respondents who stated to have no intention to start a spin-off answered 'no'.

3.4.2 Background factors: general and entrepreneurial subculture

There are two sorts of background factors tested in this study: general factors and entrepreneurial subculture. The general questions are researched by questions about gender, age, nationality, name of department at the University of Twente and the function of the respondent at that department are asked. These variable are the control variables: variables that could explain certain differences in outcome that are not caused by the tested beliefs (Van Thiel, 2010, pp. 74 & 93). The answers for age and nationality have been divided into categories in order to make the data more anonymous. The name of the department is the only open question in the questionnaire, so that the respondents are influenced as little as possible. The exact questions can be found in the appendix (D).

Entrepreneurial subcultures are characterized by uncertainty avoidance, risk taking and innovation, as described in subsection 2.3.4. These values are measured in the questionnaire by eight statements which have five answer categories: strongly disagree until strongly agree. As the answer category "strongly disagree" is negative, I use -2 as indicator. Subsequently "agree" is indicated with

-1 and "neutral" with 0. Logically, "agree" is stated with 1 and "strongly agree" with 2.

To rate the entrepreneurial culture as seen by the respondents, the scores of the individual statements have to be added. As there are eight different statements, with a score between -2 and 2, the total score of entrepreneurial culture will be between -16 and 16. A negative score indicates a culture which is not entrepreneurial, while a positive score shows that the culture is entrepreneurial. The results are classified in two sorts of categories. For the description of results there are five categories. To keep the scales of attitude, perceived norm, perceived behavioural control and entrepreneurial culture comparable, in this scale scores lower than -5 are not entrepreneurial, -5 to -1 is slightly not entrepreneurial, 0 is neutral, 1-5 is slightly entrepreneurial and above 5 is entrepreneurial. For the analysis of results there are two categories formulated: every score below 0 is not entrepreneurial, every score of 0 or higher is entrepreneurial.

3.4.3 Attitude towards spin-offs

As shown in the theoretical chapter (2), attitude towards behaviour is determined by a combination of behavioural beliefs and their importance. Therefore, I used eight statements about behavioural beliefs and seven about their importance, based on the salient beliefs. To find out researchers' attitudes toward spin-offs in this research, the individual beliefs have to be multiplied by their individual importance. By doing that, several partial attitudes are created, which are the attitudes of a single statement. The total attitude of one respondent can be found by adding these partial attitudes, as this gives the total of all statements and their importance.

For these questions the same answer ratings are used as with entrepreneurial culture: "strongly agree" is rated with -2, adding up to a score of 2 for "strongly agree". Within the behavioural belief statements, there were five answer categories: strongly disagree until strongly agree. As the answer category "strongly disagree" is negative, I use -2 as indicator. Subsequently "agree" is indicated with -1 and "neutral" with 0. Logically, "agree" is stated with 1 and "strongly agree" with 2. By using this scale from negative, through zero towards positive, one can see at first glance whether an attitude is positive, negative or neutral.

Within the importance statements, there are also five answer categories. This time they start from "not important at all" towards "extremely important". The statements answered by "not important at all" are indicated with 0. "Somewhat important" becomes 1, adding up until 4 for "extremely important". By using zero for the "not important at" all category immediately indicates that the variable cannot influence a person's attitude on that subject: attitude is determined by behavioural belief multiplied with its importance; when the importance is zero, the outcome becomes zero too. By using these answer values, the total score of a partial attitude will be a value between -8 and 8.

To come to partial attitude values, individual statements have to be multiplied with each other. Every statement within the behavioural belief category has a

statement in the importance category that fits and thus asks how important that attitude statement is. Nevertheless, there are eight statements within the behavioural belief category, but only seven statements of importance. The first five statements about behavioural belief will be multiplied with the first five statements about the importance, which means for example that the value of the statement "By starting a spin-off, I can take my own (work) decisions" will be multiplied with the value of the statement "Freedom in my work". The sixth belief statement, about the use of qualities and talents, will be multiplied with the seventh importance statement about job satisfaction and the statements of attitude and importance about social security will be multiplied (eight of attitude and sixth of importance). Then only the behavioural belief statement about learning new skills remains, which will be multiplied with the self-respect and personal development statement of importance. This means that this fifth statement of the importance category will be used for both that statement about qualities and talents as well as the self-respect and personal development statement within the behavioural belief category. An overview of the multipliers can be found in table 3.1

Table 3.1: Definiton partial attitudes

Partial attitude nr	Attitude statement: By starting a spin-off...		Importance statement
1	I can take my own (work) decisions	X	Freedom in my work
2	My spare time will be expanded and work load will reduce	X	Free time
3	My social prestige increases	X	A good social reputation
4	I will earn more	X	Earning more money
5	I will gain more self-respect and personal development	X	Self-respect and personal development
6	I have to learn new skills	X	Self-respect and personal development
7	I will be able to fully use my qualities and talents	X	Job satisfaction
8	My social security will be expanded	X	Social security

When the partial attitudes are created, the outcome can differ from -8 towards 8. A negative score indicates a negative belief; the category is evaluated negative. For example, when a partial attitude on earning more money has a score of -6 it means that the respondent does not agree that starting a spin-off will make him or her earn more money. A positive score indicates an agreement on the positive effect of starting a spin-off: a score of 6 on the same category would indicate that the respondent sees starting a spin-off as something that will make him or her earn more money.

The larger the number, the more important the category is. A score of one on the category earning more money indicates that the respondent sees earning more money as not very important. This score can only appear when the respondent has filled in "agree" on the behavioural belief statement, as this gives a score of one, and "somewhat important" on the importance statement, as this gives also a score of one. When a respondent has a partial attitude score of six, this indicates that this category is very important: an outcome of six can only originate from a score of two on behavioural belief and a score of three on importance.

When a partial attitude is zero, this indicates that the category is not influencing the overall attitude of this respondent very much. When the respondent has filled in "neutral" at the behavioural statement and/or "not important at all" within the importance statement, the partial attitude will become zero on this category. When an opinion about a belief is neutral, it will not influence the attitude as the respondent has not a positive or negative evaluation on this statement. The same goes for importance, as the respondent literally indicates that the category is not important at all.

As the possible outcomes of partial attitude are described, it is clear that scores of minus three or lower, three or higher and scores of zero indicate important opinions. A score beneath minus three indicates that the category is important and evaluated negative; a score of zero means that the category is not important to the respondent, while a score of three or higher means that the category is seen as positive and important.

The total attitude is generated by adding up the partial attitudes. The total attitude per person lies between -40 and 40. A very negative score indicates a negative attitude: the person has a negative view of spin-offs. A positive score thus indicates a positive evaluation of spin-offs. When a score is near zero, the attitude is neutral. The person in question then does not see spin-offs as very positive or negative.

As the range of possible results is very high, I have divided the outcome of attitude in two different sorts of categories. For the description of results there are five categories: all scores lower than -10 are negative, -10 to -1 is slightly negative, 0 is neutral, 1-10 is slightly positive and above 10 is positive. For the analysis of results I have made only two categories, in order to make the results more significant. Every score below 0 is negative, scores of 0 or higher ar positive. Scores of 0 are part of the positive category, because they do not influence the outcome negatively and there are not so many respondents with this score.

3.4.4 Perceived norm toward spin-offs

Just as with attitude, a perceived norm consists of beliefs multiplied by importance. The beliefs belonging to perceived norm are the normative beliefs: what a respondent thinks that relevant others want him or her to do. To indicate this perceived norm there were four statements in the questionnaire about the opinion of relevant others and four questions about the importance of these opinions.

Within the normative belief statements, respondents could choose from five answers: "strongly discourage" towards "strongly encourage". The first category is valued with -2, as this has a negative influence on the perceived norm. The last category, "strongly encourage", is indicated with a score of 2, as this has a positive influence on the perceived norm. The answer categories in between add up, which means the first answer is rated with -2, then -1, 0, 1, 2, just as the categorization of behavioural beliefs, mentioned in subsection 3.4.3. The zero here also indicates a neutral position, which will not influence the perceived norm and thus is rated with zero.

The statements about the importance of relevant others' opinions are constructed in a similar way to the attitude importance statements: there are five answer categories, starting from "not important at all" towards "extremely important". The first category, "not important at all", is indicated with 0, adding up towards a score of 4 for the "extremely important category". By using this scale, the partial perceived norms that do not matter to the respondent, as he or she states that something is not important at all, receive a score of 0 and thus immediately indicate that they cannot influence the total perceived norm.

As the values of the statements within categories are explained, it is important to know which statements of the importance category are multiplied by which statements of the normative beliefs, in order to get the partial perceived norms. In contrast with attitude, the statements within the perceived norm category all correspond to each other. There are four normative belief statements, indicating the opinion of respectively family and friends, departmental colleagues, colleagues from other departments/universities/business and the opinion of supervisors/managers. Within the importance category there are the same four categories, indication the importance of the opinion of these groups. Therefore, the matching statements will be multiplied with each other: the score of the opinion of family and friends will be multiplied by the score of importance of the opinion of family and friends, and so on. This gives four partial perceived norms with scores between -8 and 8.

The outcome of the partial perceived norms can be read in a similar way to the partial attitude outcome. This means that the scores of -3 or lower, 3 or higher and scores of zero are important. When a score of -3 or lower is given, that category relevant others is important to the respondent and will discourage the respondent to start a spin-off. A score of 3 or higher also indicates an important group of relevant others, but they are positive towards the respondent starting a spin-off. A score of zero indicates that the respondent does not see these persons as important and/ore they do not have an opinion about starting a spin-off.

The perceived norm is measured by adding up the partial perceived norms. As there are four partial perceived norms with scores between -8 and 8, the score of the total perceived norm lies between -32 and 32. A very negative score indicates a negative perceived norm: the respondents relevant others discourage him or her to start a spin-off, and the opinion of these others are important to the respondent. A positive score thus indicates important relevant others who encourage the respondent to start a spin-off. When the score is near zero, the perceived norm is neutral, which means the person is not encouraged or discouraged much by relevant others and/or the opinion of these relevant others is not seen as important.

As the range of possible results is very high, I have divided the outcome of perceived norm in two different sorts of categories. For the description of results there are five categories: all scores lower than -10 are negative, -10 to -1 is slightly negative, 0 is neutral, 1-10 is slightly positive and above 10 is positive. For the analysis of results I have made three categories, in order to make the results more significant. Every score below 0 is negative, scores of 0 are neutral and scores

above 0 are positive. I have chosen to use three categories for this item because of the big amount of respondents who have a score of zero. When I would include 0 to the positive category, the outcome can become biased.

3.4.5 Perceived behavioural control toward spin-offs

As stated in figure 2.2, perceived behavioural control is a single variable, arising from control beliefs. In contrast to attitude and perceived norm, the perceived behavioural control is thus not a compounded variable. The questionnaire contained of six statements, formed by the salient beliefs, to find out how the respondents think about their own capabilities and resources to start a spin-off.This perceived behavioural control is calculated by adding up the individual scores of the six statements within this category.

The individual statements about perceived behavioural control as used in the questionnaire have five different answer categories, from "strongly disagree" towards "strongly agree". These answer categories are also used for the statements of behavioural beliefs, the same scale of value will be used. This means that "strongly agree" is rated wit -2, adding up to 2 for "strongly agree". By using this answer scale, it is immediately clear when a factor is restricting the respondent from starting a spin-off or when it is sufficient or even supporting. When the respondent answers "neutral", the score is zero. This also indicates that the factor does not influence the perceived behavioural control.

As there are five individual statements used in this category, the total perceived behaviour is measured by adding the scores of these statements. Consequently, the total score can differ from -10 to 10. When the score is very negative, the respondent has many factors restricting him or her from starting a spin-off. Oppositely, a positive score indicates that the respondent has enough resources, skills and facilities to start a spin-off.

As with the other variables, the possible scores for perceived behavioural control is widely varied. Therefore there are two different sorts of categories. For the description of results there are five categories. Nevertheless, as the possible range of answers is three to four times smaller than with attitude and perceived norm, the scale is smaller too. Therefore, scores lower than -3 are negative, -3 to -1 is slightly negative, 0 is neutral, 1-3 is slightly positive and above 3 is positive. For the analysis of results there are two answer categories, to make the outcome more significant. Scores below 0 are negative and scores of 0 or higher are positive.

3.5 Sample description

As by now the operationalization of the variables has been described, I will continue with the sample description. In this section I will give an overview of the general choices towards the data, analysed in the statistical computer programme SPSS and the general results.

3.5.1 General results

For this research, I have sent 121 questionnaires to researchers of the four departments Robotics and Mechatronics (RaM), Telecommunication Engineering group (TE), Onderzoeksmethodologie, Meetmethoden en Data-Analyse (OMD) and Instructional Technology (IST). In total I received 46 questionnaires, of which 10 were incomplete. Missing data of ten respondents has been removed, as they have not completed the questionnaire. Only data of respondents who have filled in the general questions and at least one other category of questions have been used for analysis. Therefore, with a response of 36 out of 121 questionnaires, the response rate is 30%.

From the RaM department 10 persons out of 44 completed the questionnaire, which makes this the department with the lowest response rate of 23 %. The TE department gave a response rate of 42%, with ten respondents having completed the questionnaires, while the department consists of 24 researchers. One person did not fill in the exact department, but gave "EWI" as answer. Therefore, this respondent is part of TE or RaM, but which department cannot be verified due to anonymity of respondents. In total there are 21 respondents within the hard-applied departments. Within the OMD department, 9 out of 35 respondents completed the questionnaire, which gives a response rate of 26 %. The amount of incomplete questionnaires within this department is striking: 7 persons did not fill in the questionnaire completely. The last department, IST, has a response rate of 33 %, with 6 respondents having filled in the questionnaire completely out of 18 persons sent in total. An overview of the response per department is given in table 3.2.

Table 3.2: Overview results

Department	Sent questionnaires	Completed questionnaires (%)	Incomplete questionnaires (%)
RaM*	44	22,7	4,5
TE*	24	41,7	4,2
OMD	35	25,7	20
IST	18	33,3	0
Total	121	29,8	8,3

*1 respondent filled in department "EWI", not sure RaM or TE; not added to this overview

Within the general questions, I asked about gender, age, nationality, department and function at the department. From the 36 respondents, 33 % are female and 66 % are male. Exactly 50% of all respondents is between 20-29 years old; the other respondents vary in age between 30 to 60+.

Most respondents are Dutch: 88,9%; 8,3% is Asian and 2,8% is European but not Dutch. More than half of the persons is PhD with 52,8%. 11,1% is professor and 8,3% has a function as assistant professor (Universitair Docent; UD). 2,8% is associate professor (Universitair Hoofddocent; UHD). 25% states that he or she has another function (category 'other').

Chapter 4

Results

As stated before, this research is trying to find out the influence of academic subculture on academics' intentions to start a spin-off. The theoretical model used for this research, the reasoned action approach, has been explained in chapter 2. This model states that culture influences attitude, perceived norm and perceived behavioural control. These three factors influence a person's intention to behave in a certain way. In the operationalization chapter (3) I have explained how these concept are operationalized in this quantitative research and how the results of the questionnaire are analysed, where after I have given the first general results.

In this chapter I will describe and analyze the results. I will first describe the results: an overview of the results per statement will be given, followed by Cronbach's alpha reliability test when a variable is compounded. Thereafter the results of the total variable will be given. In the second part of this chapter the results will be analyzed. The influence of the background factors on the dependent variable will be analysed first, whereafter the theoretical model as stated in chapter 2 will be tested empirically. Finally the influence of entrepreneurial culture on the dependent variabels will be analyzed.

4.1 Descriptive results

4.1.1 Intention

As depicted in table 4.1, more than a third of the respondents has the intention to start a spin-off (36,4%). The other two third of the respondents does not have such an intention.

Table 4.1: Frequency table intention to start a spin-off (in %, N=33)

	Percent
Yes	36,4
No	63,6
Total	100,0

As I am interested in the influence of academic subculture, the division between hard en soft sciences, I have looked at the intention to start a spin-off per faculty. The two hard-applied departments, TE and RaM, are gathered in the category EWI, the faculty they are part of. The two soft-applied departments, IST and OMD, are put in the category BMS, which is also the name of their faculty. In table 4.2 an overview is given of the intention to start a spin-off by faculty. Within the 13 respondents belonging to BMS, 23,1% has the intention to start a spin-off. At EWI 45% of the 20 respondents has the intention to start a spin-off. When looking at the amount of respondents answered 'yes', 25% is part of BMS and 75% is part of EWI. Within EWI, the intention to start a spin-off is thus bigger than within BMS, but this difference is not significant (Fisher-exact $p = 0,278$).

		UT faculty		
		BMS	EWI	Total
Intention to start a spin-off	Yes	23,1	45,0	36,4
	No	76,9	55,0	63,6
Total		100,0	100,0	100,0

Table 4.2: Intention to start a spin-off per faculty (in %, N=33)

Another interesting fact is the division between men and women. As shown in table 4.3, within the group of men 43,5% has the intention to start a spin-off, while in the group of women 20% has such an intention. This difference is also not significant (Fisher-exact $p = 0,259$).

		Gender		
		Male	Female	Total
Intention to start a spin-off	Yes	43,5	20,0	36,4
	No	56,5	80,0	63,6
Total		100,0	100,0	100,0

Table 4.3: Intention to start a spin-off per gender (in %, N=33)

Although differences reputed are not significant, it seems that EWI academics are more likely to start a spin-off and men are also more likely to do so, as visible in table 4.3. This is not a surprise because EWI has much more male academics (86%) than BMS (40%)

		UT faculty		
		BMS	EWI	Total
Gender	Male	40,0	85,7	66,7
	Female	60,0	14,3	33,3
Total		100,0	100,0	100,0

Table 4.4: Gender division per faculty (in %, N=36)

4.1.2 Entrepreneurial culture

Entrepreneurial culture is measured by adding the individual scores of statements about this subject, as described in chapter 3. The results of the statements will be described here, where after I will measure the coherence of the statements. Thereafter I will describe the outcome of entrepreneurial culture as a whole, followed by the culture per faculty.

In table 4.5 an overview of the results per statement about entrepreneurial culture is given. This overview shows that the results are very diverse; often people have answered neutral. The second statement, 'innovation is normal' is the only statement with a striking positive result: 81,8% of the respondents (strongly) agrees, of which 30,3% stated that they strongly agree. Within the last statement, 'there are few rules and procedures to comply with', the answers are very diverse, but 12,1% strongly disagreed with the statement and another 33,3% disagreed.

Table 4.5: Frequencies per statement entrepreneurial culture (in %)

	strongly disagree	disagree	neutral	agree	strongly agree	Total	
						Mean	Standard Deviation
Within my UT department, commercialization of new ideas and inventions is seen as normal (N=33)	3,0	18,2	**45,5**	30,3	3,0	.12	.857
Within my UT department, innovation is normal (constant stream of new ideas, systems are renewed constantly) (N=33)	,0	6,1	12,1	**51,5**	30,3	1.06	.827
Within my UT department, uncertainty is seen as normal (N=32)	,0	18,8	**40,6**	**40,6**	,0	.22	.751
Within my UT department, the research and knowledge that result from this are suitable for starting a spin-off (N=33)	,0	24,2	24,2	**48,5**	3,0	.30	.883
Within my UT department, modifying current systems and products is usual (N=33)	3,0	18,2	27,3	**42,4**	9,1	.36	.994
Within my UT department, turning inventions into marketable products is usual (N=33)	6,1	24,2	**36,4**	30,3	3,0	.00	.968
Within my UT department, taking chances and running risks is usual (N=33)	6,1	24,2	**36,4**	30,3	3,0	.00	.968
Within my UT department, there are few rules and procedures to comply with (N=33)	12,1	**33,3**	30,3	21,2	3,0	-.30	1.045

Cronbach's alpha on this item is 0,811 which is very good. All items are included to measure the total entrepreneurial culture, which gives it a possible outcome between -16 and 16. Further description of categories can be found in the operationalization. 59,4% of the respondents has a (slightly) positive view of the entrepreneurial culture, of which 18,8% has a positive view of culture. Only a quarter of the respondents, 28,1%, has a (slightly) negative view. Therefore, re-

spondents' view of their culture can be seen as mainly positive, which means that the greater part of the respondents sees his/her department as entrepreneurial.

	Percent
Not entrepreneurial	12,5
Slightly not entrepreneurial	15,6
Neutral	12,5
Slightly entrepreneurial	40,6
Entrepreneurial	18,8
Total	100,0

Table 4.6: Frequency table entrepreneurial culture (in %, N=32)

As discussed above, the outcome of the individual statements about entrepreneurial culture differs a lot. The overall outcome is mainly entrepreneurial, but here is also a division from not entrepreneurial towards entrepreneurial culture. It therefore is interesting to divide the outcome per faculty, to see whether or not there is a difference in culture between the two faculties. In table 4.7 the division of answers per faculty is given. The non-entrepreneurial view of culture is mainly given by respondents from BMS, while the entrepreneurial view comes more from EWI respondents. Within the respondents who have a non-entrepreneurial view of culture, 75% belongs to BMS. Within the slightly not entrepreneurial category this is 80% BMS. The neutral position is equally divided, as 50% comes from BMS and 50 % from EWI. Within the answer category slightly entrepreneurial 76,9% comes from EWI; this is even 100% for the entrepreneurial category. Concluding, there is a significant difference between the faculties ($Chi^2 = 11,274; df = 4; p = 0,024$): respondents of the BMS faculty do not see their departments as entrepreneurial, while EWI respondents see their departments as entrepreneurial. Therefore, the expectation is that EWI respondents also have a more positive attitude towards starting a spin-off.

	UT faculty		Total
	BMS	EWI	
Not entrepreneurial	25,0	5,0	12,5
Slightly not entrepreneurial	33,3	5,0	15,6
Neutral	16,7	10,0	12,5
Slightly entrepreneurial	25,0	50,0	40,6
Entrepreneurial		30,0	18,8
Total	100,0	100,0	100,0

Table 4.7: Crosstabulation entrepreneurial culture per faculty (in %, N=32)

4.1.3 Attitude

As described in subsection 3.4.3, attitude is measured by statements about behavioural beliefs and by statements about the importance of these beliefs. I have first determined partial attitudes, which are the individual behavioural belief and

importance statements multiplied by each other, where after I added up these data to receive the attitude. The partial attitudes show the opinion of respondents on different parts and possible effects of spin-offs. The total attitude indicates the evaluation of spin-offs as a whole by these respondents. In this section I will first show the individual results of these statements and mention the most striking results. Thereafter I will show the reliability of the compounded variable attitude by Crombach's alpha, followed by the results of attitude as a whole.

To measure the behavioural beliefs, respondents had to rate eight statements about consequences of starting a spin-off. An overview of the answers per statement is given in table 4.8. Most respondents agreed on two statements about taking own (work) decisions and having to learn new skills: added up respectively 82,4% and 91,2% answered 'agree' or 'strongly agree' on these statements. The statement about spare time and work load, by contrast, has been rated negatively: 82,3% (strongly) disagreed with this statement.

Table 4.8: Frequencies per statement behavioural beliefs (in %)

	strongly disagree	disagree	neutral	agree	strongly agree	Total	
						Mean	Standard Deviation
By starting a spin-off I can take my own (work) decisions (N=34)	,0	2,9	14,7	**50,0**	32,4	1,12	,769
By starting a spin-off my social prestige increases (N=34)	2,9	11,8	**44,1**	41,2	,0	,24	,781
By starting a spin-off I will earn more (N=33)	3,0	39,4	**48,5**	9,1	,0	-,36	,699
By starting a spin-off I will gain more self-respect and personal development (N=33)	3,0	6,1	42,4	**45,5**	3,0	,39	,788
By starting a spin-off I will be able to fully use my qualities and talents (N=34)	,0	20,6	14,7	**50,0**	14,7	,59	,988
By starting a spin-off I have to learn new skills (N=34)	,0	,0	8,8	44,1	**47,1**	1,38	,652
By starting a spin-off my spare time will be expanded and work load will reduce (N=34)	29,4	**52,9**	11,8	5,9	,0	-1,06	,814
By starting a spin-off my social security will be expanded (N=32)	12,5	**34,4**	31,3	18,8	3,1	-,34	1,035

The importance of the behavioural beliefs are measured by seven statements, as visible in table 4.9. When looking at the results, it is clear that job satisfaction is the most important factor to them: 44,4% states this is extremely important, 47,2% sees it as very important and no respondent has answered it is less than important. Freedom in work is also seen as important, with 50% seeing this as very important and 19,4% even see it as extremely important. Conversely, earning more money is the least important factor within these statements. 16,7% of the respondents states this is not important at all; 41,7% sees it as somewhat important.

As stated above and in the operationalization section (3.4), the individual statements of behavioural beliefs and importance are multiplied with each other, which

	Not important at all	Somewhat important	Important	Very important	Extremely important	Total	
						Mean	Standard Deviation
Importance of freedom in my work (N=36)	,0	,0	30,6	**50,0**	19,4	2.89	.708
Importance of free time (N=36)	,0	16,7	38,9	**44,4**	,0	2.28	.741
Importance of a good social reputation (N=36)	13,9	22,2	**47,2**	13,9	2,8	1.69	.980
Importance of earning more money (N=36)	16,7	**41,7**	36,1	5,6	,0	1.31	.822
Importance of self-respect and personal development (N=36)	,0	2,8	30,6	**55,6**	11,1	2.75	.692
Importance of social security (N=34)	5,9	20,6	**38,2**	29,4	5,9	2.09	.996
Importance of job satisfaction (N=36)	,0	,0	8,3	**47,2**	44,4	3.36	.639

Table 4.9: Frequencies per statement importance of behavioural beliefs (in %)

gives the partial attitudes. The combination of these eight partial attitudes gives the overall attitude per person. The reliability is rather low with a Cronbach's alpha of 0,450. Baarda, De Goede, and Van Dijkum (2007, p. 78) state that a minimal alpha of 0,60 is needed for complex measurable concepts, such as attitude. Therefore I have deleted the items 'free time (and work load)', 'earning (more) money' and 'social security', which gives a new Cronbach's alpha of 0,658. Attitude will thus be determined by the adding up the scores of five partial attitudes: freedom in work, social prestige/reputation, self-respect and personal development, learning new skills/personal development and job satisfaction.

The attitude outcomes lie between -3 and 26; an explanation of the score division is given in the research methodology chapter, section 3.4. In table 4.10 the frequency of attitude of the 33 respondents is presented. Almost half of the respondents has a positive attitude towards starting a spin-off: 48,5%. Another 36,4% has a slightly positive score, while only 6,1% has a slightly negative score; there are no respondents with a negative score. This means that overall the respondents have a positive attitude towards starting a spin-off, as 84,9 % has a (slightly) positive attitude.

	Percent
Slightly negative	6,1
Neutral	9,1
Slightly positive	36,4
Positive	48,5
Total	100,0

Table 4.10: Frequency table attitude categories (in %, N=33)

4.1.4 Perceived norm

The perceived norm towards spin-offs was measured by questions about the normative beliefs and the importance of these beliefs, which were multiplied with each other in order to receive partial perceived norms. Adding up these partial perceived norms gives the perceived norm, as explained in the operationalization

3.4. In this section I will first describe the results of the individual statements of normative beliefs and their importance and mention the most striking results. Thereafter I will show the reliability of the compounded variable attitude by Crombach's alpha, followed by the results of attitude as a whole.

In order to measure the normative beliefs, the respondents had to rate four statements about the opinion of relevant others about starting a spin-off. An overview of the answers per statement is visible in table 4.11. This table shows that many respondents do not think that relevant others have an opinion about them starting a spin-off: per statement, almost half to three-quarter of the respondents answered that this group of relevant others is neutral and would thus neither encourage nor discourage him/her to start a spin-off. Especially colleagues of other departments, universities and business are according to the respondents neutral about this. As far as the respondents concern even friends, family and colleagues do not seem to have strong feelings for having the respondents to start a spin-off.

Table 4.11: Frequencies per statement normative beliefs (in %)

	strongly discourage	discourage	neutral	encourage	strongly encourage	Total	
						Mean	Standard Deviation
Opinion family and friends (N=33)	3,0	9,1	**45,5**	36,4	6,1	.33	.854
Opinion departmental colleagues (N=32)	,0	6,3	**59,4**	34,4	,0	.28	.581
Opinion colleagues other departments etc (N=32)	,0	3,1	**78,1**	18,8	,0	.16	.448
Opinion supervisors/managers (N=32)	,0	12,5	**53,1**	28,1	6,3	.28	.772

The opinion of friends and family is seen as the most important: respectively 32,4%, 29,4% and 8,8% sees the opinion of family and friends as important, very important or extremely important. The opinion of colleagues from other departments, universities and business on the other hand is seen as least important; 29,4% of the respondents sees this opinion as not important at all; 38,2% says it is somewhat important.

Cronbach's alpha on perceived norm is 0,528; which is not very high. When the item 'family and friends' is deleted, the alpha becomes 0,695. Nevertheless, as I have described above, the opinion of family and friends is quite important in this category. Therefore I have chosen not to delete this item and work with this item, although it has a relatively low reliability of internal consistency.

The total perceived norm is formed by adding up the four partial perceived norms, as described in the operationalization. The outcome is not very explicit, as 30,3% of the respondents has a neutral perceived norm and 48,5% is slightly positive. None of the respondents has a negative perceived norm. Overall the perceived norm towards starting a spin-off is slightly positive but does not have impact on respondents' intention to start a spin-off: relevant others do not have a preference and their opinion is not important.

	Not important at all	Somewh at important	Important	Very important	Extremely important	Total	
						Mean	Standard Deviation
In considering starting a spin-off, how important is the opinion of family and friends (N=34)	5,9	23,5	**32,4**	29,4	8,8	2.12	1.066
In considering starting a spin-off, how important is the opinion of departmental colleagues (N=34)	17,6	**44,1**	14,7	23,5	,0	1.44	1.050
In considering starting a spin-off, how important is the opinion of colleagues from other departments, universities, business (N=34)	29,4	**38,2**	17,6	14,7	,0	1.18	1.029
In considering starting a spin-off, how important is the opinion of my supervisors/managers (N=34)	14,7	23,5	**35,3**	26,5	,0	1.74	1.024

Table 4.12: Frequencies per statement importance of normative beliefs (in %)

	Percent
Slightly negative	12,1
Neutral	30,3
Slightly positive	48,5
Positive	9,1
Total	100,0

Table 4.13: Frequency table perceived norm (in %, N=33)

4.1.5 Perceived behavioural control

As mentioned in subsection 3.4.5, the perceived behavioural control is measured by adding the individual scores of the statements within this category. I will therefore first mention the scores of these individual statements, where after I measure the coherence of these statements, followed by the overall results of perceived behavioural control of starting a spin-off.

In table 4.14 an overview of the answers per statement are given. As visible in this table, the answers are quite divided. Respondents disagree with many statements, which means there are many barriers for starting a spin-off. Time is the greatest limitation: 61,7% of the respondents (strongly) disagrees that they have enough time to start a spin-off. Financial resources are a second limitation, followed by information and knowledge about starting a spin-off. Respectively 54,5% and 51,5% (strongly) disagrees with these statements. Nevertheless, 30,3% (strongly) agrees that they have enough financial resources. The answers to this statement are thus widely spread. Respondents are mainly positive about their skills to start a spin-off: 47,1% (strongly) agrees with this statement. This is the only statement with a positive mean, all other statements have a negative mean. Overall, the respondents answered most statements negatively, although the division is wide (most standard deviations are above one) and the means lie close to zero.

Table 4.14: Frequencies per statement perceived behavioural control (in %)

	strongly disagree	disagree	neutral	agree	strongly agree	Total	
						Mean	Standard Deviation
I have enough financial resources to start a spin-off (N=33)	12,1	**42,4**	15,2	24,2	6,1	-.30	1.159
I have the skills to start a spin-off (N=34)	2,9	20,6	29,4	**41,2**	5,9	.26	.963
I have enough information and knowledge about starting a spin-off (N=33)	9,1	**42,4**	18,2	24,2	6,1	-.24	1.119
I have enough time to start a spin-off (N=34)	23,5	**38,2**	20,6	17,6	,0	-.68	1.036
I have a dispensable position at this department (N=34)	8,8	**38,2**	26,5	23,5	2,9	-.26	1.024
I have a supporting social network (potential clients and suppliers; people sharing knowledge) (N=33)	9,1	24,2	**36,4**	21,2	9,1	-.03	1.104

Perceived behavioural control is measured by adding up the individual statements. As this thus is a compounded variable, I have also measured the reliability of this variable. Cronbach's alpha on this item is 0,748 which means the internal consistency is reliable (Baarda et al., 2007, p. 78). Nevertheless, by deleting the item 'I have a dispensable position at this department' the alpha rises to 0,780. The clearness of this item for respondents is discussable, as will be evaluated in chapter 5. Therefore I have deleted this item.

As visible in table 4.15, the outcome of perceived behavioural control is very divided. 25% of the respondents has a negative perceived behavioural control; 34,4% is slightly negative. Another 25% is slightly positive and only 12,5% is positive. In total this means that about 60% of the respondents perceive barriers to start their own company.

Table 4.15: Frequency table perceived behavioural control (in %, N=32)

	Percent
Negative	25,0
Slightly negative	34,4
Neutral	3,1
Slightly positive	25,0
Positive	12,5
Total	100,0

4.1.6 Summary

By now all results of the five items have been described. A third of the respondents has the intention to start a spin-off, which means he/she has already got a spin-off or has/had the intention to start one. Within EWI the intention to start a spin-off is bigger than within BMS. The intention to start a spin-off also differs

per gender, almost half of the men has the intention towards only one fifth of the women. Entrepreneurial culture is rated diverse among all respondents. Overall 59,4% of the respondents has a (slightly) positive score, which means they see their department as entrepreneurial. When divided into faculty, EWI respondents see their departments overwhelmingly entrepreneurial, while BMS respondents do not see their departments as entrepreneurial.

The attitude towards starting a spin-off is overwhelming positive, with 84,9% of the respondents having a (slightly) positive score, which means most respondents have a positive view of starting a spin-off. The perceived norm of the respondents is somewhat positive, with a (slightly) positive score of 57,6% of the respondents. When respondents feel a social pressure to behave in a certain way, more than half of the respondents will be pressed slightly to start a spin-off. The perceived behavioural control on the other hand is rated negative: 59,4% of the respondents has a (slightly) negative score. This means that more than half of the respondents will be restricted from starting a spin-off because of internal and external boundaries. In the next chapter the results will be analysed.

4.2 Analysis of results

As the descriptive results have been given, I will analyze these results in this section. First I will look at the influence of the background factors on the dependent variables. Thereafter the theoretical model used in this research will be tested empirically, followed by an analysis of the influence of entrepreneurial culture on the dependent variables.

4.2.1 Influence of background factors on variables

As stated in the hypothesis, I expected that technical (hard) sciences departments are more entrepreneurial than social (soft) sciences. Consequently, the more entrepreneurial a culture is, the more academics may feel like starting a new company and the more spin-off activities they are supposed to have. Therefore, the expectation is that EWI has more spin-off activities than BMS. As visible in subsection 4.1.2, EWI respondents indeed have a greater intention to start a spin-off than BMS respondents, although this difference is not significant. Nevertheless, as intention is influenced by culture, attitude, perceived norm and perceived behavioural control, it is interesting to see whether the faculties also differ in these variables or not. In this subsection therefore, I will check if respondents from the different faculties differ in answers on these variables. Thereafter I will do the same for the control variables gender, age, and function. Nationality is not analysed as there is too little difference in nationality: 88,9% of the respondents is Dutch.

When looking at attitude, there is absolutely no significant difference in outcome per faculty. Within BMS 76,9% of the respondents has a positive attitude towards starting a spin-off; within EWI this is 82,4%. Looking at the second variable, EWI

respondents have a significant more positive perceived norm than BMS respondents ($Chi^2 = 7,781; df = 2; p = 0,020$). As visible in table 4.16, within EWI there are no respondents with a negative perceived norm, while 30,8% of the BMS respondents has this. EWI respondents have more neutral perceived norms than BMS respondents: 40% versus 15,4%. The percentage respondents with a positive perceived norm is comparable; 53,8% from BMS and 60% from EWI.

Table 4.16: Crosstabulation perceived norm per faculty (in %, N=33)

		UT faculty		
		BMS	EWI	Total
Perceived norm	Negative	30,8	,00	12,1
	Neutral	15,4	40,0	30,3
	Positive	53,8	60,0	57,6
Total		100,0	100,0	100,0

The perceived behavioural control of the respondents of both faculties is comparable, there is no significant difference. The disciplinary culture as seen by respondents has already been discussed in the descriptive part above. Nevertheless, in this analysis part I have used a new category for the variables, which means culture is divided into a positive and a negative part. By using this scale, the outcome is even more significant different (Fisher-exact $p = 0,006$), as visible in table 4.17. 58,3% of the BMS respondents has a negative entrepreneurial culture against 10% of the EWI respondents; 90% of these EWI respondents has a positive entrepreneurial culture against only 41,7% of BMS.

Table 4.17: Crosstabulation culture per faculty (in %, N=32)

		UT faculty		
		BMS	EWI	Total
Culture	Not entrepreneurial	58,3	10,0	28,1
	Entrepreneurial	41,7	90,0	71,9
Total		100,0	100,0	100,0

As by now the possible differences in outcome of the dependent variable per faculty have been examined, I will do the same for gender. There is no coherence between gender and attitude, as Fisher-exact $p = 1,00$. The same goes for perceived norm and perceived behavioural control, there is no significant difference between the two sexes. Only culture has a marginal significant difference (Fisher-exact $p = 0,96$), as visible in table 4.18. 50% of the females have sees their department's culture as entrepreneurial and another 50% sees this culture as not entrepreneurial. Men see their departmental culture overwhelming entrepreneurial: 81,8%. Men have thus a marginal significant more entrepreneurial view of their culture than women.

Table 4.18: Crosstabulation culture per gender (in %, N=32)

		Gender		
		Male	Female	Total
Culture	Not entrepreneurial	18,2	50,0	28,1
	Entrepreneurial	81,8	50,0	71,9
Total		100,0	100,0	100,0

Within age there are five different categories, as visible in the survey D. There is no significant difference between the age categories on attitude, perceived norm, perceived behavioural control and on culture. Within function there are also five different categories. For attitude, perceived norm and perceived behavioural control there is no significant difference between the functions. Nevertheless, for culture there is a significant difference, but the amounts used for this analysis is so small that this outcome is not reliable. The table and reasons why this outcome is not reliable will be discussed in the discussion chapter (5).

4.2.2 Analysis theoretical model

In this subsection I check the relations from the theoretical model: I will measure the relationship between attitude and intention; perceived norm and intention and the relationship between perceived behavioural control and intention. As stated in the theoretical chapter (2), the relationship between these variables and intention should be positive: a positive attitude/perceived norm/perceived behavioural control should lead to a positive intention towards behaviour.

First of all I am going to look at the relationship between attitude and intention. The expectation is that respondents with a positive attitude towards spin-off will have a positive intention to start a spin-off, while a negative attitude should correspondent with a negative intention. As visible in table 4.19 this expectation comes true partly. There is a marginal significant coherence between the variables (Fisher-exact $p = 0,055$). 60,7% of the respondents has an outcome as expected: they have a negative attitude and no intention to start a spin-off (21,4%) or a positive attitude and an intention to start a spin-off (39,3%). There is also 39,3% of the respondents who have a positive attitude but no intention to start a spin-off, which is not in line with the theoretical expectation. Therefore the expected positive relation between attitude and intention is not verified, but this could be caused by the other variables perceived norm and perceived behavioural control.

The second variable that is said to influence intention is the perceived norm. Here the same positive relation is expected: when the perceived norm is positive, the intention is also expected to be positive and when the perceived norm is negative, the intention also is expected to be negative. As there are many respondents who have a neutral perceived norm, there is an extra category 'neutral'. The outcome

Table 4.19: Crosstabulation attitude versus intention (in %, N=28)

		Attitude		
		Negative	Positive	Total
Intention to start a spin-off	Yes	,00	39,3	39,3
	No	21,4	39,3	60,7
Total		21,4	78,6	100,0

of this analysis is not significant and the expected relation between perceived norm and intention is not demonstrated with these results, shown in table 4.20. The great amount of respondents who have a neutral perceived norm cannot be explained by the theoretical model, as this only explains the positive and negative values. Besides this, 37,5% of the respondents has an outcome as expected with 9,4% having a negative perceived norm and no intentions to start a spin-off and 28,1% with a positive perceived norm and the intention to start a spin-off. Therefore, the expected relationship between perceived norm and intention is not found with these results, but this could cohere with the scores on attitude and perceived behavioural control.

Table 4.20: Crosstabulation perceived norm versus intention (in %, N=32)

		Perceived norm			
		Negative	Neutral	Positive	Total
Intention to start a spin-off	Yes	3,1	6,3	28,1	37,5
	No	9,4	25,0	28,1	62,5
Total		12,5	31,3	56,3	100,0

The last variable that is expected to have a positive relationship with intention is perceived behavioural control. As the theory states, respondents with a positive score on perceived behavioural control should have a positive intention to start a spin-off; while negative scores on perceived behavioural control should correlate with a negative intention. The correlation between the variables is marginal significant (Fisher-exact $p = 0,06$). As shown in table 4.21, 71% of the respondents has a positive correlation between perceived behavioural control and intention: 45,2% has no intention to start a spin-off and a negative perceived behavioural control and 25,8% has a positive result on both variables. Nevertheless, another 29% of the respondents has no correlation between those variables. Therefore, the positive relationship between perceived behavioural control and intention as theoretically expected is marginally verified, it seems to be the most coherent variable of the three discussed. It may therefore influence the outcome of attitude and perceived norm: when a respondent has a positive attitude and positive perceived norm, but barriers that restrain him/her from starting a spin-off, he/she has not got the intention to start an own company. The coherence between attitude/perceived norm and intention seems to be absent, but can be clarified by the perceived behavioural control.

Table 4.21: Crosstabulation perceived behavioural control versus intention (in %, N=31)

		Perceived behavioural control		
		Negative	Positive	Total
Intention to start a spin-off	Yes	12,9	25,8	38,7
	No	45,2	16,1	61,3
Total		58,1	41,9	100,0

4.2.3 Influence of culture on attitude, perceived norm and perceived behavioural control

By now the relationships between attitude, perceived norm and perceived behavioural control on intention have been analysed. The relation between perceived behavioural control and intention is the one that fits most with the theory; attitude has some influence, but perceived norm not. This means that the theoretical model as explained in chapter 2 does not totally correspond with the results from this research on this part. It may be possible that culture influences these variables. Therefore in this subsection I will analyse the relationship between culture and attitude, perceived norm and perceived behavioural control .

The culture measured in this study indicates the amount of entrepreneurship that is part of the departmental culture. It therefore is called the entrepreneurial culture. The theoretical model stated that this culture influences attitude, perceived norm and perceived behavioural control. As the culture used here is the departmental culture, this will not influence all these factors. Within perceived norm, external colleagues and family and friends will not be influenced directly by the departmental culture. Therefore in this part I will use colleagues and supervisors only as part of perceived norm.

When looking at the relationship between entrepreneurial culture and attitude, the expectation is that respondents who rate their departmental culture positive on entrepreneurship will also have a positive attitude on starting a spin-off and the persons who rate their culture negative will have a negative attitude. The results of this research do not show this relation, as can be seen in table 4.22. The outcome is not significant. More than half of the respondents has both a positive view of culture and a positive attitude, but only 3,6% has both variables negative. The other persons, 42,9%, do not have a cohere relation between the two variables. Thus the entrepreneurial culture does not influence attitude in this research.

The relationship between culture an perceived norm is stated significant ($Chi^2 = 8,526; df = 2; p = 0,014$), but the conditions for a Chi-Square Test are not met, as four cells have an expected count less than five. What this means for the results of this research will be discussed further in the Discussion chapter. Table 4.23 shows an overview of the data. As there are many respondents who have a perceived norm of 0, the neutral category is also used in this overview. Only 39,7% of the respondents has corresponding scores on culture and perceived norm, all other respondents have no correlation between the two variables or have a neu-

Table 4.22: Crosstabulation attitude versus culture (in %, N=28)

		Culture		
		Not entrepreneurial	Entrepreneurial	Total
Attitude	Negative	3,6	14,3	17,9
	Positive	28,6	53,6	82,1
Total		32,1	67,9	100,0

tral score on perceived norm (50%). Therefore this shows that entrepreneurial culture does not influence perceived norm.

Table 4.23: Crosstabulation perceived norm versus culture (in %, N=32)

		Culture		
		Not entrepreneurial	Entrepreneurial	Total
Perceived norm	Negative	9,4	,0	9,4
	Neutral	9,4	40,6	50,0
	Positive	9,4	31,3	40,6
Total		28,1	71,9	100,0

The relation of perceived behavioural control and culture is not significant. More than half of the respondents do not have a corresponding score on culture and perceived behavioural control (53,3%), which was not as expected theoretically. Table 4.24 shows that entrepreneurial culture thus does not influence perceived behavioural control. This outcome may be explained by the nature of culture used in this study: the entrepreneurial culture within departments does not directly influence personal barriers.

Table 4.24: Crosstabulation perceived behavioural control versus culture (in %, N=30)

		Culture		
		Not entrepreneurial	Entrepreneurial	Total
Perceived behavioural control	Negative	16,7	43,3	60,0
	Positive	10,0	30,0	40,0
Total		26,7	73,3	100,0

Concluding, the relations between entrepreneurial culture and atttide, perceived norm and perceived behavioural control, as derived from the theoretical model, are not verified in this study. All three variables seem to be not influenced by entrepreneurial culture. Culture can thus not influence intention through these variables, as expected by means of theory.

4.2.4 Influence of entrepreneurial culture on intention

As entrepreneurial culture does not influence culture through the three variables attitude, perceived norm and perceived behavioural control, it may be possible that culture influences intention directly. Therefore this relation has been analysed, as visible in table 4.25. The relation between these two variables is not significant. Two third of the respondents of the respondents who has the intention to start a spin-off, sees his/her departmental culture as entrepreneurial (25,8%); one third of these academics does not see their culture as entrepreneurial (12,9%). More than half or the respondents (58,1%) has a non-corresponding outcome: a positive score on one variable and a negative score on the other variable. Therefore, entrepreneurial culture does not influence the intention to start a spin-off within this group of respondents.

Table 4.25: Crosstabulation culture and intention (in %, N=31)

		Culture		
		Not entrepreneurial	Entrepreneurial	Total
Intention to start a spin-off	Yes	12,9	25,8	38,7
	No	16,1	45,2	61,3
Total		29,0	71,0	100,0

In the next chapter, conclusion and discussion, I will describe the final results and answer the research questions. Thereafter the research will be reflected critically in the discussion part.

Chapter 5

Conclusion and discussion

As the results of this research have been discussed in the preceding chapter, this chapter will provide a conclusion and reflection on the research. In the first section the research questions will be answered, where after these conclusions and the overall research will be reflected critically in the discussion part.

5.1 Conclusion

This aim of this research was to find out how academic (sub)culture influences human behaviour. This human behaviour was specified as researchers' intentions towards starting a spin-off company. Therefore, the main research question was "how does academic culture influence researchers' intention to create spin-offs?". In order to answer this question there were three sub questions.

The first sub question was "what do subcultures of university departments look like?" Becher and Trowler distinguish hard and soft sciences, where hard sciences are technical departments and soft sciences are social departments. The technical departments differ significantly from the social departments on entrepreneurial culture: technical departments have an entrepreneurial focus while social departments do not have such an entrepreneurial focus. The subcultures of university departments can thus be divided into two categories: technical, entrepreneurial and social, not entrepreneurial.

The second sub question is "what are researchers' intentions to create spin-offs?" This research showed that 36,4% of the researchers has the intention to start a spin-off, which means that one third of the researchers has a spin-off, had the intention to start a spin-off in the past years or has the intention to start one in the future. The other two third of the researchers does not have the intention to start a spin-off.

The last sub question is "how do the subcultures influence researchers' intentions to establish spin-offs?" The results have shown that the subcultures do not influence researchers' attitude, perceived norm and perceived behavioural control. Besides, there is no significant coherence between researchers' attitude and perceived norm towards their intention; only perceived behavioural control has

a marginal significant influence on intention. Therefore, the subcultures do not influence researchers' intentions to establish spin-offs.

Overall, the conclusion of this research is that academic culture does not influence researchers' intentions to create spin-offs.

5.2 Discussion

As the conclusion has shown that academic culture does not influence researchers' intentions to start a spin-off, I will reflect on the research in this section. The results will be interpret and I will speculate what may have caused them. First I will interpret the results and speculate what may have caused these results. Thereafter the limitations of the research will be discussed, followed by recommendations for future research.

5.2.1 Interpretation of results

As the outcome of this research is that the hypothesis is not met and academic subculture does not influence researchers' intention to start a spin-off, it is interesting to think about possible clarifications. First of all, it may be possible that the theoretical model as discussed in chapter 2 does not fit the situation. As stated in that same chapter, I have made the choice to see culture as a background factor. Nevertheless, there was also the possibility of seeing culture as factor that influences perceived behavioural control instead of seeing it as background factor. Looking at the results, it seems that culture only influences perceived behavioural control marginal significant, but it does not influence the other variables. Therefore, it may be that culture should have placed at the other side of the model, influencing perceived behavioural control only. This could clarify why the outcome is that culture influences only perceived behavioural control.

A second clarification for the results is that other background factors are influencing the outcome. In this research I used culture as only background factor and have tried to keep other background factors as similar as possible. Nevertheless, it is very difficult to keep all factors stable; it may be possible that other factors have influenced the intention indirectly. Gender is an example of such a background factor. As visible in chapter 4, results, the intention to start a spin-off is higher among respondents of EWI than among respondents of BMS. Nevertheless, the same chapter has shown that men also have more intentions to start a spin-off than women and that EWI has significant more men than women in comparison to BMS. It thus is questionable whether the difference in intention to start a spin-off comes from academic subculture, or that is comes from difference in gender. These two factors can also be connected with each other; maybe gender influences culture, which makes both culture and gender different and influence the intention to start a spin-off. Nevertheless, gender can also be an important background factor influencing researchers' intentions to start a spin-off.

The ignorance of what spin-offs are among respondents can be a third clarification of the results. One respondent has send an e-mail in response to the questionnaire in which she stated that she was not familiar with the concept spin-off. She had no experience with it and neither had some of her colleagues. This may explain the low response rate among some departments: within one department there were many respondents who did start but did not complete the questionnaire. Overall it can thus be that respondents were not familiar enough with the concept 'spin-off', as a result of which questionnaires were not always filled in as desired.

Another possible explanation is the inaccuracy of the operationalization. In this case, the theory may be right but the concepts are not operationalized properly. The variables measured then do not correspond with the theoretical concepts and thus do not measure the right factors. For example, a different operationalization of the concept attitude may have lead to a different outcome, more in line with the hypothesis.

As stated in the description of general results (chapter 3), 25% of the respondents filled in that his/her function is 'other'. This is a last reason that may clarify the results as given. As these persons are not academic staff as mentioned by the other categories, it may be that they are supporting staff or students graduating at that department. These persons are less in a position to start a spin-off: supporting staff does not do scientific research and students are busy getting their degree. Therefore, they may influence the results in such way that they may have positive attitude, perceived norm en perceived behavioural control, and see the departmental culture as entrepreneurial, but do not have the intention to start a spin-off because they do not have the possibility to start a spin-off.

By now four important clarifications for the results as given have been explained. As there are also limitations resulting from the research design that have influenced the outcome, I will hereafter explain these limitations.

5.2.2 Limitations

As this research has approached respondents of only one university, the University of Twente, the range of the research is limited. The results are not generalisable for other universities. Within the university, only four departments have been researched. This is also a limitation for the generalisability of the outcome of the research; it may be that the variables are seen differently at other departments. Besides, there are only two departments per sort of science: two for the technical sciences and two for the social. It is questionable of these departments are representative for the whole technical and social population within the university.

As a result of the small range of the research, the sample taken is also very limited. There are only 36 respondents in this quantitative research. As a result of this small sample, results are difficult to analyze statistically as outcomes are barely significant. For example, the culture per function has been analyzed. The outcome is significant ($Chi^2 = 10,143; df = 4; p = 0,038$) but 80% of the cells have an expected count that is less than five of which four expected counts are

below one which means that the conditions for the Chi-square Test are not met. In many other cases the outcome is not significant at all. The small amount of respondents thus prohibits from being able to draw accurate conclusions.

5.2.3 Recommendations for future research

This research has given a small view of the relation between academic culture and intention to start a spin-off. Nevertheless, it is very interesting to do further research on these subjects. Therefore, some recommendations for future research are made in this subsection.

The relationship between culture and knowledge commercialization can be researched extendedly, but in greater scale than this research. When looking at academic culture, more universities should be researched in order to be able to compare the outcome and to see whether or not there is a significant similarity between the cultures. Within the universities there should also be more departments approached, as this increases the reliability. Hereby the amount of respondents will automatically increase, which makes it easier to generalize outcome and do statistical analysis.

Next to an extended scale, it is very interesting to do qualitative research on this subject. As this research is quantitative, there is no explanation given by respondents why they have answered the way they did. When research is qualitative by means of interviews, respondents can answer extensively and explain their reasoning. When the respondents experiences lack of clarity, this can immediately be recovered, as the researcher and respondent are with each other. For example, the concept 'spin-off' can be explained when the respondent has no clear view. The same goes for the function of respondents, when doing interviews it is clear that the respondents are part of the group aimed at.

Another recommendation is the research of actual behaviour of academics. Since this study has only researched the intention to start a spin-off and assumed that these intentions will lead to certain behaviour, the creation of spin-offs, it is possible that the intention and actual behaviour of researchers differ more than expected.

Appendix A

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Appendix B

E-mails departments

Dear members of (department),

My name is Karin Lammers and I am a Public Administration master's student. I would like to ask you to complete a short questionnaire that is part of my master thesis project. The survey can be found at **http://www.thesistools.com/web/?id=469088**. This project concerns the establishment of spin-offs at the University of Twente*. Completion of the questionnaire will only take 5-10 minutes of your precious time. Answers will be treated confidentially; reporting will be anonymous and for my project only.

I would sincerely appreciate your help because this is vital to my master thesis. Thank you very much in advance for completing the questionnaire. If you need further information, please do not hesitate to contact me at j.h.lammers@student.utwente.nl.

Kind regards, Karin Lammers

*My master thesis project is supervised by the Center for Higher Education Policy Studies (CHEPS-UT; dr. H.F. de Boer)

Appendix C

Salient beliefs

C.1 Attitude

- What do you see as positive effects of starting an own company?
- What do you see as negative effects of starting an own company?

C.2 Perceived norm

- Who are your relevant others (persons who's opinion is important to you when making the choice of starting an own company)?
- How can these relevant others influence your choice to start an own company?

C.3 Perceived behavioural control

- What do you need to be able to start your own business?
- What are possible restrictions, that can prevent you from starting your own company?

Appendix D

Survey

Thesis survey on spin-offs at the University of Twente

In this survey you will find eight questions. If you do not know the answer to a question, please do not fill it in. Thank you very much in advance for completing this survey!

1. General questions

Gender	Male ☐	Female ☐

Age	20-29 ☐	30-39 ☐	40-49 ☐	50-59 ☐	60+ ☐

Nationality	Dutch ☐	European (not Dutch) ☐	Asian ☐	African ☐
	North American ☐	South American ☐	Australian/Oceanian ☐	

Name of UT department

_____

Function at department	PhD ☐	Postdoc ☐	UD ☐
	UHD ☐	Professor ☐	Other ☐

2. By starting a spin-off...

	strongly disagree	disagree	neutral	agree	strongly agree
...I can take my own (work) decisions	☐	☐	☐	☐	☐
...my spare time will be reduced and work load will expand	☐	☐	☐	☐	☐
...my social prestige increases	☐	☐	☐	☐	☐
...I will earn more	☐	☐	☐	☐	☐
...I will gain more self-respect and personal development	☐	☐	☐	☐	☐
...I will be able to fully use my qualities and talents	☐	☐	☐	☐	☐
...I have to learn new skills	☐	☐	☐	☐	☐
...my social security will be reduced	☐	☐	☐	☐	☐

3. How important are the following aspects to you?

	not important at all	somewhat important	important	very important	extremely important
Freedom in my work	☐	☐	☐	☐	☐
Free time	☐	☐	☐	☐	☐
A good social reputation	☐	☐	☐	☐	☐
Earning more money	☐	☐	☐	☐	☐
Self-respect and personal development	☐	☐	☐	☐	☐
Social security	☐	☐	☐	☐	☐
Job satisfaction	☐	☐	☐	☐	☐

4. In considering starting up a spin-off, how important is the opinion of...

	not important at all	somewhat important	important	very important	extremely important
...family and friends	☐	☐	☐	☐	☐
...departmental colleagues	☐	☐	☐	☐	☐
...colleagues from other departments, universities, business	☐	☐	☐	☐	☐
...my supervisors/managers	☐	☐	☐	☐	☐

5. According to your view, would the following persons (dis)encourage you to start your own spin-off?

	strongly discourage	discourage	neutral	encourage	strongly encourage
Family and friends	☐	☐	☐	☐	☐
Departmental colleagues	☐	☐	☐	☐	☐
Colleagues from other departments, universities, business	☐	☐	☐	☐	☐
Supervisors/managers	☐	☐	☐	☐	☐

6. To what extend do you (dis)agree with the following statements?
I have...

	strongly disagree	disagree	neutral	agree	strongly agree
...enough financial resources to start a spin-off	☐	☐	☐	☐	☐
...the skills to start a spin-off	☐	☐	☐	☐	☐
...enough information and knowledge about starting a spin-off	☐	☐	☐	☐	☐
...enough time to start a spin-off	☐	☐	☐	☐	☐
...a dispensable position at this department	☐	☐	☐	☐	☐
...a supporting social network (potential clients and suppliers; people sharing knowledge)	☐	☐	☐	☐	☐

7. Which of the following options does imply to you?
Please tick one answer

- ☐ I currently have a spin-off
- ☐ During the past three years, I did seriously intend to start a spin-off
- ☐ Within five years, I seriously intend to start a spin-off
- ☐ I havo no intention to start a spin-off

8. To what extend do you (dis)agree with the following statements?
Within my department at the UT...

	strongly disagree	disagree	neutral	agree	strongly agree
...modifying current systems and products is unusual	☐	☐	☐	☐	☐
...commercialization of new ideas and inventions is seen as normal	☐	☐	☐	☐	☐
...turning inventions into marketable products is unusual	☐	☐	☐	☐	☐
...innovation is normal (constant stream of new ideas, systems are renewed constantly, new ideas are welcomed, not seen as threat)	☐	☐	☐	☐	☐
...there are many rules and procedures to comply with	☐	☐	☐	☐	☐
...taking chances and running risks is unusual	☐	☐	☐	☐	☐
...uncertainty is seen as normal	☐	☐	☐	☐	☐
...the research and knowledge that result from this are suitable for starting a spin-off	☐	☐	☐	☐	☐