





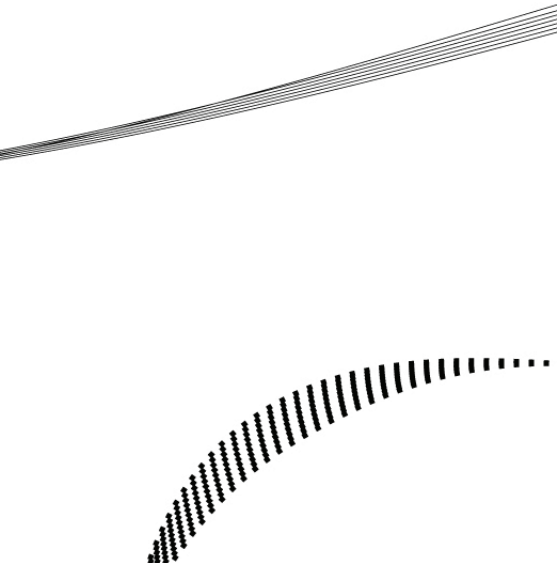

How can universities use organizational factors to stimulate entrepreneurship?

*A quantitative study on entrepreneurial
behaviour at the departments of management
& governance and behavioural sciences of
the University of Twente.*



AUTHOR:
J. Vossebeld

EXAMINATION COMMITTEE:
PD Dr. R. Harms
Prof. Dr. T. Bondarouk



UNIVERSITY OF TWENTE.

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Student

Name: J. Vossebeld
Student number: S1258710
Study: MSc in Business Administration
Specialization: Innovation & Entrepreneurship

Exam Committee

First Supervisor: PD Dr. R. Harms
University of Twente
Second Supervisor: Prof. Dr. T. Bondarouk
University of Twente

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The topic had to be entrepreneurship. That much did I know when I started thinking about my master thesis. I am interested in what drives people to be entrepreneurial. With increasing concern about entrepreneurial universities, the University of Twente was the ideal place to collect data. There is many literature on entrepreneurship, but only few authors have specified their papers on universities. This made my research more interesting to me.

I owe my thanks to PD Dr. Harms for mentoring me during my research. I got to know him as earthly-minded and to the point; something I appreciate a lot. Though sometimes busy, he always found time for feedback. Our sessions were short and powerful, without a fuss. This pleased me, and I think it pleased him as well. I want to thank Prof. Dr. Bondarouk for her clear and direct feedback at the end, which really improved my report. I also want to thank the many members from faculties Management and Governance and Behavioural Sciences for returning their questionnaires. Without sufficient replies, a quantitative study on behaviour is impossible.

After an introduction on the research, chapter 1 continues on the research design. Chapter 2 will discuss the literature on entrepreneurship and introduces the model which will be tested further on in the report. Methods are described in chapter 3, including how the questionnaire is set up and spread, how the data is validated, and which statistics will be used. Chapter 4 discusses the results of the statistical tests, and validates the model discussed earlier. Chapter 5 ends the report with a discussion. Six appendices are included at the end of the report.

Joost Vossebeld

Enschede,

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ABSTRACT

Universities are becoming more entrepreneurial. Entrepreneurial in a university context includes for example knowledge spill over, renewing teaching methods and commercializing knowledge. The drive to become more entrepreneurial is partly driven by a growing expectation to stimulate the regional economy. Some universities are now aware of the shift towards more entrepreneurial activities, and are trying to act accordingly. Two examples are the University of Twente which makes entrepreneurship one of their main long-term goals (University of Twente, 2013), and the National University of Singapore which is experimenting with interventions that potentially stimulate entrepreneurial activities (Wong, Ho, & Singh, 2007, p. 946).

There is a great deal of research on how companies can become more entrepreneurial. But most entrepreneurship research has not been tested at a university. In a business environment, organizational factors have been found to stimulate entrepreneurship (J. S. Hornsby, Kuratko, Holt, & Wales, 2013). It has been verified that management support, work discretion, rewards/reinforcement and time availability stimulate entrepreneurship in a business context. The organizational factors stimulate the entrepreneurial orientation (EO) of a company. The organizational factors are perceived by employees. By perceiving the organizational factors, the attitude towards entrepreneurship of the employees is shaped. As one of the determinants of behaviour, the attitude of employees makes them undertake more entrepreneurial activities. Attitude towards entrepreneurship is thus a mediator in the relation between the organizational factors and EO.

Whether the organizational factors mentioned above also stimulate EO in a university environment has not been tested. This research will test four organizational factors in a university context. The research question is: which organizational factors are the strongest stimulators of entrepreneurial orientation within a university context? To answer the questions, the research will check whether the organizational factors indeed lead to higher EO among university employees in two departments of the University of Twente. To understand how the relation between organizational factors and EO works, the research will answer whether attitude towards entrepreneurship is indeed a mediator in the relationship between organizational factors and EO. The research continues with a multiple regression analysis between the organizational factors and attitude towards entrepreneurship. The multiple regression analysis shows which organizational factors are most influential in the relation, and which are perhaps insignificant. With help of a questionnaire, data is collected to answer the questions. The questionnaire is distributed among two departments of the University of Twente. The questions measure the four organizational factors, the attitude of employees towards entrepreneurship and the entrepreneurial orientation. It is based on borrowed constructs. Items are selected based on their factor loadings and on Cronbach's Alpha.

While in a business context, the organizational factors predict EO as a whole and individually, they do not in a university context. As a set, they do predict EO. Individually, only management support significantly predicts EO. Work discretion, time availability and rewards/reinforcement do not significantly predict EO. Attitude is a mediator in the relation between the organizational factors and EO in the business context (J. S. Hornsby et al., 2013). For the relationship between management support and EO, attitude towards entrepreneurship is indeed a mediator. Interestingly, rewards/reinforcement also have a strong direct relationship with attitude towards entrepreneurship.

The organizational factors which can be used to stimulate entrepreneurship in a company do not all work in a university context. Universities can improve management support to stimulate entrepreneurial activity among employees. To increase management support, top-level managers can

facilitate and promote entrepreneurial behaviour, they can champion innovative aides and provide necessary resources. Support for entrepreneurial behaviour increases the attitude towards entrepreneurial behaviour among employees. Attitude towards entrepreneurial behaviour co-determines the intention to act entrepreneurial, which leads to more entrepreneurial activity among university employees.

Rewards/reinforcement has a strong direct relationship with attitude towards entrepreneurship, but does not have a relationship with EO. It is possible that rewards/reinforcement does not work at a university in contrast to companies because of the differences between universities and companies. But it could also be a result of the type of rewards that are measured in this research. The used scale does not differentiate between monetary and non-monetary rewards. It could be that either monetary or non-monetary rewards have an effect on EO, but the other does not. With the dataset used in this research, it is not possible to give an decisive answer to why rewards/reinforcement, work discretion and time availability do not have a strong direct relationship with EO in a university context, in contrast to a business context.

Rewards/reinforcement has a relationship with attitude towards entrepreneurship, but not with EO. This research does not explain why. Future research could further investigate the role of rewards in entrepreneurial universities. There are also risks with focussing on entrepreneurial activity, such as risk of ownership and risks of losing a subjective view due to stakes in the results of research. Future research could further investigate the risks of becoming more entrepreneurial. This research should not be replicated to validate the findings in other setting, before the effect of organizational goals are better understood.

1 INTRODUCTION

1.1 BACKGROUND

Universities originate as academic teaching institutions, in which research was a side activity. It was in the late 19th century that universities acquired the function of research (Etzkowitz, 2003, p. 110). Academics had a two-sided work task, splitting their resources in research and teaching. Stimulation of national and regional economic was not expected from universities, but from companies. But it is increasingly expected from universities that they stimulate economies as well (Etzkowitz, 2003, p. 110). Traditionally, the researching and teaching universities were provided with resources through governments. Knowledge from research was not commercialized much (Mowery, Nelson, Sampat, & Ziedonis, 2001). But recent decades have been characterised by more rapid changing technology, causing an increased demand for knowledge accumulation. Companies started to recognize knowledge as an asset, and actively started to accumulate knowledge (Soete, 2002, pp. 36-37). Rapid changing technology and increasing competition has led to an increase in ways of knowledge spill over from universities. The expectation for universities to drive economic growth becomes visible in laws accepted in West-European countries and the United States. In Italy, laws have been introduced a few decades ago to legalize private funding of universities. German universities systems are revaluated to increasingly stimulate local economy and to commercialize teaching and researching activity (Etzkowitz, Webster, Gebhardt, & Terra, 2000, pp. 222-223). Most well-known, one of the goals of the Bayh-Dole act in the U.S. was for universities to market acquired patents and licences (Mowery et al., 2001, pp. 101-103).

The increased demand to transfer knowledge stimulated universities to undertake entrepreneurial activities (Yusof & Jain, 2010, pp. 87-88). Knowledge has been transferred to industry by e.g. students applying knowledge in their jobs after studying and through literature. But knowledge spill over is increasingly done through industry-university collaboration (Etzkowitz, 2003, p. 112; Tuunainen, 2005, p. 174; Yusof & Jain, 2010, p. 85). The first universities to become more entrepreneurial were US universities. A gap has risen between the entrepreneurial universities and the more traditional universities in terms of innovation rate (Etzkowitz, 2003, p. 109; Soete, 2002). In order to compete, other universities are becoming more entrepreneurial as well. The universities which undertake more entrepreneurial activities are called entrepreneurial universities. A definition of entrepreneurial universities has been given by Yusof: "An entrepreneurial university is a university that extensively practices academic entrepreneurship. An entrepreneurial university can be compared to a less entrepreneurial one by measuring the level of its academic entrepreneurship" (2010, p. 90). Entrepreneurial universities incorporate their new role to commercialize knowledge (Wong et al., 2007, p. 942).

The University of Twente is an example of how a university increasingly undertakes entrepreneurial activities in order to market their knowledge. The university has acknowledged the need to become more entrepreneurial, and has made it one of the main focus points in their 'vision 2020' long-term strategy. Last year, the university is rated the most entrepreneurial university of the Netherlands (University of Twente, 2013), and it wants to become the most entrepreneurial university of Europe according to their long-term vision. Moreover, the European Union is stimulating entrepreneurial universities through funding programmes (Etzkowitz et al., 2000, p. 321). Ylijoki (2003) stresses that entrepreneurial activity is indispensable. In her research she saw that universities in Finland are increasing entrepreneurial activity to commercialize knowledge. Even fields focussed at unapplied research such as History departments find ways to act more entrepreneurial (Ylijoki, 2003). But how can universities become more entrepreneurial? Some universities are experimenting, such as the

National University of Singapore (Wong et al., 2007, p. 946). They sometimes have few theoretic bases to build on. This research will pioneer in how universities can satisfy the upcoming expectation to become more entrepreneurial by engaging changes in specific organizational factors, enabling universities to make more use of new possibilities for funding and knowledge spill over.

1.2 PROBLEM STATEMENT AND GOAL

There is a trend of increasing entrepreneurial activities undertaken by universities. Sharing and applying knowledge increasingly happens through university-industry collaboration. Funding is more often done directly by industry and collaboration in research and teaching enables increased knowledge spill over. Companies in their turn, increasingly recognize knowledge as important asset. They cooperate by becoming more involved in research, and by funding research (Berman, 1990). Research on how universities can become more entrepreneurial is needed.

Alternatively, one could question whether universities should increase their efforts on entrepreneurial activities. Resources are traditionally split between the tasks of teaching and researching activities (Etzkowitz et al., 2000). Initiating entrepreneurial activities may restrain resource availability for the traditional tasks. Resource availability is a challenge for universities who expand their goals. Moreover, entrepreneurial activities often involve industry collaboration. Financial interests due to industry collaboration may influence the independent role of universities (Krimsky, Ennis, & Weissman, 1991). Independent research is in particular necessary in health care, where research is needed to verify effectiveness and safety of new treatments. Recently a research team at the University of Utrecht is investigated because they were suspected to have a financial interest in the outcome of their research (Voormolen, 2014). University policy must prevent such cases. Depending on local regulation and university policy, a problem of ownership of intellectual problem could also arise where entrepreneurial activities lead to commercialization of knowledge (Rasmussen, Moen, & Gulbrandsen, 2006, pp. 528-529). However, good policy could prevent ownership conflicts. The mentioned challenges of entrepreneurial activity need attention, but are mostly controllable. Without further discussing whether universities should become more entrepreneurial, this research will departure from a point where universities are trying to increase their entrepreneurial activities.

Literature stresses there are organizational factors which stimulate entrepreneurial activities in corporations (J. S. Hornsby et al., 2013). Management support, work discretion, time availability and rewards/reinforcement increase the entrepreneurial orientation in a company. But the organizational factors have not been tested in a university environment. This research will focus on the four concepts because there has been much research to the concepts, including sufficient empirical research. Moreover, the concepts have been proven successful in companies, and might potentially work in a university environment as well. But concepts, models and findings are often not directly applicable to the university context. Universities mainly differ from companies as they are non-profit. Universities are often funded by government, but increasingly also by external agencies (Ylijoki, 2003). But they are also distinct from most (profit and non-profit) organizations in structure, goals, etc. Universities are expected to become more entrepreneurial, and some are in fact becoming more entrepreneurial. But which organizational factors correlate with more entrepreneurial activities?

1.3 RESEARCH QUESTION

In order to find a solution on how a university can become more entrepreneurial, the following research question has been developed:

Which organizational factors are the strongest stimulators of entrepreneurial orientation within a university context?

Organizational factors are management support, work discretion, time availability and rewards/reinforcement. The organizational factors are borrowed from literature. This research focusses on entrepreneurial orientation at the individual level, measured at two departments of the University of Twente.

2 LITERATURE REVIEW

2.1 THE CONCEPT OF ENTREPRENEURSHIP IN A UNIVERSITY CONTEXT

2.1.1 Entrepreneurship

Research is split into different domains, and there is not yet a generally accepted definition for entrepreneurship. Research focussing on individuals has some differences with research on entrepreneurship in groups (Sharma & Chrisman, 2007; Urbano & Turró, 2013). There is more distinction between entrepreneurship literature which lead to many different definitions of the concept of entrepreneurship. Some of the most common are: new entry (Lumpkin & Dess, 1996), the creation of new organizations (Gartner, 1988) and innovations that necessitate changes in resource development and the creation of new capabilities to pursue opportunities (Walter, Auer, & Ritter, 2006). Many definitions are limited, and are not generalizable to all situations. Therefore, none of the definitions has been adopted as generally correct (Rutherford & Holt, 2007; Sharma & Chrisman, 2007). Sharma and Chrisman (2007) make clear that the establishment of companies don't necessarily involve new market combinations. Which is not taken in account in some definitions, such as that of Gartner (1988). Without giving a definition, Shane and Venkataraman (2000) identify entrepreneurship according to two stages: discovery and exploitation. Explorations which are not applied by exploitation are not considered entrepreneurship. Exploitation of existing knowledge, within existing markets, and with an established company is not entrepreneurship according to most definitions either. The definition of Shane and Venkataraman (2000) is broad but still clearly distinct entrepreneurial activities from other activities. It also does not limit entrepreneurship to new entities, which makes it suitable for a university context. Because many entrepreneurial activities at universities do not include new entity creation. This research will therefore use discovery and exploitation as explanation of what defines entrepreneurial activity.

2.1.2 Corporate entrepreneurship

This research focusses on entrepreneurship in an organizational context, which is called corporate entrepreneurship (CE). Names intended for the same phenomenon as CE include, but are not limited to: corporate venturing, internal entrepreneurship and intrapreneurship (Sharma & Chrisman, 2007; Zahra, 1991, p. 260). The definitions differ in how restricted they are. Some restrict entrepreneurship to activities which are unrelated to current competences (Burgelman, 1983) others restrict entrepreneurship to activities which require new resources (Ellis & Taylor, 1987). This view suggests that entrepreneurship is restricted to new entity creation, but it is not (Lumpkin & Dess, 1996). A more limited definition which can be suitable for a research in business context, can be less suitable for a university context. For this research therefore, a more general, but equally accepted definition of corporate entrepreneurship will be used: *"Corporate entrepreneurship is the process whereby an individual or a group of individuals, in association with an existing organization, create a new organization or instigate renewal or innovation within that organization"* (Sharma & Chrisman, 2007, p. 18). The above definition gives three conditions of which at least one has to be met. A new organization must be created in the process, the process must instigate renewal or the process must innovate. Both instigating renewal and innovating indicate exploration is not sufficient, which is in line with the view on entrepreneurship of Shane and Venkataraman. Shane and Venkataraman (2000) identify discovery and exploitation as stages of entrepreneurship.

Organizations differ in how much entrepreneurial they are. If an organization is more entrepreneurial, it is said that the company has a higher entrepreneurial orientation (EO). EO is the degree to which employees in an organization are proactive, risk taking and innovative (Miller, 1983). EO is related to CE, as it measures the degree of entrepreneurship in a company. Alternative names for the concept include entrepreneurial posture, entrepreneurial style or corporate entrepreneurship intensity (Walter et al., 2006). An organization which' employees have a higher EO, undertakes more entrepreneurial activities than an organization with lower EO among employees. Entrepreneurial activities are initiated by individuals or group of individuals. EO is determined by the individuals in an organization. While literature sometimes mentions organizations have a high EO, it are actually the employees of an organization which have a high EO. This research will measure EO among employees. In companies, EO is related to financial and non-financial performance. The link with performance has been proven for both perceived and archival performance (Lumpkin & Dess, 1996; Rauch, Wiklund, Lumpkin, & Frese, 2009; Urbano & Turró, 2013).

2.1.3 CE in a university context

CE can be found in universities as well, though its usage in research might need further specification. The definition of Sharma (2007) describing corporate entrepreneurship as the process whereby an individual or a group of individuals, in association with an existing organization, create a new organization or instigate renewal or innovation within that organization can be further specified for use in a university context. It describes all existing organizations, while this research is only focussing on universities. It describes new organizations, but many entrepreneurial activities take place without entity creation. But most important, 'renewal or innovation' can be further specified in a university context. According to literature on entrepreneurship in universities, entrepreneurial activities lead to new ways to commercialize knowledge and new ways for knowledge spill over (Etzkowitz et al., 2000). Both are ways to exploit the fast knowledge of universities. The view on entrepreneurship of Shane and Venkataraman (2000) learns us that entrepreneurial activities include exploration and exploitation of knowledge. The new ways of exploiting the knowledge which is previously explored in universities are therefore entrepreneurial activities. With this knowledge, it is possible to adopt the definition of Shane and Venkataraman (2000) to the university environment: *Corporate entrepreneurship within university context is the process whereby an individual or a group of individuals associated with a university, undertake activities that lead to new ways to exploit knowledge previously explored at universities*. The definition clearly limits entrepreneurship at universities to activities which lead to new ways of exploiting knowledge. Exploiting knowledge at universities can be done both through a spin off, or within the existing organization. The definition is also depicted in table 1.

Table 1
Decomposition of the definition of corporate entrepreneurship within a university context

Individual or group of individuals	Associated with a university	Undertake activities	Exploiting knowledge previously explored at universities
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2.2 THE FRAMEWORK FOR STIMULATING ENTREPRENEURSHIP IN A UNIVERSITY CONTEXT

2.2.1 Organizational factors

Researchers on entrepreneurship have been investigating factors that stimulate the amount of entrepreneurial activities undertaken in organizations (Jeffrey S Hornsby, Kuratko, & Zahra, 2002, p. 255). Stimulating factors are sought and found in external factors, (corporate) strategy and organizational factors by, among others, Zahra (1991). But where external factors are fixed, organizational factors can be changed (Zahra, 1993).

Kuratko, Montagno and Hornsby (1990) have identified specific organizational factors which stimulate EO. A rewards system to stimulate entrepreneurial activities; support from management to undertake entrepreneurial activities; the time availability for doing so; and the work discretion or freedom to do so. A reward system that encourages entrepreneurship should include “goals, feedback, emphasis on individual responsibility and result-based incentives” (Jeffrey S Hornsby et al., 2002, p. 259). A reward system should be able to increase willingness to take risks which belong to entrepreneurial activity. Management support refers to the willingness to “facilitate and promote entrepreneurial activity” (Jeffrey S Hornsby et al., 2002, p. 259). Management can do so by championing ideas, providing resources or expertise and by institutionalizing entrepreneurial activities within the firm. Of all four organizational factors, management support had the strongest relationship with EO in a business environment (J. S. Hornsby et al., 2013, p. 950). Availability of more time than minimally necessary encourages “experimentation and risk-taking behaviour” (Jeffrey S Hornsby et al., 2002, p. 259), workload must be evaluated so that employees can “pursue innovation” (J. S. Hornsby et al., 2013, p. 939). Work discretion is the degree to which failure is tolerated, the degree to which decision making is allowed by employees and the absence of “excessive oversight and delegation” (J. S. Hornsby et al., 2013). Entrepreneurial results often occur where employees which have sufficient work discretion for experimentation (Jeffrey S Hornsby, Kuratko, Shepherd, & Bott, 2009).

The organizational factors are believed to be antecedent of EO both individually and in combination. Meaning that both combined, and taken individually, they should predict EO. For the later practical implications of which organizational factors should be used, it is important to know they are all perceived by employees. Both increasing management support, as increasing the awareness of the management support can have an effect, for example.

The organizational factors stimulate middle managers’ entrepreneurial behaviour, which leads to implementation of entrepreneurial processes. The relation between organizational factors and EO can be seen in figure 1. This depiction is an altered version of the original (Jeffrey S Hornsby et al., 2002). Work discretion is the degree to which failures are tolerated, decision making is allowed at lower hierarchical levels, and the degree of freedom. Rewards/reinforcement refers to a reward system based on performance, recognize important achievements and encourage challenges. Time availability is whether workload is arranged in a way which enables pursuing innovations and supports focus on long-term goals beside short-term goals. The organizational factors affect the attitude towards entrepreneurship of the employees. The existence of management support, work discretion, rewards/reinforcement and time availability increase the entrepreneurial attitude. The attitude of employees effects the amount of entrepreneurial activities they undertake. The amount of entrepreneurial activities among employees can be explained as the EO of the employees. In the model depicted in figure 1, organizational factors ultimately affect the amount of entrepreneurial orientation. Management support is the degree to which top-level managers are facilitating and promoting entrepreneurial behaviour, championing innovative ideas and providing the necessary resources.

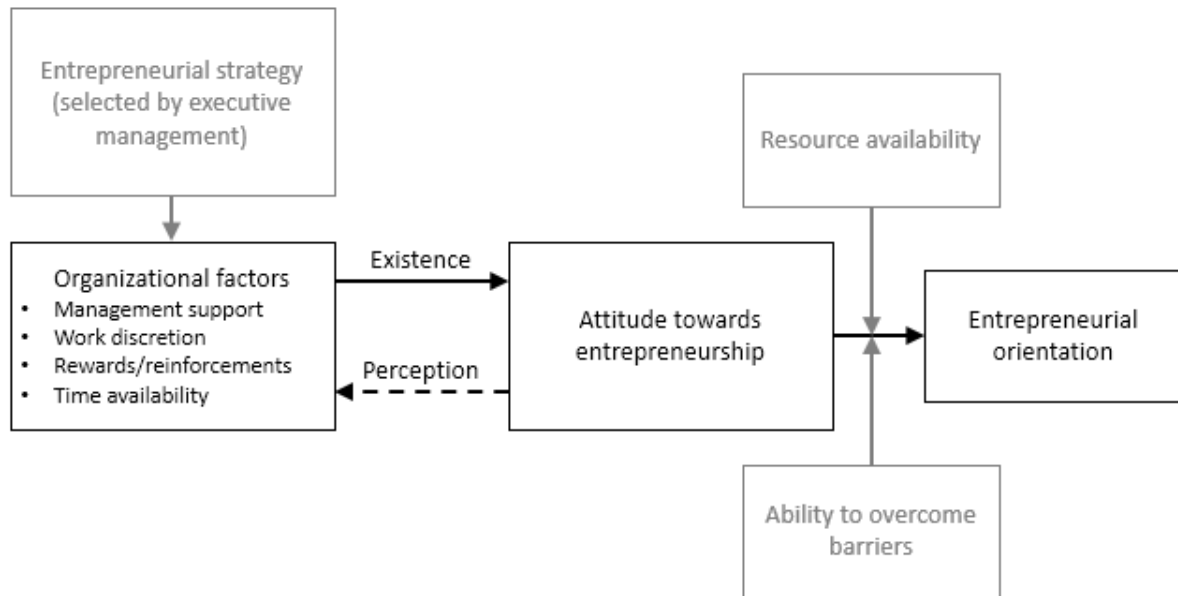


Figure 1: Depiction of the model of (Jeffrey S Hornsby et al., 2002)

2.2.2 Explaining attitude using the TPB (theory of planned behaviour)

Part of the model depicted in figure 1 can be explained by the TPB (theory of planned behaviour). The arrows between organizational factors and attitude towards entrepreneurship mean that the attitude is influenced by how an individual perceives the organizational factors. The organizational factors thus change the attitude towards behaviour, specified as attitude towards entrepreneurial behaviour in the depicted model. The other indicators mentioned by the TPB (subjective norms and perceived behavioural control) are not significantly influenced by the organizational factors, or they are ignored by the original author, Hornsby (2002). The organizational factors change attitude. According to Hornsby (2002) and the TPB (Ajzen, 1991), the stronger one's attitude favours acting entrepreneurial, the more one will undertake entrepreneurial activities.

The theory of TPB is derived from the theory of reasoned action (Madden, Ellen, & Ajzen, 1992). Behaviour is best predicted by intention. Intention describes the motivational factors to behave in a certain way. The stronger one's intention to engage in a behaviour, the more likely he will engage in the behaviour. Intention is determined by attitude towards a certain behaviour, subjective norms and perceived behavioural control. Attitude towards the behaviour is the degree to which the behaviour is perceived as favourable or unfavourable by the person. Subjective norm is the social pressure on the topic, whether it is encouraged or discouraged by the environment. While perceived behavioural control is the perceived ease by which behaviour can be performed due to available resources and opportunities (Ajzen, 1991, p. 183 & 188). Generally, attitude towards the behaviour, stimulating subjective norm and stimulating perceived control on the behaviour, increase the intention to perform certain behaviour. The influence between the three indicators can vary across situations. But if the indicators are stronger a person will have a greater intention to behave in a certain manor. If two indicators stay equal, but one becomes stronger, the stronger indicator will have a positive effect on intention (Ajzen, 1991, p. 148). According to the TPB, attitude towards entrepreneurial behaviour co-determines entrepreneurial behaviour.

2.2.3 Building hypothesis

Perceived organizational factors are thought to correlate with EO, and attitude towards entrepreneurship is thought to be a mediator in the relation between organizational factors and EO (Jeffrey S Hornsby et al., 2002). In this research it will be tested which organizational factors universities can use to influence their EO. The organizational factors are depicted in figure 2. All shown relations are expected to be significant and positive. The used scales will be explained further on.

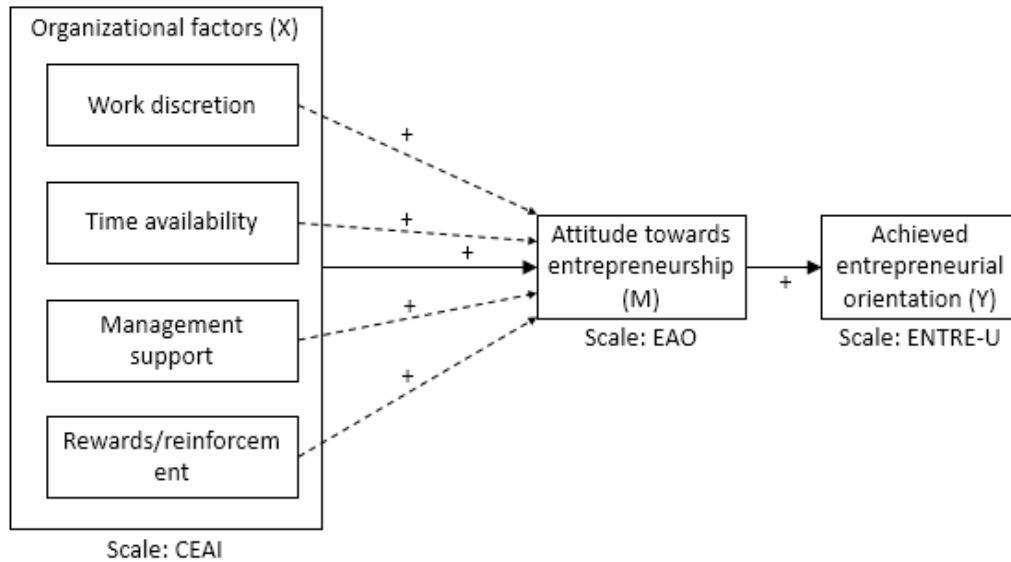


Figure 2: Depiction of the expected relationships

The first hypothesis will test whether organizational factors indeed positively influence the amount of entrepreneurial activities at a university. The organizational factors are thought to be antecedents of EO “both individually, and in combination” (J. S. Hornsby et al., 2013). Hypothesis 1 takes the set of organizational factors and tests whether they significantly predict attitude towards entrepreneurship together.

H1: There is a strong direct relationship between ‘organizational factors’ and ‘attitude towards entrepreneurship’.

The second hypothesis will test whether the attitude towards entrepreneurship of the university employees is indeed a partial mediator in the relationship between organizational factors and entrepreneurial orientation. Hornsby (2002) clarifies that organizational factors influence the behaviour. According to the TPB (Ajzen, 1991), the change in behaviour is due a change in attitude towards the behaviour. Therefore, partial mediation is expected. If attitude is indeed not a full mediator, the organizational factors also affect EO directly or through other mediators.

H2: ‘Organizational factors’ affect ‘entrepreneurial orientation’ through its effect on ‘attitude towards entrepreneurship’.

If the organizational factors indeed correlate with EO, it is important to know which factors correlate strongest with the attitude towards entrepreneurship. When certain factors have a small or insignificant relation to the attitude of employees, they have a less important role in the model. For universities it is useful to know which organizational factors have the strongest correlation with attitude towards entrepreneurship. The next hypothesis tests the correlation between the single organizational factors and attitude.

H3: All single organizational factors have a strong direct relationship with 'entrepreneurial orientation'

For all organizational factors that have a relationship with entrepreneurial orientation, it is expected that attitude towards entrepreneurship is a partial mediator. The partial mediation could however, be true only for some of the organizational factors. This is tested in the hypothesis 4a-4d.

H4a: Variation in 'entrepreneurial orientation' is partially, but not fully explained by 'attitude towards entrepreneurship', after controlling for 'work discretion'.

H4b: Variation in 'entrepreneurial orientation' is partially, but not fully explained by 'attitude towards entrepreneurship', after controlling for 'time availability'.

H4c: Variation in 'entrepreneurial orientation' is partially, but not fully explained by 'attitude towards entrepreneurship', after controlling for 'management support'.

H4d: Variation in 'entrepreneurial orientation' is partially, but not fully explained by 'attitude towards entrepreneurship', after controlling for 'rewards/reinforcement'.

3 METHODS

3.1 QUESTIONNAIRE DESIGN AND RESPONSE

3.1.1 Questionnaire

All three scales require quantitative data, and are very suitable for a questionnaire. The scales all need input from middle managers or employees. In companies, middle managers are the initiators of entrepreneurial activities. In universities the teaching and researching staff is the most appropriate comparison. Moreover, the scales have been developed for department or business unit level, which translates into faculty level in a university. The most appropriate respondents are therefore the researching and teaching staff of one or two faculties. It is expected that the required response will be acquired after spreading a questionnaire among the staff of the departments Management and Governance and Behavioural Sciences. The departments have a population of roughly 350 employees. There is no explicit data on an exact number of employees available. A list of potential respondents is established from different available sources on the websites of the University of Twente, since no ready list was available for research purposes. Worth to mention, personnel departments were not willing or able to supply a list of possible respondents.

Much attention is given to distributing the questionnaire, to maximize response. All respondents were visited in person and after a short vocal introduction received a hard-copy questionnaire with a return envelope on which the return address was already filled out. The questionnaire had an explanatory introduction and was accompanied with a letter of PD Dr. Harms. The questionnaire can be found in appendix 1. All change that had to be made to the original scales can be found in appendix 2. At the third round of visiting offices in person, almost no new respondents were reached. With the three rounds, about 150 staff members were given a questionnaire. If the method would yield insufficient response, staff of an additional university department could have been approached. Approaching more respondents was not necessary as the initial departments yielded 66 valid responses. The personal visit and short conversation should have decreased non-response bias. Unfortunately, since no useful data was available about the respondents who did not fill in the questionnaire, non-response bias cannot be ruled out statistically afterwards. With a high response rate and no notable lacking groups (such as lacking senior employees or lacking older employees), non-response bias is considered to be low.

3.1.2 Response

The total number of returned questionnaires was 71, but 5 were invalid. Invalid response included 3 empty questionnaires with a handwritten note that the respondent did not regard himself as a useful respondent. The inclusion of three invalid respondents can be designated to manually composed list of potential respondents. There was no list of employees available for research purposes at the University of Twente. The list of potential respondents is composed out of public available information on the websites of the University of Twente. Only few staff members have been incorrectly marked as teaching or researching staff, while they are in fact supporting staff. The few wrongly approached indicates that the composed list actually contained very few mistakes. The other 2 invalid responses were partially empty and were not accompanied by a note. The invalid responses could be mistakes, or respondents who believed the questionnaire was too long. Because of the small number of entirely and partially blank questionnaires, they do not indicate a potential problem in the questionnaire. A response of 71 from about 350 distributed questionnaires equals a 20% response rate.

All questions can be found in appendix 1. The Likert scale questions of the ENTRE-U, CEAI and EAO scales had few missing values. Of 70 questions, only 10 (14%) had missing values. Only 1 or 2 missing values (<3%) occur for each of those 10 questions. It is appropriate to exclude missing values pairwise. No entire cases are left out in further analyses, but only single variables of cases will be left out if no data is available. The few missing values indicate good questions. The main reason for the good questions is that they are borrowed from literature.

The questions on demographics have more missing values. The questions on demographics are the questions on the last page of the questionnaire in appendix 1. The first four are often left blank if a respondent did not teach. It is likely that many respondents also filled in the lowest possible answer if they did not teach. The first four questions are therefore biased and are excluded from the research. Demographics questions 5 and 6 are left blank respectively 6 and 1 time. Questions 5 and 6 can be used with pairwise exclusion of missing values. Demographics question 7 is left blank 7 times, but in two cases the respondent explained they are a junior researcher with a master's degree. These two cases are recoded into answer 'PhD', as the difference is unimportant for this research. With 5 blank questions, question 7 can be used with pairwise exclusion of missing answers. Demographics questions 8 up to 16 are left blank in very few cases. These few cases are recoded into '0', as in most cases it became apparent that '0' was most appropriate. Questions 8-16 can be used with the knowledge that the answers might be slightly biased.

3.1.3 Homogeneity

The sample consists for 42,6% out of respondents from department Management and Governance, and for 57,4% out of respondents from department Behavioural Sciences. The two departments are merged in the duration of this research, and their areas of research have many similarities. It is still important to verify that the groups do not give significantly different answers. A MANOVA test (multivariate analysis of variance) is executed, using the Wilks lambda distribution, to test homogeneity: Wilks Lambda = .003, $F(55,1) = 5,21$, $p = .337$, partial $\eta^2 = .997$. Wilks Lambda shows there is no significant difference in the answers of both groups. If compared based jointly on all questions except for demographic questions, the faculties are not significantly different.

Additionally, individual questions are tested for homogeneous answers using an ANOVA test. If the ANOVA tests yields a result with $p < 0,05$, members of the two departments have given significant different answers. Only 6 of all 70 questions have significant different answers. The ANOVA results are included as appendix 3. Based on the Wilks Lambda score and the individual ANOVA tests, the departments can be treated as a single population.

3.2 OPERATIONALIZATION

3.2.1 Assessing validity of the scales

Three reflective scales are selected for this research. Organizational factors are measured using the CEAI scale (corporate entrepreneurship assessment instrument). To measure its effect on attitude of employees and on EO, two more scales are selected. The selected scales for organizational factors, attitude and EO are scales measuring underlying factors. What they measure, causes what is observed. In other words, the direction of causality goes from construct to measure. A direction from construct to measure indicates the scales are all reflective (Diamantopoulos & Winklhofer, 2001). An important characteristic of reflective models are interchangeable items. With correlating items being caused by what is measured by the scale, dropping an item should not alter the meaning of the construct too much (Jarvis, MacKenzie, & Podsakoff, 2003). Two scales are designed for-profit corporations from which a university differs in many ways. The only scale which is designed for universities had a questions which is not applicable in the geographic location of this research. The inappropriate question is removed.

Another characteristic of reflective models is that its items are expected to be correlating. Expected correlation enables reliability and validity assessment with methods assuming internal consistency (Jarvis et al., 2003). Factor analysis and Cronbach's alpha are examples of measures which rely on internal consistency and can be used for reflective models (MacKenzie, Podsakoff, & Podsakoff, 2011). The adoption of scales to the university specific situation and assessment of the scale items is done further on.

Nevertheless, validity of the scales must be assessed, especially because of small changes and some removed questions. All three questions have been developed and assessed in literature using factors analysis (J. S. Hornsby et al., 2013; Jeffrey S Hornsby et al., 2002; William Todorovic, McNaughton, & Guild, 2011). Recalculating factors loadings will yield new results as the scales are now used in a very specific environment. Testing the questions with factor loadings also excludes possible biases from changed and deleted questions.

Factor loadings typically vary from 0,4 to 0,7. Whilst 0,4 is often considered low but sufficient, 0,7 is considered unlikely in real-life. High factor loadings result in higher statistical power. A minimum factor loadings of 0,6 is therefore chosen for this research. Factor loadings can be calculated once, after which all questions with factor loadings below 0,6 are eliminated. However, factor loadings of questions change after another questions is eliminated. It is therefore more correct to eliminate questions in steps. After one or a few questions are eliminated, factor loadings are calculated again, to eliminate the effect of the previously removed questions. The iterations of excluding questions based on factor loadings can be seen in appendix 4.

3.2.2 CEAI (corporate entrepreneurship assessment instrument)

CEAI (corporate entrepreneurship assessment instrument) is a set of factors that managers can use to stimulate employees to become more entrepreneurial. The factors are organizational factors originally identified by Hornsby (2002). He measured the factors using an unnamed scale with 5 dimensions. The scale was improved and named Corporate Entrepreneurship Assessment Instrument (CEAI). The final dimensions are: management support, work discretion, rewards/reinforcement and time availability. The CEAI scale has a correlate with EO (Jeffrey S Hornsby et al., 2002). The four dimensions of the scale each have a relationship with EO as well (J. S. Hornsby et al., 2013).

The CEAI scale is different from most CE measurements in its goal. It does not measure CE, but the factors that determine managers' stimulation of CE. In other words: the factors which stimulate

employees to become entrepreneurial (Lumpkin & Dess, 1996). The scale has been developed, improved and assessed in a for-profit environment. The relationship between the four organizational factors and EO is not yet tested in a university environment. Though the dimensions and items of the scale seem just as valid for such an environment. Items such as “My manager helps me get my work done by removing obstacles” and “During the past three months, my work load was too heavy to spend time on developing new ideas” should be useable. The organizational factors are measured as perceived factors. No figures on actual time availability, rewards, etc. are used for the scale.

The CEAI scale was almost directly applicable, only four small rephrased words were needed to make the scale applicable for a university. The changes can be seen in appendix 2. The CEAI scale is reflective, thus indicators are interchangeable (Jarvis et al., 2003). Interchangeable items make small changes to the questions possible without changing what the scale measures. The CEAI scale had 4 dimensions with 20 items divided among them. In the university specific environment, 4 questions yielded factor loadings below 0,6. With 16 items left, one of the four dimensions had only 2 items. The dimension with only two items (rewards/reinforcement), still had a very high Cronbach’s alpha score. The dimension is therefore left in. The overall scores of the CEAI scale are also very high (van den Berg, S, & van der Kolk, 2014, pp. 228-232), as can be seen in table 5.

Table 2
Cronbach’s alpha score of the CEAI dimensions

Construct	Dimension	Cronbach’s alpha
CEAI	Work discretion	0,856
	Time availability	0,743
	Management support	0,768
	Rewards reinforcement	0,893

A histogram has been depicted in figure 3, to assess normality. It shows a Gaussian distribution. The distribution is verified using a Shapiro-Wilks test (Shapiro-Wilks=0,988; df=68; p=0,771). With skewness of 0,244 and kurtosis of 0,170, the data is mesokurtic but still normally distributed. The items of the CEAI scale are used for correlation statistics in this research. The normal distribution of the items of CEAI are therefore assessed in appendix 6.

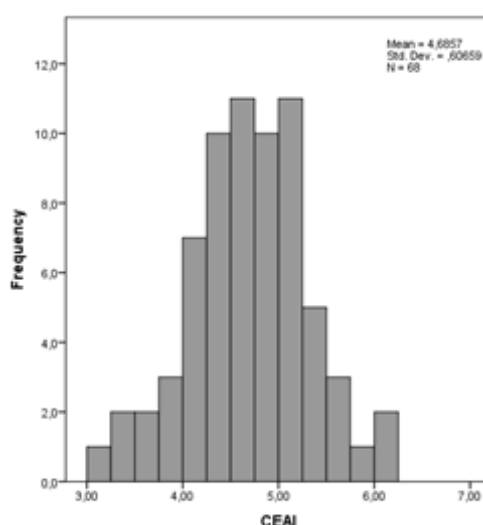


Figure 3: Frequency graph (CEAI scale)

3.2.3 EAO (entrepreneurial attitude orientation)

Attitude is an important concept in the model in figure 2. A scale exists which measures attitude towards entrepreneurship, named the Entrepreneurial Attitude Orientation (EAO) (Shetty, 2004). The EAO scale was originally developed to test individual entrepreneurship, but proved even more useful in groups of individuals. It has undergone many improvements in literature. After rephrasing to fit groups of individuals, dropping items and adding items the scale used in this research includes 4 dimensions with 29 items divided among them. Though the EAO scale has not been used in Europe yet, it has been proven reliable in China, Brazil, South Africa, India and Russia (Johnson, 2004). The EAO scale has been used in different industries and companies, including IT and finance companies.

The EAO scale did not need much rephrasing. All exact changes made to questions can be seen in appendix 2. The EAO scale is reflective, thus indicators are interchangeable (Jarvis et al., 2003). The EAO scale had 29 items among 4 dimensions. As much as 12 items had low factor loadings. With 17 items left, one of the four dimensions only had 2 items left. The dimension with only two items (personal control) also has a very low Cronbach's alpha score, as can be seen in table 3 (van den Berg et al., 2014, pp. 228-232). Based on the low score, the dimension is eliminated from this research. All (validity) scores can be found in appendix 5.

Table 3
Cronbach's alpha scores of the EAO dimensions

Construct	Dimension	Cronbach's alpha
EAO	Self-esteem	0,636
	Innovation	0,780
	Achievement	0,748
	Personal control	0,119

A histogram has been depicted in figure 4, to assess normality. The histogram is not decisive. A Shaphiro-Wilks test shows the data does not have a Gaussian distribution (Shapiro-Wilks=0,931; df=68; p=0,001). An outlier test shows there are two extreme cases which are more than 1,5 times the quartile range removed from Q1 or Q3. A Shapiro-Wilks test without the outliers shows the data is normally distributed (Shapiro-Wilk=0,977, df=66, p=0,254). With skewness of -0,159 and kurtosis of 0,117 the data is almost symmetrical and only slightly platykurtic. The data is considered to have a Gaussian distribution.

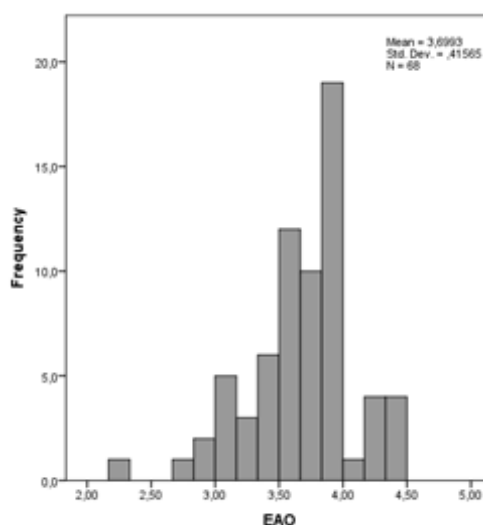


Figure 4: Frequency graph (EAO scale)

3.2.4 ENTRE-U

There are several ways to measure EO. As a very common concept, many scales have been developed for EO. Five scales are found in literature, which could be used to measure EO in this research. A short assessment of the scales is depicted in table 4. All five depicted scales measure some construct which approximates degree of entrepreneurship. Only two actually measure EO, the other three measure some other concept. Two had only one or two articles written about them, which gave insufficient information to borrow the scale for this research. Only one of the five scales where intended for use in a university context. The ENTRE-U scale was selected, as it measures EO, has sufficient literature written about it and it is adopted for use in a university environment.

Table 4
Scales measuring different forms of degree of entrepreneurship

	ICQ	EPI	III	ENTRESCALE	ENTRE-U
Original author	(D. F. Kuratko, Hornsby, & Covin, 2014)	(Morris & Sexton, 1996)	(Hill, 2003)	(Khandwalla, 1977)	(William Todorovic et al., 2011)
Measures	Entrepreneurial climate	Frequency and degree of entrepreneurship	Intreprenurial intensity	EO	EO
Literature	Unsufficient	Sufficient	Unsufficient	Lots	Sufficient
Purpose	For-profit only	For-profit only	Mainly for profit	For-profit only	University specific

Interestingly the ENTRE-U scale is actually based on the ENTRESCALE, which are both assessed table 4. The difference lies in the purpose. ENTRESCALE is intended for companies, where ENTRE-U is an altered version for universities. Khandwalla (1977) developed a 9 item scale, which is later named ENTRESCALE. The original scale included 9 items equally divided among 3 dimensions, with the mean score of all items as result. The scale has been further developed by Miller (1983) and Covin & Slevin (1989). Knight (1997) has reduced the scale to 8 items, excluding the item with the least correlation to the other 8 items. He has extensively proven cross-cultural reliability and validity for the 8 item scale. ENTRESCALE has proven to be a thorough scale for EO among profit organizations.

ENTRESCALE, from which ENTRE-U is derived, has a proven correlation with the measurement of organizational factor preceding EO (CEAI), which is mentioned earlier (J. S. Hornsby et al., 2013). The correlation is yet only tested in a business environment. ENTRESCALE also stands out from the list of EO scales (as seen in table 4) as it has a derivative especially for universities. ENTRE-U is originally developed by William Todorovic, McNaughton and Guild (2011). Instead of using the original dimensions of ENTRESCALE, William Todorovic et al. (2011) have developed a four dimension scale to suite universities characteristics (e.g.: non-profit, high-knowledge). The four dimensions are research mobilization, unconventionality, industry collaboration and university policies. The dimensions have 22 items divided among them which are university-specific and not suitable for other types of organizations. Originally, 23 items where derived from 84 potential items using interviews with faculty members of different disciplines at four universities. One item was eliminated to improve reliability (William Todorovic et al., 2011). One of university-specific items (as example) is: "We encourage our graduate students to engage in research with significant implications for industry or society" (William Todorovic et al., 2011). Based on the well proven ENTRESCALE and specifically developed for universities, ENTRE-U is ideal to measure EO at the University of Twente.

A single question in the ENTRE-U construct had to be removed, as it includes an organization which does not operate in the Netherlands. All changed and removed questions can be seen in appendix 2. The ENTRE-U scale had 4 dimensions with 21 items among them. In this research, 5 items yielded factor loadings below 0,6 and are eliminated. The dimensions are not changed, as all dimensions still had at least three items. Another way to assess validity is Cronbach's alpha. Though it is redundant after factor analysis in most situations, Cronbach's alpha is more sensitive for dimensions with few items. The dimensions of ENTRE-U all have fairly high scores (van den Berg et al., 2014, pp. 228-232), as can be seen in table 5. Additional (validity) scores on validity can be found in appendix 5. The items are aggregated to come to the organizational factors. They are summed up with equal weighting, as done in the original literature on the scale (Jeffrey S Hornsby et al., 2002).

Table 5
Cronbach's alpha scores of the ENTRE-U dimensions

Construct	Dimension	Cronbach's Alpha
ENTRE-U	Research mobilization	0,854
	Unconventionality	0,834
	Industry collaboration	0,753
	University policies	0,631

To assess normality, a histogram is depicted in figure 5. The histogram shows a Gaussian distribution. A Shapiro-Wilks test verifies the distribution (Shapiro-Wilks=0,984, df=67, p=0,525). With skewness of -0,262 and kurtosis of 1,276, the data is slightly leptokurtic (peaked) but normally distributed.

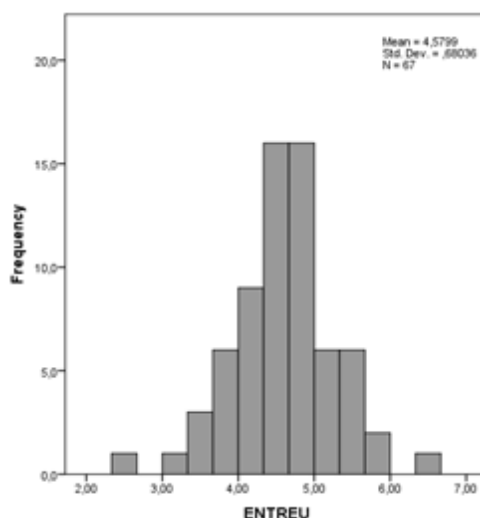


Figure 5: Frequency graph (ENTRE-U scale)

3.3 METHODS OF ANALYSIS

Four organizational factors are tested in a university environment. Three concepts are selected to measure the four organizational factors, attitude of employees and EO among university employees. The first hypothesis¹ will be tested with a multiple regression analysis. All four organizational factors are used as predictors in the analysis, and EO is the dependant variable. The multiple regression analysis will show whether the organizational factors significantly predict EO. The second hypothesis² will be tested using the steps of Baron and Kenny (1986). A zero-order relationship will be established using a multiple regression analysis between organisational factors and EO, and organizational factors and attitude. The correlation between attitude and EO will be calculated. Since all three variables have a Gaussian distribution and since they all measure on the interval level, Pearson's R will be used to calculate the correlation. With a zero-order relationship established, it will be verified whether attitude is a mediator using the unstandardized regression coefficients of organizational factors and attitude predicting EO.

When in the used dataset, organizational factors indeed predict EO, it is interesting to know which organizational factors have the strongest relationship with EO. A multiple regression analysis is done, with the perceived organizational factors predicting attitude towards entrepreneurship³. After the regression analysis, it will be tested whether attitude towards entrepreneurship is also the mediator for the relation between each single organizational factor and EO⁴. This is done by establishing a zero-order relationship and subsequently calculating the unstandardized regression coefficients with each of the organizational factors and attitude as predictors, and EO as dependant variable.

To ensure that the statistical tests performed are not influenced by confounding variables, a correlation matrix will be made with possible confounding variables as independent variables. Organizational factors and entrepreneurial orientation are the dependant variables. Because the independent variables in this correlation matrix are not normally distributed, Spearman's P is used to calculate correlations.

¹ H1: There is a strong direct relationship between 'organizational factors' and 'attitude towards entrepreneurship'.

² H2: 'Organizational factors' affect 'entrepreneurial orientation' through its effect on 'attitude towards entrepreneurship'.

³ H3: All single organizational factors have a strong direct relationship with 'entrepreneurial orientation'.

⁴ H4a-d: Variation in 'entrepreneurial orientation' is partially, but not fully explained by 'attitude towards entrepreneurship', after controlling for '[each organizational factor]'.

A descriptive statistics table is drawn in table 6. Many correlations between the organizational factors and attitude (EAO) are significant, and the many correlations between the organizational factors and entrepreneurial orientation (ENTRE-U) as well. Some strong direct relationships can be expected.

Table 6
Descriptive statistics

	Mean	Std. Deviation	1	2	3	4	5	6	7
1 ENTREU	4,5799	,68036	1						
2 CEAI	4,6857	,60659	,383*	1					
3 EAO	3,6993	,41565	,398*	,245*	1				
4 work discretion	5,3088	,92472	,260*	,541*	-,108	1			
5 time availability	4,7537	,86440	,226	,442*	,059	-,021	1		
6 management support	3,9596	,94495	,449*	,653*	,257*	,265*	,142	1	
7 rewards/ reinforcement	4,7206	1,32817	,054	,697*	,303*	,118	,071	,205	1

* Correlation is significant at the 0.05 level (2-tailed).

4 RESULTS

4.1 THE SET OF ORGANIZATIONAL FACTORS PREDICTING EO

The model in figure 6 assumes attitude towards entrepreneurship is a mediator in the relation between perceived organizational factors and entrepreneurial orientation. It is assumed the set of organizational factors together predict EO. The steps (or paths) from Baron and Kenny (1986) are used to check for mediation. The steps will answer hypothesis 1 and 2.

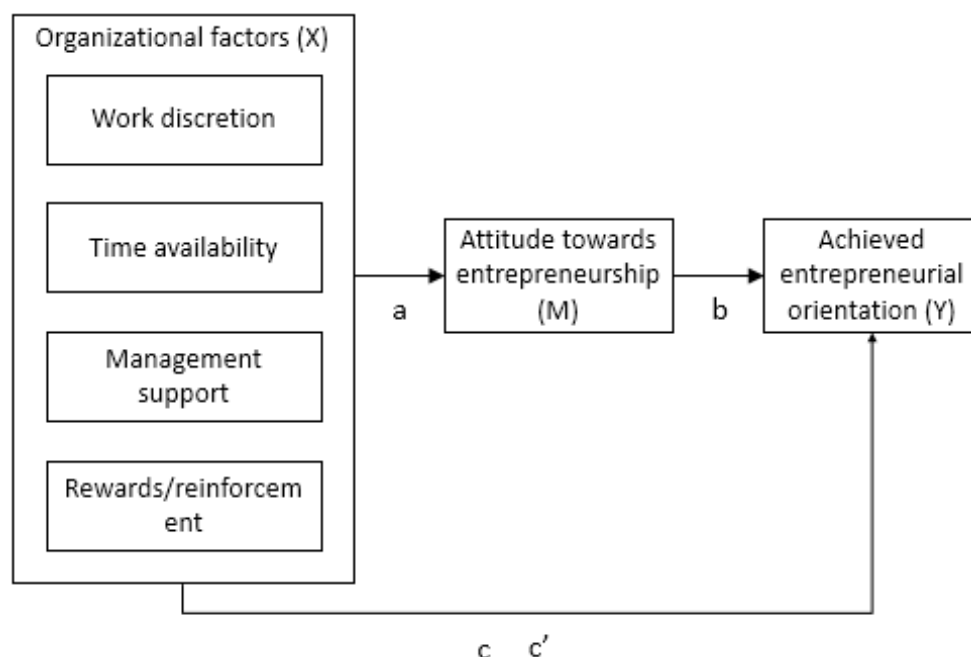


Figure 6: depiction of relations tested for mediation

Table 7 shows correlations between the three constructs. Based on the correlation between organizational factors and entrepreneurial orientation, hypothesis 1 cannot be rejected⁵. There is a strong direct correlation between organizational factors and EO. The relation means changes in organizational factors can ultimately influence EO. It does not verify which factors actually influence EO, or how. The relationships between organizational factors and attitude towards entrepreneurship, and attitude and entrepreneurial orientation are also shown in figure 6. The correlations are shown. With all three correlations significant, a zero-order relationship among the variables is confirmed. A zero-order relationship means attitude towards the desired behaviour can indeed be a mediator between organizational factors and behaviour, as Ajzen (1991, p. 148) suggests. The zero-order relationship does not yet prove that attitude is in fact a mediator.

Table 7
Pearson R scores for relations a, b and c

	Relation	Pearson R (two tailed)
a	X-M	R=0,245, n=68, p=0,044
b	M-Y	R=0,398, n=67, p=0,001
c	X-Y	R=0,383, n=67, p=0,001

⁵ H1: There is a strong direct relationship between 'organizational factors' and 'attitude towards entrepreneurship'.

With a zero-order relationship confirmed, it is possible to test whether attitude towards entrepreneurship is a partial or a full mediator. Testing for mediation can be done by looking at the unstandardized regression coefficients. Attitude is a mediator if the effect of attitude towards entrepreneurship is still significant after controlling for the organizational factors. If the effect of organizational factors is not significant any more, there is full mediation. Table 8 shows the regression coefficients.

Table 8
Coefficients with of organizational factors and attitude towards entrepreneurship predicting entrepreneurial orientation

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
CEAI	,339	,125	,303	2,697	,009
EO	,525	,182	,323	2,882	,005

Since both attitude and the organizational factors significantly predict EO, attitude is a partial mediator. Hypothesis 2 cannot be rejected⁶. Attitude towards entrepreneurship is a mediator between organizational factors which stimulate entrepreneurship, and actual entrepreneurial behaviour. The mediating relationship proves that the EO of the university is indeed depending on employees that perceive the organizational factors and alter their attitude accordingly. In other words, organizational factors influence EO through the employees which need to interpret the organizational factors.

4.2 EACH SINGLE ORGANIZATIONAL FACTORS PREDICTING EO

More interesting than learning that perceived organizational factors influence EO is learning which organizational factors do so. Attitude towards entrepreneurship amongst university staff is an almost full mediator in the relationship. Which organizational factors perceived by the employees influence attitude towards entrepreneurship indicates which organizational factors can be used to increase EO. The four dimensions of perceived organizational factors are work discretion, time availability, management support and rewards/reinforcement, as shown in figure 7. Each organizational factors has a dotted line to attitude towards entrepreneurship, which represent strong direct relationships. There is a line from attitude towards entrepreneurship which represents a strong direct relationship as well.

⁶ H2: 'Organizational factors' affect 'entrepreneurial orientation' through its effect on 'attitude towards entrepreneurship'.

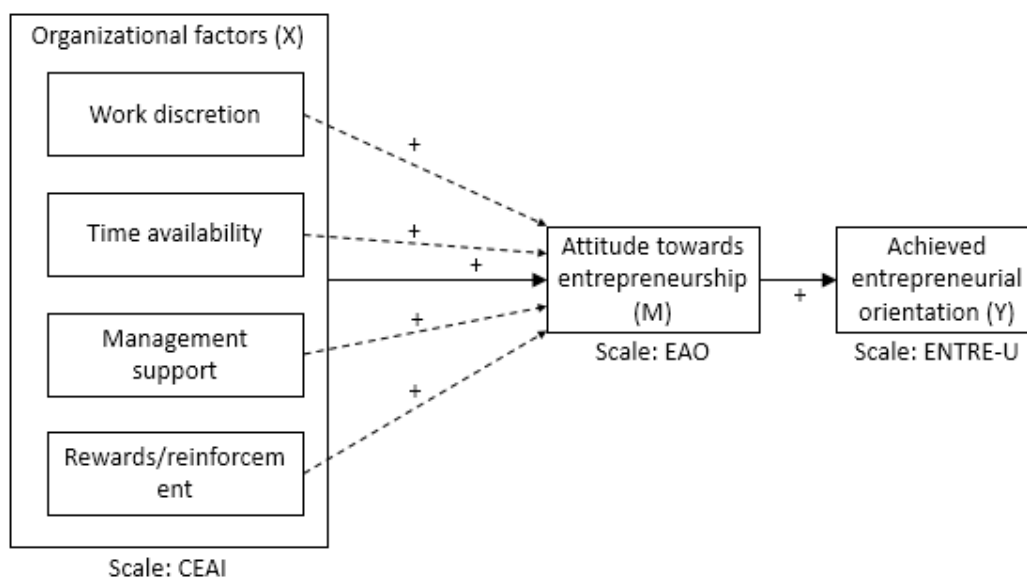


Figure 7: Depiction of the expected relationships (repeated)

First it is verified whether all organizational factors have a strong direct relationship with entrepreneurial orientation. Then whether they have a strong direct relationship with attitude towards entrepreneurship. If they have a positive relation with both, it can be tested whether attitude is the mediator for each single organizational factor. Testing the relations of the organizational factors with EO is done in a multiple regression analysis. The dependent variable is entrepreneurial orientation, the independent variables are the organizational factors, as shown in figure 7. The distributions of the organizational factors can be found in appendix 6. First, the ANOVA results are shown in table 9. The items of the organizational factors are added up to come to the organizational factors. The organizational factors are not aggregated, they are used as predictors in a multiple regression analysis. The organizational factors statistically significantly predict attitude towards entrepreneurship, with $p=0,017$.

Table 9

ANOVA results of organizational factors predicting attitude towards entrepreneurship

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	7,942	4	1,985	5,445	,001
Residual	22,609	62	,365		
Total	30,551	66			

Looking at the results of the coefficients in table 10, it becomes clear that only one of the organizational factors significantly EO. While management support indeed has a strong direct relationship with EO, the other organizational factors do not. Just one strong direct relationship is unexpected, as all four organizational factors have a strong direct relationship with EO in companies (J. S. Hornsby et al., 2013). Hypothesis 3 has to be partially rejected. Not all single organizational factors have a strong direct relationship, but management support does. Hypothesis 4a, 4b and 4d⁷ can also be rejected. Since the variables do not have a relationship with EO, it is not necessary to test for mediation.

Table 10
Coefficients of organizational factors predicting entrepreneurial orientation

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Work discretion	,124	,083	,170	1,491	,141
Time availability	,152	,090	,187	1,686	,097
Management support	,283	,083	,395	3,396	,001
Rewards/reinforcement	-,034	,057	-,066	-,592	,556

While hypothesis 4a, b and d are rejected, hypothesis c cannot be rejected yet. When management support has a strong direct relationship with attitude towards entrepreneurship, attitude might be a mediator between management support and EO. To test for a relationship, a multiple regression analysis is performed with attitude towards entrepreneurship as dependant variable, and the four organizational factors as predictors. The organizational factors are not aggregated, but are used as predictors in a multiple regression analysis. First, the ANOVA results in table 11 show that the set of organizational factors significantly predict attitude.

Table 11
ANOVA results of organizational factors predicting attitude towards entrepreneurship

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1,986	4	,496	3,261	,017 ^b
Residual	9,590	63	,152		
Total	11,576	67			

Looking at the results of the coefficients in table 12, it becomes clear that two of the organizational factors significantly predict attitude. While perceived work discretion and perceived time availability have a positive effect on entrepreneurial attitude in companies, the relationship is not confirmed in a university context. Management support and rewards/reinforcement do positively significantly predict attitude.

⁷ H4a-d: Variation in 'entrepreneurial orientation' is partially, but not fully explained by 'attitude towards entrepreneurship', after controlling for '[each organizational factor]'.

Table 12

Coefficients of organizational factors predicting attitude towards entrepreneurship

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Work discretion	-,094	,054	-,209	-1,746	,086
Time availability	-,001	,056	-,002	-,014	,989
Management support	,113	,054	,256	2,094	,040
Rewards/reinforcement	,086	,037	,275	2,341	,022

While all four organizational factors predict attitude in a for-profit environment (J. S. Hornsby et al., 2013), only two do in a university environment. Management support has a strong direct relationship with both attitude and EO. Whether attitude is the mediator in this relationship will be tested further on. Rewards/reinforcement predicts attitude towards entrepreneurship, but not entrepreneurial orientation. While rewards influence the attitude of employees, it seems rewards cannot influence the employees to undertake entrepreneurial activities. An insignificant result in a regression does not exclude the possibility that the organizational factors influence EO in another way. There could for instance be a prerequisite of a certain amount of perceived time availability, or work discretion. But there is no direct relationship between increasing the perceived time or work discretion, and more entrepreneurial activity.

With a zero-order relationship confirmed, it is possible to test whether management support is a partial or a full mediator. Attitude is a mediator if the effect of attitude towards entrepreneurship is still significant after controlling for the organizational factors. If the effect of organizational factors is not significant any more, there is full mediation.

Table 13

Coefficients of EAO and management support predicting entrepreneurial orientation

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
EAO	,491	,177	,302	2,768	,007
Management support	,266	,078	,371	3,398	,001

Table 13 shows both management support and attitude towards entrepreneurship significantly predict entrepreneurial orientation. Attitude is a partial mediator in the relationship between management support and entrepreneurial orientation⁸.

⁸ H4c: Variation in 'entrepreneurial orientation' is partially, but not fully explained by 'attitude towards entrepreneurship', after controlling for 'management support'.

4.3 CHECKING FOR CONFOUNDING VARIABLES

In literature on the scales used for this research, there are no confounding variables mentioned. The researchers had no reason to believe confounding variables existed, but did not validate that no confounding variables exist either. Literature on entrepreneurship has been trying to identify traits and behaviours leading to entrepreneurship. Such behaviours or traits could be a confounding variables. Any variable which both correlates with X (management support or rewards/reinforcement) and Y (EO) are possible confounding variables. Variables which do not correlate both with X and Y, cannot be confounding variables. The possible confounding variables are numerous, it is only possible to test some general traits and some of the most obvious work related behaviours. A correlation table is depicted table 14, with possible confounding variables and variables X and Y.

Table 14
Correlation table of possible confounding variables predicting organizational factors and entrepreneurial orientation

	Organizational factors (X)	Entrepreneurial orientation (Y)
What is your age?	$\rho=-0,233$ n=67 p=0,057	$\rho=-0,074$ n=66 p=0,557
What is your current position?	$\rho=-0,320^*$ n=63 p=0,011	$\rho=-0,091$ n=62 p=0,484
How many research projects did you initiate in the last 3 years?	$\rho=-0,250^*$ n=68 p=0,04	$\rho=-0,087$ n=67 p=0,483
How many projects did you initiate in the last 3 years which yielded an investment from industry or society?	$\rho=-0,119$ n=68 p=0,334	$\rho=0,141$ n=67 p=0,256
How many papers did you publish in scientific journals in the last 3 years?	$\rho=-0,140$ n=68 p=0,254	$\rho=0,066$ n=67 p=0,593
How many symposia or colloquia have you arranged in the last 5 years?	$\rho=-0,322^*$ n=68 p=0,007	$\rho=0,087$ n=67 p=0,482
In how many symposia or colloquia have you participated as speaker in the last 3 years?	$\rho=-0,144$ n=68 p=0,242	$\rho=-0,117$ n=67 p=0,344
How many bachelor students are you currently supervising?	$\rho=-0,037$ n=68 p=0,767	$\rho=0,015$ n=67 p=0,903
How many master students are you currently supervising?	$\rho=-0,355^*$ n=68 p=0,003	$\rho=0,034$ n=67 p=0,783
How many PhD and PD students are you currently supervising?	$\rho=-0,163$ n=68 p=0,185	$\rho=0,032$ n=67 p=0,799

*** correlation is significant at the 0,05 level**

Note: Two of the originally tested questions were removed because they had too much similarity with the EO scale. However, the removed questions did not correlate with both X and Y.

None of the 10 tested variables can be a confounding variable in the validated model. Many likely confounding variables can be excluded. There are 4 significant correlations between work related questions and organizational factors. None of the work related questions also correlate with EO though. No correlation with both variables makes it impossible for these 10 questions to indicate a confounding variable. While some of the correlations could be non-coincidental, the model of this research does not explain any of the correlations. Some correlations seem to have a meaning. However, searching for explanations after finding correlations in a general correlation table, without prior established theoretical explanation is considered bad practice.

5 CONCLUSION, DISCUSSION, LIMITATIONS AND FURTHER RESEARCH

5.1 CONCLUSION

Universities are becoming more entrepreneurial (Yusof & Jain, 2010, pp. 87-88), but most literature on entrepreneurship still concentrates on companies (Davidsson, 2005, pp. 1-7; Gregoire, Noel, Déry, & Béchar, 2006, p. 335; Zahra, 1991, pp. 260-261). Reasons for more entrepreneurial activity include but are not limited to the desire to increase knowledge spill over and to increase commercialization of knowledge. The literature on entrepreneurship stresses that increasing certain organizational factors can lead to an increase in entrepreneurial activity (J. S. Hornsby et al., 2013; Jeffrey S Hornsby et al., 2002). This research has taken some of these organizational factor to test them in a university context. The overall question to this research is “which organizational factors are the strongest stimulators of entrepreneurial orientation within a university context?”

The organizational factors which predict EO in companies are management support, work discretion, time availability and rewards/reinforcement. The set of organizational factors, as well as each single organizational factors, has a strong direct relationship with EO. A dataset was acquired at two departments (recently merged into one faculty) of the University of Twente, through a questionnaire. With the dataset, it was possible to confirm that indeed the same organizational factors predict EO, when taken together. Hypothesis 1 was therefore not rejected: There is a strong direct relationship between ‘organizational factors’ and ‘attitude towards entrepreneurship’.

According to literature, the organizational factors are perceived by employees, whose change in entrepreneurial activities lead to higher EO among employees. The attitude of employees is a mediator in the relationship between organizational factors and EO (D. Kuratko et al., 1990). The organizational factors perceived by employees have a significant positive relation with the entrepreneurial orientation of the organization. By perceiving the organizational factors, the attitude of the employees is shaped, which has an effect on the amount of entrepreneurial activities they undertake (Jeffrey S Hornsby et al., 2002). Hypothesis 2 was also not rejected: ‘Organizational factors’ affect ‘entrepreneurial orientation’ through its effect on ‘attitude towards entrepreneurship’.

While the first two hypothesis focus on the set of organizational factors, the last two hypothesis focus on each single organizational factor. In a company environment, each organizational factor has a strong direct relationship with EO (J. S. Hornsby et al., 2013). For each organizational factor, attitude towards entrepreneurship is the mediator in the relationship with EO among employees. With the dataset acquired in a university context, it was not possible to confirm these relationships. Hypothesis 3 was rejected. Not every single organizational factors has a strong direct relationship with ‘entrepreneurial orientation’. Management support does have a strong direct relationship with EO, but time availability, work discretion and rewards/reinforcement do not.

Hypothesis 4 assumed attitude towards entrepreneurship is the mediator between the single organizational factors and EO. There is no mediation possible between EO and the organizational factors time availability, work discretion and rewards/reinforcement. Hypothesis 4c was not rejected: Variation in ‘entrepreneurial orientation’ is partially, but not fully explained by ‘attitude towards entrepreneurship’, after controlling for ‘management support’. Management support has a strong direct relationship with EO, in which attitude towards entrepreneurship is a mediator. However, a strong direct relationship between rewards/reinforcement and EO was also found. Rewards/reinforcement seem to effect attitude towards entrepreneurship. But the relation between rewards and attitude does not lead to higher EO among employees.

5.2 DISCUSSION

The findings for the organizational factor management support show that management support can indeed predict EO among employees. In companies, management support was the organizational factor which had the strongest relationship with EO. In a university environment, increased perceived management support is the only organizational factors that has a strong direct relationship with EO. Attitude towards entrepreneurship is a mediator in the relationship between management support and EO. To increase management support, a faculty could facilitate and promote entrepreneurial behaviour, champion innovative ideas and provide necessary resources. As management support is a factor perceived by employees, both increasing support for entrepreneurial activities as increasing the awareness of such support among employees can be fruitful. Faculties can thus support researchers and teachers when they initiate entrepreneurial activities within their day-to-day jobs, but faculties should also make the teachers and researchers aware that there is support for entrepreneurial initiatives. Support for entrepreneurial behaviour increases the attitude towards entrepreneurial behaviour among employees. Attitude towards entrepreneurial behaviour co-determines the intention to act entrepreneurial, which leads to more entrepreneurial activity among university employees.

While rewards/reinforcement has a strong direct relationship with attitude towards entrepreneurship, rewards/reinforcement does not predict EO. The relation confirms that employees' attitude towards entrepreneurship can be changed by adjusting a reward system accordingly. But a more favourable attitude towards entrepreneurship through rewards does not directly lead to more entrepreneurial behaviour. Some type of reward might be a prerequisite, or there might be some other relation between rewards and EO. But it is not confirmed that increased perceived rewards towards entrepreneurial behaviour, lead to more entrepreneurial behaviour. The difference in the effect of the organizational factors in a company and in a university are most likely explainable by differences between the two organization types. But the difference in the effect of rewards/reinforcement might have another reason. In literature on rewards, rewards can be divided into monetary and non-monetary rewards. The used scale does not differentiate between the both.

Time availability and work discretion also do not have a strong direct relationship with EO. Some perceived available time and some perceived work discretion might be a prerequisite, or might influence EO in another way. But a direct relationship between increased perceived time availability and work discretion with EO is not confirmed.

It is not possible to give a decisive answer to why perceived work discretion and perceived time availability do not have a strong direct relationship with EO in a university context. Perceived work discretion might have less influence because researchers and teachers already have sufficient work discretion to initiate entrepreneurial activities. If there is sufficient work discretion, perceived work discretion is a prerequisite, but increasing the perceived work discretion beyond a certain point does not lead to an increase in entrepreneurial activity. Perceived time availability could also be a prerequisite, which means that increasing perceived time availability beyond a certain point does not increase entrepreneurial activity. An alternative option is that the type of entrepreneurial activities in a university context might sometimes not need significantly more time. Entrepreneurial activities in research and teaching might sometimes not take significantly more time than other non-entrepreneurial researching and teaching activities. This possibility would explain why increased perceived time does not directly lead to increased entrepreneurial activities. However, this research did not facilitate in finding why the organizational factors do not lead to increased EO. Any reasons sought for why three of the organizational factors do not have a direct relationship with EO can only be based on assumptions at this point.

5.3 LIMITATIONS AND FURTHER RESEARCH

The used scale for rewards/reinforcement did not differentiate between monetary and non-monetary rewards. Items on both monetary and non-monetary rewards are included. Moreover, many items in the scale are ambiguous on which type of rewards they measure. Though sources confirming a strong direct relationship between rewards/reinforcements and EO in a company environment used the same scale, the indistinctness on monetary or non-monetary rewards might have led to different results. The scale was chosen because it did correlate with different scales of EO in a company environment. For future research it is important to choose a scale that differentiates between monetary and non-monetary rewards. Rewards/reinforcement is also an interesting organizational factor to further investigate. As it has a strong direct relationship with attitude towards entrepreneurship, it might have some effect on entrepreneurial activity. Unfortunately, this research does not give a decisive answer on why rewards/reinforcement did not have a strong direct relationship with EO.

Another interesting topic for future research are the risks of increasing entrepreneurial activity. This research departed from the point where a university is trying to increase entrepreneurial activity. There is a risk to focussing on entrepreneurial activity, which was only shortly mentioned in this research. The risks include but are not limited to risks of ownership conflicts, conflicts in allocating research and risks of subjective researchers due to a financial stake in the outcomes of a project.

Often, research can be replicated to validate the findings in different settings. For the findings of this research, it is more useful to first further investigate the findings before testing them in other settings. It is important to understand why three of the organizational factors, and specifically rewards/reinforcement do not have a strong direct relationship with EO. Do not the organizational factors influence the type of work done by teachers and researchers? Or are the organizational factors mere prerequisites for entrepreneurial behaviour, which do not have an effect beyond a certain point?

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APPENDIX 1: QUESTIONNAIRE

This appendix shows the questionnaire questions. The actual questionnaire included an introduction text and included an accompanying letter from PD Dr. R. Harms, as well as a return envelope.

Questions based on the ENTRE-U scale, 7-scale Likert from strongly agree to strongly disagree.

- U1: We encourage our graduate students to engage in research with significant implications for industry or society
- U2: We encourage students to seek practical applications for their research
- U3: Faculty members in our department emphasize applied research
- U4: Compared to other similar departments in the Netherlands, our department has a reputation for its contribution to industry or society
- U5: Many of our faculty members conduct research in partnership with non-academic professionals
- U6: Our faculty members are expected to make substantial contributions to industry or society
- U7: Compared to other similar departments in the Netherlands, we are good at identifying new opportunities
- U8: We support our faculty members collaborating with non-academic professionals
- U9: We try to generate off-campus benefits from research projects
- U10: Cooperation with organizations outside the university significantly improves our research activities
- U11: Our faculty members often seek research opportunities outside the traditional university environment
- U12: Compared to other similar departments in the Netherlands, our faculty members are known as very efficient and productive researchers
- U13: When we come upon an unconventional new idea, we usually let someone else try it and see what happens
- U14: We are recognized by industry or society for our flexibility and innovativeness
- U15: Our graduate students often secure high quality industry positions
- U16: Our department is highly regarded by industry
- U17: We encourage industry involvement in the research activities of our faculty members
- U18: We believe that our department should build relationships with private or public sector organizations
- U19: We feel that university-wide policies at this university contribute substantially towards our department achieving its goals and objectives
- U20: Compared to most other universities, our university is very responsive to new ideas and innovative approaches
- U21: Our university policies are best described as developed “bottom-up” using feedback from all levels of the university

Questions based on the CEAI scale, 7-scale Likert from strongly agree to strongly disagree.

- C1: I have the freedom to decide what I do on my job
- C2: It is basically my own responsibility to decide how my job gets done
- C3: I almost always get to decide what I do on my job
- C4: I have much autonomy on my job and am left on my own to do my own work
- C5: This department provides the freedom to use my own judgement

- C6: I feel that I am my own boss and do not have to double-check all of my decisions with someone else
- C7: I seldom have to follow the same work methods or steps for doing my major tasks from day to day
- C8: I have just the right amount of time and workload to do everything well
- C9: I always have plenty of time to get everything done
- C10: I feel that I am always working with time constraints on my job
- C11: My co-workers and I always find time for long term problem solving
- C12: During the past three months, my workload kept me from spending time on developing new ideas
- C13: People are often encouraged to take calculated risks with ideas around here
- C14: This department supports many small and experimental projects realizing that some will undoubtedly fail
- C15: Senior managers encourage innovators to bend rules and rigid procedures in order to keep promising ideas on track
- C16: Those employees who come up with innovative ideas on their own often receive management encouragement for their activities
- C17: Money is often available to get new ideas off the ground
- C18: My supervisor/manager will give me special recognition if my work performance is especially good
- C19: My supervisor/manager will tell his/her boss if my work was outstanding
- C20: The rewards I receive are dependent upon my work on the job

Questions based on the EAO scale, 5-scale Likert from strongly agree to strongly disagree.

- E1: I spend a lot of time looking for someone who can tell how to solve all my work-related problems
- E2: I feel self-conscious when I am with very successful people
- E3: I feel inferior to most people I know.
- E4: I often feel bad about the quality of work that I do
- E5: I feel very energetic working with innovative colleagues in a dynamic climate
- E6: I believe that to become successful in the academic world you must spend time everyday developing opportunities
- E7: I usually take control in unstructured situations
- E8: I believe that it is important to continually look for new ways to do things in my job
- E9: I usually seek out colleagues who are excited about exploring new ways of doing things
- E10: I enjoy finding good solutions for problems that nobody has looked at yet
- E11: I often approach my tasks in unique ways
- E12: I get very excited when I think of new ideas to stimulate my university
- E13: I believe it is important to approach work opportunities in unique ways
- E14: I enjoy being the catalyst of change in organisational affairs
- E15: I get a thrill out of doing new and unusual things in my organisational affairs
- E16: I do every job as thoroughly as possible
- E17: I spend a considerable amount of time making any organisation I belong to function better
- E18: I make a conscientious effort to get the most out of my work resources
- E19: I think that to succeed in research these days you must eliminate deficiencies
- E20: I get a sense of pride when I do a good job on my research projects
- E21: I feel proud when I look at the results that I have achieved in my research activities
- E22: I always try to make friends with people who may be useful in my organisation

- E23: I make it a point to do something significant and meaningful at work everyday
- E24: I get a sense of accomplishment from the pursuit of my work opportunities
- E25: I believe that to be successful a person must spend time planning the future of the organisation
- E26: I always feel good when I make the organisation I belong to function better
- E27: I feel depressed when I do not accomplish any meaningful work
- E28: I believe that any organisation can become more effective by employing competent people
- E29: I get excited creating my own work opportunities

Questions on demographics and realized behaviour

- D1: How many new courses did you propose and start up in the last 5 years?
 - a. 0
 - b. 1
 - c. 2
 - d. >2
- D2: How often do you drastically redesign your ongoing courses?
 - a. Each 4 years or less
 - b. Each 3 years
 - c. Each 2 years
 - d. Each year
- D3: How often do you arrange speakers from industry or society in your classes?
 - a. 0 classes each course
 - b. 1-2 classes each course
 - c. 3-4 classes each course
 - d. >4
- D4: In how many of your classes do you use non-standard teaching methods? (course = all classes of a quartile)
 - a. 0 classes each course
 - b. 1-2 classes each course
 - c. 3-4 classes each course
 - d. >4
- D5: At which point are you comfortable with applying and testing new research methods?
 - a. If they seem valid
 - b. If proven valid
 - c. After general acceptance
- D6: What is your age?
 - a. <35
 - b. 36-45
 - c. 46-55
 - d. >55
- D7: What is your current position?
 - a. PhD
 - b. Assistant professor
 - c. Associate professor
 - d. Full professor
- D8: How many research projects did you initiate in the last 3 years?
- D9: How often were you involved in a (research) project from/with a business incubator in the last 3 years?

How can universities use organizational factors to stimulate entrepreneurship?

- D10: How many projects did you initiate in the last 3 years which yielded an investment from industry or society?
- D11: How many papers did you publish in scientific journals in the last 3 years?
- D12: How many symposia or colloquia have you arranged in the last 5 years?
- D13: In how many symposia or colloquia have you participated as speaker in the last 3 years?
- D14: How many bachelor students are you currently supervising?
- D15: How many master students are you currently supervising?
- D16: How many PhD and PD students are you currently supervising?

APPENDIX 2: CHANGES TO ORIGINAL SCALES

ENTRE-U		
U1	We encourage our graduate students to engage in research with significant implications for industry or society	I encourage graduate students to engage in research with significant implications for industry or society
U2	We encourage students to seek practical applications for their research	I encourage students to seek practical applications for their research
U3	Faculty members in our department emphasize applied research	I emphasize applied research within our faculty/department
U4	Compared to other similar departments in our province, our department has a reputation for its contribution to industry or society	Compared to other similar departments in the Netherlands, my department (including myself) has a reputation for its contribution to industry or society
U5	Many of our faculty members conduct research in partnership with non-academic professionals	I conduct research in partnership with non-academic professionals
U6	Our faculty members are expected to make substantial contributions to industry or society	I am expected from other faculty members to make substantial contributions to industry or society
U7	Compared to other similar departments our province, we are good at identifying new opportunities	Compared to other similar departments in the Netherlands, my department (including myself) is good at identifying new opportunities
U8	We support our faculty members collaborating with non-academic professionals	I am being supported in collaborating with non-academic professionals
U9	We try to generate off-campus benefits from research projects	I try to generate off-campus benefits from research projects
U10	Cooperation with organizations outside the university significantly improves our research activities	Cooperation with organizations outside the university significantly improves my research activities
U11	Our faculty members often seek research opportunities outside the traditional university environment	I often seek research opportunities outside the traditional university environment
U12	Compared to other similar departments in our province, our faculty members are known as very efficient and productive researchers	Compared to other similar departments in the Netherlands, my faculty (including myself) is known as very efficient and productive
U13	When we come upon an unconventional new idea, we usually let someone else try it and see what happens	When I come upon an unconventional new idea, I usually let someone else try it and see what happens
U14	We are recognized by industry or society for our flexibility and innovativeness	I am recognized by industry or society for flexibility and innovativeness
U15	Our graduate students often secure high quality industry positions	My graduate students often secure high quality industry positions

U16	Our department is highly regarded by industry	My department (including myself) is highly regarded by industry
U17	We encourage industry involvement in the research activities of our faculty members	I encourage industry involvement in the research activities of our faculty members
U18	We believe that our department should build relationships with private or public sector organizations	I believe that our department should build relationships with private or public sector organizations
U19	We feel that university-wide policies at this university contribute substantially towards our department achieving its goals and objectives	I feel that university-wide policies at this university contribute substantially towards our department achieving its goals and objectives
U20	Compared to most other universities, our university is very responsive to new ideas and innovative approaches	Compared to most other universities, my university is very responsive to new ideas and innovative approaches
U21	Our university policies are best described as developed “bottom-up” using feedback from all levels of the university	Our university policies are best described as developed “bottom-up” using feedback from all levels of the university
-	We seek significant funding from sources other than the Tri-councils	<i>Removed entirely: no similar authority is known in the Netherlands.</i>

CEAI

C5	This business unit provides the freedom to use my own judgement	This <u>department</u> provides the freedom to use my own judgement
C14	This business unit supports many small and experimental projects realizing that some will undoubtedly fail	This <u>department</u> supports many small and experimental projects realizing that some will undoubtedly fail
C18	My supervisor will give me special recognition if my work performance is especially good	My <u>supervisor/manager</u> will give me special recognition if my work performance is especially good
C19	My manager will tell his/her boss if my work was outstanding	My <u>supervisor/manager</u> will tell his/her boss if my work was outstanding

EAO

E2	I feel self-conscious when I am with very successful business people	I feel self-conscious when I am with very successful <u>people</u>
E5	I feel very energetic working with innovative colleagues in a dynamic business climate	I feel very energetic working with innovative colleagues in a dynamic <u>climate</u>
E6	I believe that to become successful in business you must spend time everyday developing opportunities	I believe that to become successful <u>in the academic world</u> you must spend time everyday developing opportunities
E8	I believe that it is important to continually look for new ways to do things in my role	I believe that it is important to continually look for new ways to do things in my <u>job</u>

E11	I often approach my business tasks in unique ways	I often approach my <u>tasks</u> in unique ways
E12	I get very excited when I think of new ideas to stimulate my organization	I get very excited when I think of new ideas to stimulate my <u>university</u>
E19	I think that to succeed in work these days you must eliminate deficiencies	I think that to succeed in <u>research</u> these days you must eliminate deficiencies
E20	I get a sense of pride when I do a good job on my work projects	I get a sense of pride when I do a good job on my <u>research</u> projects
E21	I feel proud when I look at the results that I have achieved in my work activities	I feel proud when I look at the results that I have achieved in my <u>research</u> activities

APPENDIX 3: ANOVA RESULTS FOR HOMOGENEITY TEST

Tests of Between-Subjects Effects (df=1)

Source	Dependent Variable	Type III Sum of Squares	Mean Square	F	Sig.	Partial Eta Squared
Faculty	research mobilization 1	,303	,303	,232	,632	,004
	research mobilization 2	,105	,105	,076	,784	,001
	research mobilization 3	,135	,135	,100	,753	,002
	research mobilization 4	3,964	3,964	2,626	,111	,046
	research mobilization 5	,949	,949	,450	,505	,008
	research mobilization 6	1,579	1,579	,775	,383	,014
	unconventionality 1	,922	,922	,710	,403	,013
	unconventionality 2	,000	,000	,000	,991	,000
	unconventionality 3	,479	,479	,244	,623	,004
	unconventionality 4	,179	,179	,132	,718	,002
	unconventionality 5	1,724	1,724	1,173	,283	,021
	unconventionality 6	2,637	2,637	2,744	,103	,048
	unconventionality 7	,088	,088	,097	,757	,002
	industry collaboration 1	1,762	1,762	1,339	,252	,024
	industry collaboration 2	8,216	8,216	7,427	,009	,119
	industry collaboration 3	6,676	6,676	5,086	,028	,085
	industry collaboration 4	7,737	7,737	3,592	,063	,061
	industry collaboration 5	2,546	2,546	2,202	,144	,038
	university policies 1	,007	,007	,004	,948	,000
	university policies 2	1,762	1,762	1,236	,271	,022
	university policies 3	2,683	2,683	1,618	,209	,029
	work discretion 1	,335	,335	,240	,626	,004
	work discretion 2	,020	,020	,014	,906	,000
	work discretion 3	,192	,192	,186	,668	,003
	work discretion 4	,895	,895	,733	,396	,013
	work discretion 5	2,683	2,683	4,112	,047	,070
	work discretion 6	2,074	2,074	,929	,339	,017
	work discretion 7	3,742	3,742	2,435	,124	,042
	time availability 1	9,301	9,301	3,849	,055	,065
	time availability 2	,005	,005	,003	,958	,000
	time availability 3	1,152	1,152	,746	,391	,013
	time availability 4	,088	,088	,055	,815	,001
	time availability 5	1,509	1,509	,683	,412	,012
	management support 1	,335	,335	,309	,580	,006
	management support 2	,016	,016	,012	,912	,000
	management support 3	,288	,288	,173	,679	,003

How can universities use organizational factors to stimulate entrepreneurship?

management support 4	6,175	6,175	4,211	,045	,071
management support 5	1,062	1,062	,809	,372	,015
rewards reinforcement 1	3,580	3,580	1,883	,176	,033
rewards reinforcement 2	6,036	6,036	2,609	,112	,045
rewards reinforcement 3	5,627	5,627	2,145	,149	,038
self-esteem 1	,088	,088	,096	,758	,002
self-esteem 2	,842	,842	1,215	,275	,022
self-esteem 3	1,213	1,213	2,128	,150	,037
self-esteem 4	1,152	1,152	1,455	,233	,026
innovation 1	,742	,742	1,088	,301	,019
innovation 2	2,282	2,282	2,245	,140	,039
innovation 3	,013	,013	,016	,899	,000
innovation 4	,058	,058	,087	,769	,002
innovation 5	,560	,560	,933	,338	,017
innovation 6	,125	,125	,290	,592	,005
innovation 7	,001	,001	,001	,973	,000
innovation 8	2,456	2,456	2,002	,163	,035
innovation 9	,024	,024	,032	,858	,001
innovation 10	1,651	1,651	1,624	,208	,029
innovation 11	,868	,868	,910	,344	,016
achievement 1	,000	,000	,000	,987	,000
achievement 2	4,606	4,606	6,023	,017	,099
achievement 3	,156	,156	,275	,602	,005
achievement 4	1,276	1,276	1,898	,174	,033
achievement 5	,005	,005	,013	,911	,000
achievement 6	,817	,817	,831	,366	,015
achievement 7	,352	,352	,338	,563	,006
achievement 8	,156	,156	,196	,660	,004
achievement 9	,168	,168	,309	,581	,006
achievement 10	7,349	7,349	7,321	,009	,117
achievement 11	1,687	1,687	2,130	,150	,037
achievement 12	,258	,258	,255	,615	,005
personal control 1	1,762	1,762	3,496	,067	,060
personal control 2	,204	,204	,284	,596	,005

Note: Retrieved through IBM SPSS Statistics 22

APPENDIX 4: FACTOR LOADINGS AND COMMUNALITIES

- Minimum factor loading = 0,6; minimum communality = 0,35.
- Factor loadings are calculated again after each iteration (round), so they are not influenced by other eliminated items.
- Retrieved through IBM SPSS Statistics 22; Extraction method: Principal component analysis.

Construct	Dimension	Question	First iteration		Second iteration		Third iteration	
			Factor loading	Communalities	Factor loading	Communalities	Factor loading	Communalities
ENTRE-U	Research mobilization	U1	0,841	0,707	0,856	0,732	0,840	0,706
		U2	0,801	0,642	0,821	0,673	0,849	0,721
		U3	0,824	0,678	0,840	0,696	0,843	0,711
		U4	0,591	0,349	0,601	0,361	eliminated	eliminated
		U5	0,569	0,324	eliminated	eliminated	eliminated	eliminated
		U6	0,784	0,615	0,776	0,602	0,808	0,652
	Unconventio nality	U7	0,755	0,569	0,752	0,565	0,721	0,519
		U8	0,784	0,615	0,787	0,619	0,797	0,635
		U9	0,833	0,695	0,838	0,702	0,859	0,738
		U10	0,755	0,571	0,766	0,587	0,790	0,625
		U11	0,677	0,458	0,685	0,469	0,698	0,487
		U12	0,486	0,237	0,479	0,230	eliminated	eliminated
		U13	0,306	0,094	eliminated	eliminated	eliminated	eliminated
	Industry collaboration	U14	0,682	0,466	0,704	0,495		
		U15	0,670	0,449	0,701	0,491		
		U16	0,801	0,641	0,813	0,662		
		U17	0,822	0,676	0,815	0,664		
University policies		U18	0,478	0,229	eliminated	eliminated		
		U19	0,713	0,509				
		U20	0,803	0,644				
		U21	0,761	0,580				

How can universities use organizational factors to stimulate entrepreneurship?

Construct	Dimension	Question	First iteration		Second iteration	
			Factor loading	Communalities	Factor loading	Communalities
CEAI	Work discretion	C1	0,855	0,730	0,862	0,744
		C2	0,768	0,590	0,785	0,616
		C3	0,902	0,814	0,907	0,823
		C4	0,646	0,418	0,650	0,422
		C5	0,828	0,685	0,821	0,674
		C6	0,632	0,400	0,622	0,387
		C7	0,341	0,116	eliminated	eliminated
CEAI	Time availability	C8	0,834	0,696	0,843	0,710
		C9	0,675	0,456	0,710	0,504
		C10	0,668	0,446	0,717	0,514
		C11	0,533	0,284	eliminated	eliminated
		C12	0,753	0,567	0,730	0,532
		C13	0,646	0,417	0,651	0,424
		C14	0,761	0,579	0,765	0,585
CEAI	Management support	C15	0,840	0,705	0,842	0,709
		C16	0,779	0,606	0,802	0,643
		C17	0,385	0,148	eliminated	eliminated
		C18	0,913	0,833	0,951	0,905
CEAI	Rewards reinforcement	C19	0,927	0,860	0,951	0,905
		C20	0,523	0,273	eliminated	eliminated

How can universities use organizational factors to stimulate entrepreneurship?

Construct	Dimension	Question	First iteration		Second iteration		Third iteration		Fourth iteration		Fifth iteration	
			Factor loading	Communalities	Factor loading	Communalities	Factor loading	Communalities	Factor loading	Communalities	Factor loading	Communalities
Self-esteem		E1	0,588	0,346	0,616	0,379	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E2	-0,330	0,109	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E3	0,819	0,670	0,825	0,681	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E4	0,840	0,706	0,847	0,718	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
Innovation		E5	0,552	0,305	0,581	0,338	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E6	0,678	0,460	0,700	0,489	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E7	0,300	0,090	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E8	0,689	0,474	0,734	0,539	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E9	0,668	0,446	0,698	0,487	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E10	0,451	0,203	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E11	0,769	0,591	0,734	0,539	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E12	0,655	0,430	0,648	0,420	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E13	0,288	0,083	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E14	0,292	0,085	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
EAO		E15	0,593	0,352	0,609	0,370	0,600	0,360	eliminated	eliminated	eliminated	eliminated
		E16	0,449	0,202	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E17	0,543	0,295	0,524	0,275	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E18	0,634	0,402	0,588	0,345	0,561	0,315	0,595	0,355	0,629	0,395
		E19	0,522	0,273	0,488	0,239	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E20	0,589	0,347	0,580	0,336	0,608	0,369	0,625	0,391	0,624	0,389
		E21	0,631	0,399	0,644	0,415	0,684	0,468	0,684	0,468	0,717	0,515
		E22	0,557	0,311	0,591	0,349	0,636	0,405	0,642	0,412	0,642	0,412
		E23	0,558	0,311	0,592	0,351	0,645	0,416	0,676	0,457	0,691	0,477
		E24	0,612	0,374	0,652	0,425	0,727	0,529	0,745	0,554	0,73	0,533
Achievement		E25	0,602	0,362	0,612	0,374	0,550	0,303	eliminated	eliminated	eliminated	eliminated
		E26	0,644	0,415	0,657	0,431	0,618	0,382	0,569	0,324	eliminated	eliminated
		E27	-0,230	0,001	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
		E28	0,729	0,532	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated
Personal control		E29	0,729	0,532	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated	eliminated

APPENDIX 5: SCORES: FACTOR LOADINGS, COMMUNALITY, VARIANCE EXPLAINED & CRONBACH'S ALPHA

Construct	Dimension	Question or item	Factor loading	Communality	% of variance explained	Cronbach's Alpha
ENTRE-U	Research mobilization	U1	0,840	0,706	69,765	0,854
		U2	0,849	0,721		
		U3	0,843	0,711		
		U6	0,808	0,652		
	Unconventionality	U7	0,721	0,519	60,076	0,834
		U8	0,797	0,635		
		U9	0,859	0,738		
		U10	0,790	0,625		
		U11	0,698	0,487		
	Industry collaboration	U14	0,704	0,495	57,801	0,753
		U15	0,701	0,491		
		U16	0,813	0,662		
		U17	0,815	0,664		
	University policies	U19	0,713	0,509	57,757	0,631
		U20	0,803	0,644		
		U21	0,761	0,580		
CEAI	Work discretion	C1	0,862	0,744	61,084	0,856
		C2	0,785	0,616		
		C3	0,907	0,823		
		C4	0,650	0,422		
		C5	0,821	0,674		
		C6	0,622	0,387		
	Time availability	C8	0,843	0,710	56,532	0,743
		C9	0,710	0,504		
		C10	0,717	0,514		
		C12	0,730	0,532		
	Management support	C13	0,651	0,424	49,103	0,768
		C14	0,765	0,585		
		C15	0,842	0,709		
		C16	0,802	0,643		
	Rewards reinforcement	C18	0,951	0,905	90,494	0,893
		C19	0,951	0,905		
EAO	Self-esteem	E1	0,616	0,379	59,287	0,636
		E3	0,825	0,681		
		E4	0,847	0,718		
	Innovation	E6	0,731	0,534	48,755	0,780
		E8	0,740	0,548		
		E9	0,690	0,476		
		E11	0,783	0,613		

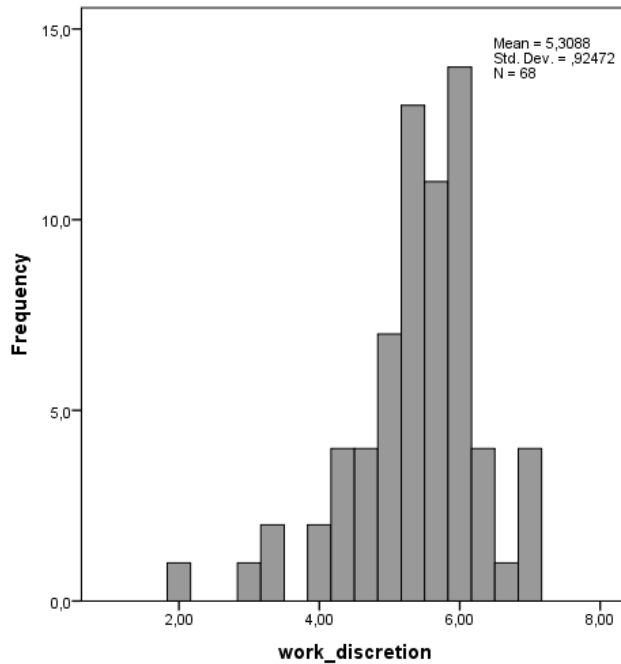
How can universities use organizational factors to stimulate entrepreneurship?

Achievement	E12	0,628	0,394	45,364	0,748
	E15	0,600	0,360		
	E18	0,629	0,395		
	E20	0,624	0,389		
	E21	0,717	0,515		
	E22	0,642	0,412		
	E23	0,691	0,477		
	E24	0,73	0,533		

Note: Retrieved through IBM SPSS Statistics 22.

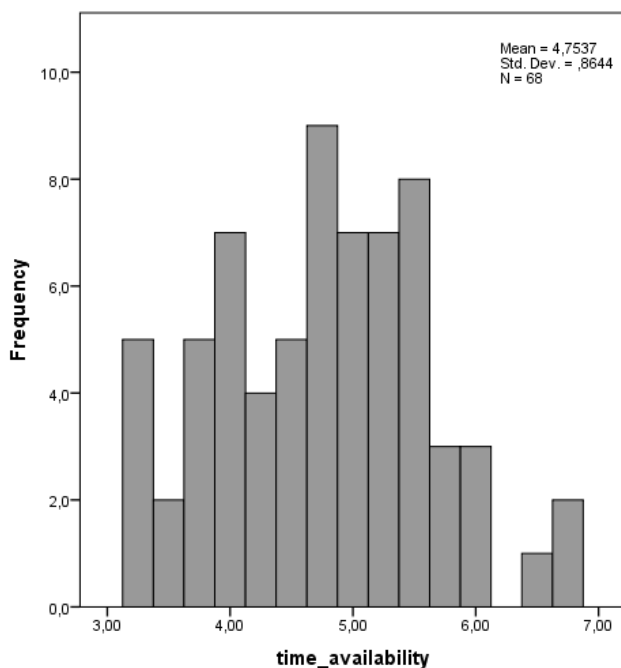
APPENDIX 6: ASSESSMENT OF DISTRIBUTION ORGANIZATIONAL FACTORS

There are many tests for normality. Kolmogorov-Smirnov (K-S) and Shapiro Wilks are most commonly used. K-S test is sensitive for extreme values, which can be corrected for with the Lilliefors correction. Still, K-S is considered less precise than Shapiro Wilks when the sample size is not extremely high. With $N=68$, Shapiro Wilks is chosen to test normality. Additionally, skewness and kurtosis will be mentioned and a bar-charts will be made for each test so that the conclusion about normality is not based on a single test without visual inspection of the distribution. Shapiro Wilks null-hypothesis is that data is normally distributed. The alternative hypothesis is thus that data is not-normally distributed.



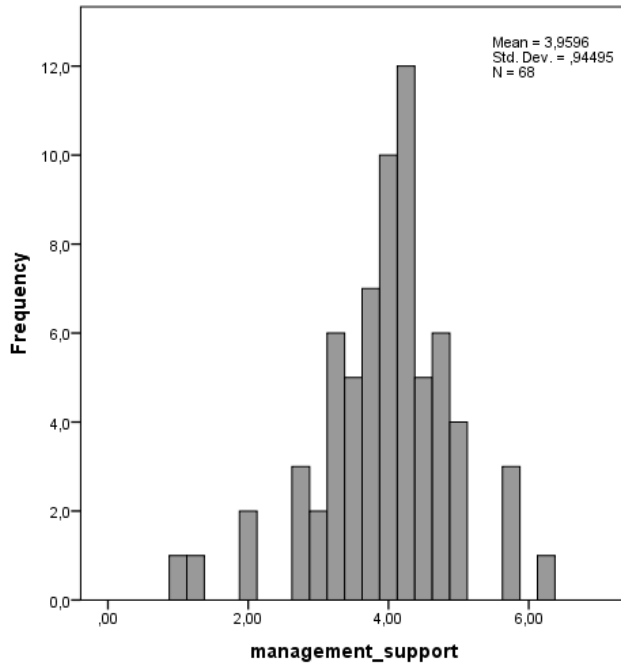
Work discretion

The Shapiro-Wilks test shows that the data is non-normally distributed (Shapiro-Wilks=0,931; $df=68$; $p=0,001$). Before continuing, it is inspected why this happened. An outlier test shows two cases with outliers (with $>1,5 \times IQR$ from Q1 or Q3). The Shapiro-Wilks test without these outliers shows the data is normally distributed (Shapiro-Wilk=0,968, $df=66$, $p=0,085$). Skewness is -0,470, which means data is skewed. Kurtosis is 0,401, which means data is leptokurtic (peaked). With both skewness and high kurtosis, this variable is considered not normally distributed.



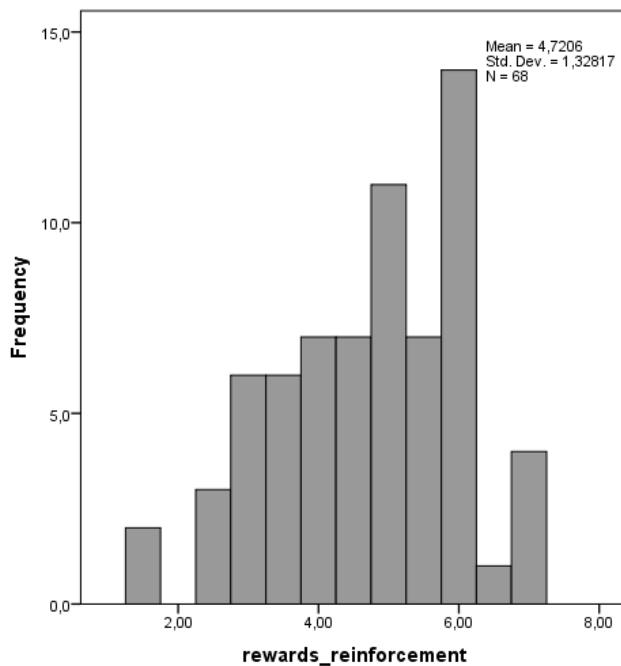
Time availability

The Shapiro-Wilks test shows that the data is normally distributed (Shapiro-Wilks=0,973; $df=68$; $p=0,144$). The histogram however, does not look normally distributed. Skewness is 0,122, which means the data is symmetrical. Kurtosis is 0,-440, which means the data is only slightly platykurtic. The data is similar to normally distributed. The histogram is confusing, but the Shapiro-Wilks test as well as skewness and kurtosis indicate that the data is fairly normally distributed.



Management support

The Shapiro-Wilks test shows that the data is non-normally distributed (Shapiro-Wilks=0,951; df=68; p=0,010). Before continuing, it is inspected why this happened. An outlier test shows three cases with outliers (with $>1,5 \times IQR$ from Q1 or Q3). The Shapiro-Wilks test without these outliers shows the data is normally distributed (Shapiro-Wilk=0,972, df=65, p=0,147). Skewness is -0,175, this means the data is only slightly skewed. Kurtosis is 0,599, which means the data is somewhat leptokurtic (peaked).



Rewards/reinforcement

The Shapiro-Wilks test shows that the data is non-normally distributed (Shapiro-Wilks=0,958; df=68; p=0,023). Before continuing, it is inspected why this happened. There are no cases with values exceeding $Q1 - 1,5 \times IQR$ or $Q3 + 1,5 \times IQR$. This means there are no outliers. Skewness is -0,380, kurtosis is -0,442. The data is both skewed and somewhat platykurtic. This can also be seen in the histogram shown on the left. Non-parametric tests must be used with this variable.