Towards the Entrepreneurial University
A study of performance and efficacy of university-industry collaborations and universities third mission activities

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Introduction to the main research field

The focus of my research is to examine universities on their way to become entrepreneurial universities with special regards to collaboration between academic scholars and research-intensive industry sectors which encourage knowledge and technology exchange. The aim is to better estimate results of exploitation of academic research results and to evaluate performance of future collaboration projects with external partners which makes it possible to create a highly efficient research environment in regional innovation systems through purposeful allocation of funding, and through the development of efficient policies. Further, following “third mission” activities which involve commercialisation of research and collaboration with institutes and industries outside of academia can be a way for universities to be less dependent on public funding. Apart from universities first and second mission of teaching and research, the third mission is a way to make economic use of research, especially when it comes to patenting, spin-off creation, or technological transfer (Dan, 2012). In my research emphasis will be on the enterprising third mission which involves service to society and/or industry with the purpose of income diversification (Montesinos, Carot, Martinez, & Mora, 2008).

As university-industry collaboration (UIC) and third mission activities among universities in countries with sparse population have been little studied, my main research question is:

How do universities located in countries with a small population develop towards an entrepreneurial university model in respect to university-industry collaborations, research, teaching, and third mission activities, and how can the development be further improved to strengthen the national research environment and regional innovation systems?

One main purpose is to outline patterns of collaboration across academics and different public and industry sectors to find out which are predominant in knowledge and technology transfer and which support third mission activities of universities. Moreover, to be able to extend specific collaboration forms motives and barriers which either hinder or strengthen university-industry relations will be examined.

For my research, five sub-questions are supporting the main research question:

• When investigating the university level who within the university is most likely to collaborate with industry and/or the public sector and vice versa?
• What forms of university-industry interactions are prevalent among academia and research-intensive industries?
• What are the main motives and barriers for academic researchers and different industry sectors to start collaborating?
• How can different forms of collaboration and third mission activities support universities located in countries with a small population to become entrepreneurial?
• How can universities serve the needs of the industry for education and research?

By performing the study in a country such as Iceland, which has a relatively short higher education history (Jóhannsdóttir & Jónasson, 2013) and only about 350,000 inhabitants, valuable indications should come to light, not only of the development of entrepreneurial universities, but also about UIC and the complexity of its impact. As universities and businesses on (small) islands face harsher market conditions and consumption is more often located outside the region (Burnett & Danson, 2017) one can assume that collaboration and strong relations of institutes are vital for establishing a competitive advantage. As Icelandic universities are trying to establish a higher research focus they further need a strong and purposeful backup from the local industry. In the context of global competitiveness collaboration between science (academia) and industry needs to be supported to strengthen the national innovation system and therewith economic growth.

**General project design and current research status**

Most research conducted in the field of university-industry collaboration has either taken the perspective from industry or from research institutes (e.g. Lin & Bozeman, 2006; Radas, 2005). In my research both sides will be considered with a stronger emphasis on academia and its shift of becoming an entrepreneurial university. As the study involves not only multifarious research questions with qualitative and quantitative aspects but also wide-ranging perspectives from individuals in academia, the public sector, industry, and society I am choosing a mixed methods approach. The mixed methods approach follows an exploratory and an explanatory design in three distinct phases. The first phase involves an exploratory design and is already partly completed. Here data has been collected through qualitative methods (interviews and literature review¹). In the second phase quantitative methods (surveys) follow which build on results of

¹ Currently, I am about to finish a literature review about entrepreneurial universities in Scandinavia which involves 38 empirical articles: “From exploration to exploitation: Entrepreneurship and third mission activities in Scandinavian universities”
the qualitative data. In the third phase, an explanatory design is adapted to use quantitative results for follow-up interviews (Creswell & Plano Clark, 2017). The chosen design will be needed to interpret quantitative results and helps to answer the research question how universities develop towards an entrepreneurial university model and in what way they can strengthen the national research environment and regional innovation systems.

During my PhD studies I will publish several (4-5) articles about my research topic. The first article is a literature review, followed by an article which describes the current UIC situation in Iceland based on interviews. The third article will be a cross-national case study among two universities and their development to become (more) entrepreneurial. Thereafter, two articles follow with quantitative and mixed research methods.

In this paper I will concentrate on the methodology of the second article which uses interviews as qualitative research method.

**Qualitative research method: Semi-structured interviews**

The second article in my PhD studies is the first step in reviewing forms of UIC, and motives and barriers to collaborate from the perspective of research institutes likewise from companies in energy production and food processing technology in Iceland. Gaining knowledge about theses aspects is central as the Icelandic industry depends on well-established research facilities and collaboration with domestic universities due to a distance to the market. As Icelandic universities are trying to establish a higher research focus they further need a strong and purposeful backup from the local industry. In the last decades many diverse industries have established which lay the foundation for an advanced competitive diversification of an Icelandic economy that was mainly dependent on fisheries for a long time. In the context of global competitiveness collaboration between science (academia) and industry needs to be supported to strengthen the national innovation system and foster economic growth. Therefore, regarding this article the following research questions should be answered:

- **How does UIC emerge and develop through time?**
- **Which collaboration forms are prevalent among academic researchers, public research institutes and companies?**
- **What are different motives and barriers of research institutes and companies to collaborate?**
- **How can universities serve the needs of the industry for education and research?**
One of the aims is to review types and determinants of collaboration among universities, public research institutes and industry by taking interviews with industry representatives from different product/research departments, public research institutes, and academic researchers. The analysis can support universities and other research institutes, and companies not only when choosing best partners to collaborate, but also in evaluating different forms of UIC and their conditions.

Following, the research methodology, including a description of participants, implementation of research, and interview analysis are outlined. In the end ethical issues and limitations are pointed out.

**Research methodology**

The purpose of this research is to understand micro environments of the given concept which can help afterwards in preparing a quantitative study to generalise findings to a larger population and to test hypotheses. Consequently, semi-structured interviews were chosen as a research method (Merriam, & Tisdell, 2016). As a consequence, questions are open, but with scope to ask follow-up or probing questions. All questions are used flexibly without predetermined wording and order, but specific data is required from all respondents. Interviews were conducted among employees of companies, public research institutes, and universities which are active in external collaboration. The method of semi-structured interviews makes it possible to change topics spontaneously as well as to adjust the order of questions asked. For the interviews an interview guide was prepared in Icelandic. The interview guide was created after reading articles related to the topic. Some questions were slightly improved and adjusted after the first interviews were taken.

**Participants**

Companies from the following main industries were considered as the target population for the research:

- energy production
- biotechnology
- food processing industry and nutrition science
These industries do not only contribute to a great extent to the national GDP of Iceland, moreover, they have been growing strongly in the last years and expanded to international standards. Additionally, universities in Iceland provide specific studies and courses in compliance to the needs of these industry branches such as “Fisheries Science”, “Natural Resources Science”, or “Biotechnology”. Further, the school “Iceland School of Energy” was established in 2008 and is owned by the private company Reykjavik Energy, the private university Reykjavik University, and the non-profit governmental institution Iceland GeoSurvey and accredited in the School of Science and Engineering at Reykjavik University. Before participants were chosen, three lists according to industry branches with names of companies and public research institutes were prepared. Therefor actual information from the Federation of Icelandic Industries (SI), Creditinfo Iceland and from the Icelandic working union VR (Verzlunarmannafélag Reykjavikur) was gathered. Companies in energy production are usually big in size, but few. Companies in biotechnology and food processing industry and nutrition science are not always distinct from each other. However, it was started to identify companies in biotechnology as interest exists to develop a biotech cluster in Iceland (Óskarsdóttir & Steinthorsson, 2018). A future quantitative study will help to get a better distinction between these industries. Companies and institutes from these industries were randomly chosen for interview participation. Yet, it was considered that the interviewee had not too much pre-knowledge of each company or institute as this could lead to research bias.

Before the start of the research consent was sought from The Icelandic Data Protection Authority (Persónuvernd).

In a next step the main person in charge for product development, innovation or research was directly contacted by email. If a website did not reveal any information about employees that are in charge for product development and/or research, then the department for human relations was contacted either by e-mail or by phone to get information about employees who fit into the research scheme (those who have a connection to academia).

Regarding academic researchers, two researchers from two different universities were chosen which the interviewee did not know beforehand but knew that they can provide valuable information about collaboration with industry. One person employed at an university was likewise employed at a research-intensive company, and the other person was head of a university department.

In total 15 people were contacted, whereas nine were willing to participate in an interview. The following table gives an overview of the interviewees, their position and education and the type of organisation they work in.
Table 1. Interviewees and their position and education

<table>
<thead>
<tr>
<th>Type of organisation</th>
<th>Position of researcher</th>
<th>Education of Employee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>Partly owner/CEO</td>
<td>B.A. Engineering</td>
</tr>
<tr>
<td>Food processing</td>
<td>Researcher/Marketing</td>
<td>Nutrition Science</td>
</tr>
<tr>
<td>Pharmaceuticals</td>
<td>Director</td>
<td>PhD Molecular Biology</td>
</tr>
<tr>
<td>Food technology</td>
<td>Researcher/Lecturer</td>
<td>PhD Geophysics</td>
</tr>
<tr>
<td>Public research organisation</td>
<td>Research &amp; Development Director</td>
<td>M.A. Anthropology</td>
</tr>
<tr>
<td>Medical Engineering</td>
<td>Project Manager</td>
<td>MSc Engineering</td>
</tr>
<tr>
<td>Energy</td>
<td>Geothermal Training</td>
<td>PhD Geology</td>
</tr>
<tr>
<td>Research (University)</td>
<td>Head of Department</td>
<td>PhD Biomedical Sciences</td>
</tr>
<tr>
<td>Public research organisation</td>
<td>Director</td>
<td>PhD Library and Information Science</td>
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Research implementation

Before the interviews were taken, the interviewees were asked for choosing the date/time and place themselves. All interviews took place at the workplace of the participants as this seemed most convenient for them. Further, all interviews took place shortly after the first contact which means on average within one week from the first contact through email. Before the interview the purpose of the study and the background of the interviewer were shortly explained, and it was emphasised that participation is voluntary. After asking for permission they were recorded with the app “Smart Recorder”. The length of the interviews were 44 to 53 minutes each. It was confirmed that information such as names or sensitive information about the company/institute will never be distributed, but that information from the interviews will only be used for the research and that the recorded interview will be deleted once it was transcribed. Shortly after each interview was taken, it was transcribed using “gisted transcription” which is a condensed transcription method where all unnecessary utterances are left out (Paulus, Dempster, & Lester, 2014). Throughout the transcription process comments were included in brackets using a different colour to identify themes better and to distinguish comments from the transcribed interview text. Comments include thoughts and explanations of the researcher, suggestions of improvement concerning the interview technique or questions asked, and additional description of e.g. language used (e.g. stress of words, pauses), body language or observations about the environment. A first initial coding took place after the first two interviews were taken. The coding enabled to find first patterns and directions and helped to improve a) the interview technique of the researcher and b) the questionnaire.
**Interview analysis**

As UIC is a very broad research topic thematic analysis will be used in the analysis of the interviews to discover patterns and to frame specific research questions. The patterns which derive help to conduct more granular research in the future by applying statistical analysis to validate themes and patterns.

Braun and Clarke (2006) describe a thematic analysis as “a method for identifying, analysing, and reporting patterns (themes) within data” (p.6). As similar qualitative research has been conducted in other countries and within different industries, themes will be derived from previous research results and tested in Iceland.

During the first step of interview analysis initial codes will be first generated by open coding of interview notes and its transcripts by setting short captions as “comments” into the word document. In a next step these captions or codes will be grouped into different categories (e.g. forms of UIC, motivational factors, barriers to collaborate) to reduce the number of initial codes and to start finding relations between different codes. The categories will then be linked to more abstract themes which will be chosen from reviewed literature and these will again be compared with the initial codes. The next step will be selective coding where data will be scanned for more evidence to confirm existing core categories. Then each interview will be read again, and text passages will be marked with different colours according to different themes they belong to. The focus will be laid on the three to four core categories around which other categories could be integrated.

A short summary paper has already been written after an initial coding process of four interviews. First results of these interviews reveal that personal formal and informal relationships are in the forefront. Most common forms of collaboration are application for grants for e.g. student projects, offering internships to university students, and use of research facilities. Motivational factors to collaborate are mostly voluntary based on reciprocity, which involves an exchange of information and equipment, common saving of costs and material, and common financing in the form of research grants. Other factors are quality assurance and better access to (international) networks which again facilitates higher knowledge and resource transfer.

The next step in my research will be to code all nine interviews and look for more categories. In the end the results of the qualitative research method will be used to generalise these findings. Therefore, results of the preliminary interviews will be taken up to prepare two
distinct questionnaires for academics and industry which will be sent out in the second half of 2019.

**Ethical concerns and limitations of the research**

Iceland is a small country where ethical matters are in general a major issue due to a high degree of familiarity among inhabitants. Therefore, confidentiality and anonymity have highest priority in my research. In general, the ethical principles of Kristinsson (2013) were followed. Consequently, before, during, and after each interview emphasis was laid on the four main rules of ethics in social research: the principle of respect for autonomy, where the research frame and purpose was explained and emphasized that participation is voluntary and anonymous; the principle of non-maleficence, that no risk is created by participation of the research; the principle of beneficence; and principle of justice, where benefits of the research are explained (Kristinsson, 2013). To follow these principles, it was clarified before each interview that the information and names of companies or individuals will not be traceable. During the analysis names were replaced by substitutes which do not give an indication of the real subject. Further, if participants need to be cited in a report it will be considered that no information that might lead to the identification of the participant or his organisation will be cited. Moreover, after the interviews have been transcribed the records were deleted. It was emphasised that participation is voluntary and that the identity of participants and companies/organisations will be protected and that no one else than the researcher has access to the interviews, that is their records, transcripts and analysis.

My research can possibly be restricted if participants disclose valuable information which can occur as I am studying at the same university where I will partly conduct my research, and due to my status as a doctoral student. Moreover, when conducting social research in Iceland the risk is involved that results can only be generalised with limitations across countries.
References


