



Norwegian University of  
Science and Technology

# University-Industry Interaction and its Contribution to Economic Development in Uganda

A study of chosen projects and their interactions with the university  
sector in Kampala

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# Problem Description

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Research within knowledge based economic development shows how interaction between government, industry and universities can promote economic growth. This paper uses the Triple Helix model as a framework for such interaction and will study the existence of University-Industry collaboration between the hydropower industry and the universities in Uganda. Other actors, i.e. donors and government actors are included for a complete overview of the situation. Previous studies from Uganda show that lack of infrastructure is a bottleneck for further development and makes the hydropower sector an interesting case for this paper. The research will be conducted through an exploratory study of qualitative interviews of relevant actors.

The main research question for this thesis is: *Based on a case study of the hydropower sector in Uganda, how would the Triple Helix model be valid in a country where the actors can turn to other means of collaboration and knowledge development outside the helix?*

To fully be able to answer the main research question, three sub questions based on the case is presented. The findings from these questions are used to discuss the main research question. The sub research questions are:

- a) *What University-Industry interactions are taking place within the hydropower sector in Uganda?*
- b) *What is the motivation of foreign actors' presence in the hydropower industry in Uganda, and how can Uganda utilize their knowledge?*
- c) *What are the challenges of collaboration between universities and the hydropower industry in Uganda, and which incentives can increase collaboration?*

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# Executive Summary

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The Triple Helix model promotes interaction between the government, universities and industry through free flow of information. The model is created with a closed system in mind. Free flow of information is illustrated by local interaction, without mention of external influence from e.g. global companies or donor organizations. In developing countries these actors play an important role and may influence the local Triple Helix. This influence is the basis for the main research question of this study.

Research was conducted through a case study of Uganda and its hydropower sector. Relevant actors within the sector were interviewed in accordance to three sub questions on University-Industry collaboration. Through a thematic analysis of these semi-structured interviews, empirical results are presented. There is little UI-collaboration within hydropower in Uganda. The foreign actors within this sector wish to collaborate with the university, but request a national framework. A number of challenges to UI-collaboration in Uganda are revealed, which can be generalized as problems of all developing countries, i.e. lack of capital, weak institutions and lack of initiative to more collaboration.

It is argued that foreign industry benefit from local knowledge and supports the local Triple Helix interactions. In the university, there is a need for a catalyst to initiate changes to enable increased UI-collaboration. Neither the government nor the industry is able to take this role. Donors are identified as important actors in developing countries and suggested as a catalyst. However, it is revealed that donor work is organized in a way that may slow economic development. This calls for a change in donor support, and further research to validate such change is suggested.

It is concluded that donors, foreign industry and other similar institutions influence the Triple Helix interactions in developing countries. The model is still valid, as the external influence is supportive of local institutional interactions. To better illustrate the situation in developing countries the Open Triple Helix model is introduced. This model includes external actors as an influence to the Triple Helix model in developing countries.

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# Table of Contents

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<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	CHOICE OF CASE COUNTRY .....	2
1.2	RESEARCH QUESTION .....	4
1.3	REVIEW CONTENT .....	5
<b>2</b>	<b>CONCEPTUAL BACKGROUND .....</b>	<b>6</b>
2.1	THE TRIPLE HELIX MODEL.....	6
2.2	DONOR STRATEGY AND DONOR INFLUENCE ON THE TRIPLE HELIX.....	9
2.3	THE ENTREPRENEURIAL UNIVERSITY .....	11
<b>3</b>	<b>METHOD.....</b>	<b>17</b>
3.1	RESEARCH QUESTIONS .....	17
3.2	RESEARCH PROCEDURE AND DESIGN.....	17
3.3	THE INTERVIEWS .....	21
3.4	DATA ANALYSIS .....	22
3.5	EVALUATION OF METHODS CHOSEN .....	24
<b>4</b>	<b>EMPIRICAL FINDINGS .....</b>	<b>26</b>
4.1	UGANDA AS A CASE COUNTRY .....	26
4.2	EXISTING UI-INTERACTION IN THE HYDROPOWER INDUSTRY IN UGANDA.....	32
4.3	FOREIGN ACTORS' MOTIVES AND HOW UGANDA CAN UTILIZE THEIR KNOWLEDGE .....	37
4.4	CHALLENGES AND INCENTIVES OF INCREASED UI-COLLABORATION .....	40
<b>5</b>	<b>DISCUSSION.....</b>	<b>50</b>
5.1	FOREIGN INDUSTRY AND ITS INFLUENCE ON THE TRIPLE HELIX MODEL.....	50
5.2	A NEED FOR A CATALYST TO IMPLEMENT CHANGE IN THE UNIVERSITY .....	51
5.3	ADVANTAGES AND DISADVANTAGES OF DONORS AS A CATALYST FOR CHANGE .....	53
5.4	THE VALIDITY OF THE TRIPLE HELIX IN DEVELOPING COUNTRIES.....	56
5.5	IMPLICATIONS FOR MANAGERS.....	60
5.6	SUGGESTIONS FOR FURTHER RESEARCH .....	62
5.7	LIMITATIONS AND EVALUATION OF THE STUDY .....	63
<b>6</b>	<b>CONCLUSION .....</b>	<b>65</b>
<b>7</b>	<b>REFERENCES .....</b>	<b>67</b>
<b>8</b>	<b>APPENDIXES .....</b>	<b>70</b>
8.1	INTERVIEW GUIDES .....	70

# Tables

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TABLE 1 - INTERVIEWS .....	21
----------------------------	----

# Figures

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FIGURE 1 UNIVERSITY, GOVERNMENT AND INDUSTRY AS INTERACTIVE SPIRALS IN THE TRIPLE HELIX MODEL .....	7
FIGURE 2 THE STATIST MODEL, THE LAISSEZ-FAIRE MODEL AND THE OPTIMAL TRIPLE HELIX MODEL .....	8
FIGURE 3 NUMBER OF INTERVIEW WITHIN DIFFERENT INSTITUTIONS.....	23
FIGURE 4 INTERVIEWS CONDUCTED IN DIFFERENT FIRMS WITHIN GENERATION .....	24
FIGURE 5 THE HYDROPOWER INDUSTRY IN UGANDA .....	29
FIGURE 6 HOW THE INDUSTRY IS CONTACTED ABOUT INTERNSHIPS .....	33
FIGURE 7 ILLUSTRATION OF HOW MANY WHO THINKS THE CURRICULUM IS OUTDATED .....	34
FIGURE 8 UI-COLLABORATION IN UGANDA TO THE LEFT AND THE OPTIMAL TRIPLE HELIX UI-INTERACTION TO THE RIGHT.....	37
FIGURE 9 - THE OPEN TRIPLE HELIX MODEL.....	58
FIGURE 10 ILLUSTRATION OF INTERACTIONS BETWEEN INSTITUTIONS IN UGANDA.....	59
FIGURE 11 THE OPTIMAL OPEN TRIPLE HELIX MODEL IN UGANDA .....	60

## List of Acronyms

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CSR	Corporate Social Responsibility
ERA	Electricity Regulatory Agency
HR	Human Resource
KCCL	Kasese Cobalt Company Ltd.
MU	Makerere University
NCHE	National Council of Higher Education
NOMA	Norad's Program for Master Studies
Norad	Norwegian Agency for Development Cooperation
NTNU	Norwegian University of Science and Technology
NVE	Norwegian Water Resources and Energy Directorate
OECD	Organisation for Economic Co-operation and Development
PEAP	Uganda Poverty Eradication Action Plan
PSFU	Private Sector Foundation Uganda
REA	Rural Electrification Agency
SIDA	Swedish International Development Cooperation Agency
SWAp	Sector Wide Approaches
TTO	Technology Transfer Office
UETCL	Uganda Electricity Transmission Company Ltd.
UI	University-Industry
UIA	Uganda Investment Authority
UNCST	Uganda National Council of Science and Technology
UPE	Universal Primary Education (in Uganda)



# 1 Introduction

With the globalization of markets, the competition between countries increases and brings new challenges to develop and sustain a good economy. Research shows that economic development cannot be explained purely in terms of traditional economic factors such as land, labor, and capital. Main theories of today focus on how countries and industries should find their competitive advantages and trade freely between nations. At both firm and national level, competitive advantage grows out of innovation and productivity (Cavusgil et al., 2008).

For developing countries, the increased global competition makes the challenge of economic development even more difficult. Competitive advantages of developing countries are often related to low wages of labor force and natural resources. This has led to a focus on agriculture and production of raw materials. The limited possibilities of increased productivity within these sectors hinders these countries of evolving past being developing countries (Reinert, 2007). Reinert (2007) states that developing a local industry is the key to economic growth. As the industry grows more advanced the focus on innovation and productivity increases.

With knowledge as a key factor to productivity and innovation, the knowledge-based society has evolved. Knowledge transfer and university-industry (UI) interaction are introduced as means to achieve economic development. The Triple Helix model explains economic development by interaction between universities, industries and the government (Etzkowitz et al., 2000). Free flow of information between these institutions expands knowledge and eventually leads to economic development. The Triple Helix model is originally designed to explain the economic development in western societies, and research confirms that the model fits well with a stable, developed economy (Etzkowitz, 2003, Van Looy et al., 2004, Klofsten et al., 1999).

Etzkowitz claims the Triple Helix model is applicable in developing countries, but the research on this is limited and there is not much tradition for UI-collaboration in developing countries. The model is based on a closed country system, where the three main actors interact without outside influence. This simplification may be challenging

in developing countries. There is a lack of both structural systems and local knowledge base in developing countries, which makes it appealing to draw on knowledge outside the country. As globalization increases, possibility to find knowledge outside the closed Triple Helix emerges. Universities in developing countries have a potential to create and refine the knowledge needed to develop the industry, which is not explored. Foreign industrial actors present in developing countries are often part of large multinational companies that provide R&D from highly developed departments with large budgets. Through donors and other financial agencies, the government is under direct influence and training by foreign actors, influencing the Triple Helix system. This is not covered as a part of the Triple Helix theory, but it is reasonable to suspect that these open system actors influence the model.

The aim of this paper is to study the influence of open system actors to the Triple Helix, and thus contribute with research on the Triple Helix model and economic development in developing countries. This will be done through a single case study of a developing country with focus on existing and potential UI-collaboration within a chosen industrial sector.

### **1.1 Choice of case country**

Uganda is chosen as case country in this study to exemplify developing countries. Etzkowitz et al. (2005) states that stability is required in developing countries that wish to use the Triple Helix model. In Uganda, the political situation has been stable for the last 25 years. There have been no civil wars and the same President has been in power for the whole period. This stability is part of the reason why Uganda has shown an impressive growth and now is a recommended investment area for foreign investors, and why it becomes a favorable case country to study UI-interaction in developing countries.

Aid donation serves as an important part of new projects in Uganda. In 2010, about 30 % of the national budget of Uganda is financed by donors (International Development Association, 2010). The lack of local funding, combined with the general skepticism from banks in regard of industry loans, leads to a situation where the government

often needs to turn to donations to be able to initiate new projects. Most donors have strict demands for the projects, which make them powerful actors between the university-industry-government institutions. The large degree of donor influence and investments from foreign industry makes Uganda an interesting country of research in terms of investigating open system influence on the Triple Helix model.

Developing a local industry, in accordance with the claims of Reinert (2007), requires some basic infrastructure to be in place. The World Bank has identified electricity as a major infrastructure challenge for Uganda if the country is to further improve its economy (International Development Association, 2010). If the electricity sector is developed, this will also improve the development of other industries. In collaboration, the government of Uganda and the World Bank has developed a five-year plan for country development where electricity is one of the main areas of importance. Because electricity is a bottleneck for further development in Uganda, this sector is chosen as area of research when investigating UI-collaboration.

Within electricity, hydropower is chosen to limit the scope of the research to a feasible level in terms of time and resource constraints. The hydropower sector is a high-technology industry sector that requires an above average amount of technical competence. This makes the potential for UI-collaboration high, compared to more low-technology industries. The government wishes to move the electricity production from thermal to hydropower because of the large environmental and financial gains of this move. Thus, the focus on hydropower guarantees a certain amount of activity in the sector and makes it an interesting choice of sector for this study. The Norwegian government has energy as one of their main focus areas of aid in Uganda. In addition, the Norwegian company TrønderEnergi has a small hydropower plant in Uganda. This makes the choice of hydropower as sector an advantage when trying to find entry points for the research as the researchers are from Norway.

Makerere University (MU), the main university in the capital of Uganda, is part of a program called NOMA. This program's overall goal is to "contribute to the education of staff in public and private sectors as well as civil society in selected developing countries through building capacity at the Master's level in higher education

institutions in the south”<sup>1</sup>. Through this program, MU is collaborating with NTNU on a project to establish a new master’s study with main focus on UI-collaboration. This project is still just a few years old and the results are not yet seen. Even though the masters program is still waiting for approval, the fact that this is a Triple Helix project and that they are collaborating with NTNU, makes MU an interesting subject for research.

## 1.2 Research question

The main research question for this master’s thesis is:

*Based on a case study of the hydropower sector in Uganda, how would the Triple Helix model be valid in a country where the actors can turn to other means of collaboration and knowledge development outside the helix?*

This research question can be divided into two areas of interest. The first concerns what theoretical implications the research will have on the Triple Helix model and the field of knowledge based economic development. The second area of interest concerns how the findings can actually contribute to improve the situation in Uganda and other developing countries.

### 1.2.1 Case specific sub research questions

The empirical material is structured within three sub questions that seek to identify current conditions (a), identify foreign involvement (b) and discover challenges (c) with UI-collaboration in the case country. Through a cross-question analysis of these sub questions a conclusion on the main research question will be given. The sub questions used are:

- a) What University-Industry interactions are taking place within the hydropower sector in Uganda?
- b) What is the motivation of foreign actors’ presence in the hydropower industry in Uganda, and how can Uganda utilize their knowledge?

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<sup>1</sup> (<http://www.siu.no/eng/Front-Page/Programme-information/Development-cooperation/NOMA>)

- c) What are the challenges of collaboration between universities and the hydropower industry in Uganda, and which incentives can increase collaboration?

### **1.3 Review Content**

Chapter two will give a conceptual background of the theories used in this paper to give the needed insight to the discussion. The Triple Helix model is presented at a macro level, followed by a macro description of donors as an influencer to Triple Helix collaboration. Further, the entrepreneurial university is presented, with a sub chapter on incentive systems in universities.

Chapter three present a description of the research methods used. The methods are reviewed in respect to trustworthiness and its four key aspects. In addition, data analysis is reviewed in detail. Further, the chapter gives an overview of the interviews conducted through this study and a short statistical evaluation. Chapter four presents the empirical results. The case country and relevant actors is presented before the results of the research are given in alignment with the three sub questions. Main findings from each sub question are presented at the end of its respective chapter.

In chapter five the main research question is discussed in light of the results from the empirical research. Through cross-question analysis, three areas of interest regarding the main research question is found and discussed in 5.1 through 5.3. In 5.4 it is discussed how these findings affects how the Triple Helix model is valid in Uganda and in developing countries in general. The final part of chapter five suggests implications for managers, further research and limitations of the study. The study is then concluded in chapter six.

## 2 Conceptual Background

### 2.1 The Triple Helix model

#### 2.1.1 The history of University-Industry interaction

The concept of UI-interaction as a part of economic development was first acknowledged when the theory of Mode 2 was introduced in *The New Production of Knowledge* (Gibbons et al., 1984). According to Gibbons et al. (1984), Mode 2 shows how there can be interaction between different actors, e.g. between the industry and the university. The theory of Mode 2 evolved to be the most cited theory of knowledge production and economic development (Shinn, 2002).

Despite its popularity, the Mode 2 model has received critique in many ways. Mode 2 claims that the project orientation of the university and its close link to the industry, results in a decline of knowledge production in the university (Gibbons et al., 1984). This is thoroughly dismissed by the majority of other authors within the subject. Shinn (2002; p. 603) finds that “almost no concrete evidence is given for the assertions advanced; and no provision is made for future empirical historical or sociological work”.

The critique of Mode 2 has led to the rise of the Triple Helix model. The Triple Helix model does not claim that close interaction of the universities with industry and government hinders knowledge production. Critique of absence of data is given to the Triple Helix model as well, but the model is considerably more documented than Mode 2 (Shinn, 2002).

#### 2.1.2 The Triple Helix model

The Triple Helix model was introduced by Etzkowitz and further developed by Leydesdorff. In contrast to traditional linear models of innovation and economic development, the Triple Helix model is presented as a spiral model that captures the reciprocal relationship between public, private and academic spheres in capitalization of knowledge. University, industry and government have traditionally operated either with little interaction, or with the government controlling industry and university. In industrial societies of today they are increasingly working together interdependently,

developing and taking each other's roles. According to Dzisah and Etzkowitz (2008), the Triple Helix model is an expanding network system of interactive spirals that is generated when university, industry and government engage to promote economic development and academic research (Figure 1<sup>2</sup>). Circulation of people around spheres enhances creativity, moving ideas and skills from one sphere to another, to their mutual advantage. This can stimulate hybridization, invention and innovation of new social formats.

There are different stages in the process of developing Triple Helix interaction. The first step is collaboration involving innovation through their traditional roles. This can be participating in discussions to develop local economy, growth agreements or establishment of a technology council. The next step is internal transformation of the institutions where each take the role of the other in Triple Helix interactions, at the same time as they maintain their primary roles and distinct identity (Leydesdorff and Etzkowitz, 2001). Thus the university continues the fundamental role as an institution for the preservation and transmission of knowledge even as it takes on some business and governance functions. For example, the university takes on the role of industry by becoming an entrepreneurial university, which stimulates innovation and development of new firms (Etzkowitz, 2008). Through this role-taking, bilateral interactions among university-government, university-industry and government-industry increase (Etzkowitz, 2008).



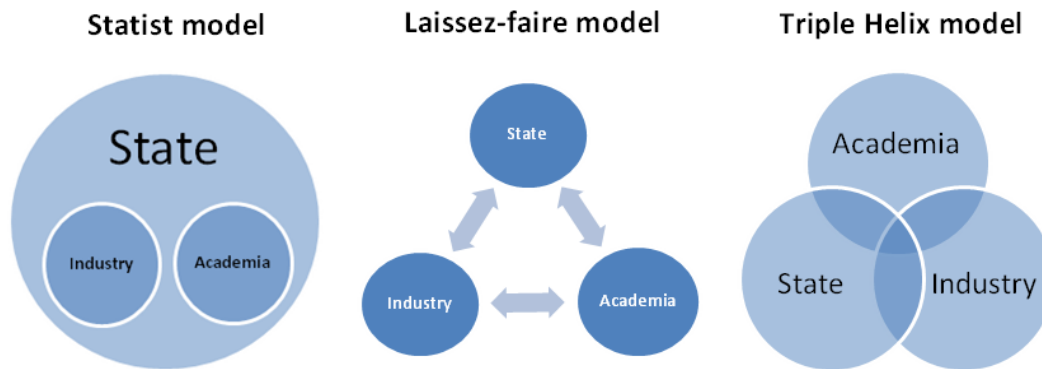
Figure 1 University, government and industry as interactive spirals in the Triple Helix model

The path of the Triple Helix development begins from two opposing starting points (Figure 2). The *statist model* emphasizes the government controlling academia and industry (Etzkowitz, 2003). In a statist society, government is the dominant institutional sphere, while industry and the university are subordinate parts of the state. In the *laissez-faire model* the industry, academia, and government are separate,

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<sup>2</sup> ([http://www.coloradocleanenergy.com/img/site\\_specific/uploads/crop\\_sm\\_TripleHelix-II-web.png](http://www.coloradocleanenergy.com/img/site_specific/uploads/crop_sm_TripleHelix-II-web.png))

interacting only modestly across strong boundaries. Here, the connection between university and industry is restricted to university providing knowledge and trained persons.



**Figure 2 The statist model, the laissez-faire model and the optimal Triple Helix model**

From both the statist and the laissez-faire model, the institutions move to a greater interdependence (Etzkowitz and Leydesdorff, 1999). Interaction among the three helices generates new organizational innovations. Each helix has an internal core and external field space. It is the external field space that overlaps, and thus taking the role of the other does not necessarily imply loss of sphere's core identity (Etzkowitz, 2008). Circulation takes place both inside each helix and between them, i.e. at micro and macro levels.

### **2.1.3 Critical voices to the Triple Helix model**

The main critique of the Triple Helix theory is directed to the simplicity of the model. Several authors suggest a more complex framework that takes this into account (Kaukonen and Nieminen, 1999, Tuunainen, 2005). This has led to suggestions of conceptual modifications to the model. An example of this is the work by Leydesdorff and Meyer (2003, 2007), who introduce sub-dynamics to the model, arguing that science, technology and industry involve different logic thus generating interfaces between these developments. Etzkowitz (2003) responds to the critique to some extent by emphasizing the influential force of international organizations as European Union. In later research he also points out that the Triple Helix model should not be



viewed as a rigid framework and that adjustments are possible (Dzisah and Etzkowitz, 2008).

Authors of conceptual articles describing the Triple Helix model look at the development of entrepreneurial activities within the university as a fact. A few raise a concern regarding the impact on the traditional roles of the university, teaching and research. They fear shift to applied research at the expense of basic research, and a downgrade of teaching activities. This is dismissed by results from the majority of the research conducted on the topic (Ranga et al., 2003, Baldini, 2008). Some even find that an increase in applied research lead to an increase in basic research as well (Van Looy et al., 2004).

## **2.2 Donor strategy and donor influence on the Triple Helix**

There is no specific mention of donors or other financial organizations in the Triple Helix theory. However, in developing countries these organizations play a large role. As this paper will study the external influence on the Triple Helix model, it is natural to give a short introduction to the theory of donor activity and their strategy in developing countries. In this study, *donors* include all donor organizations or other institutions that give financial support to developing countries.

The influence of donor organizations in developing countries is subject to controversy. The skeptics argue that donor aid risk crowding out private sector investment and innovation, and lead to government corruption and rent seeking (Easterly (2003), referred to by Bermingham et al. (2009)). However, the general view is that aid can achieve important developmental outcomes, including economic growth, but only if that aid is used effectively (Bermingham et al., 2009).

Most development aid has traditionally been channeled through project assistance. This is aid given directly to a specific purpose, e.g. building materials for a new school. Recently, budget support has been argued as a better alternative. This is support channeled directly into the financial system of the recipient country. The type of donor support chosen will have an influence on the Triple Helix collaboration. Through budget support, donors will support the government as an institution. If

donors use project support they will influence the industry or universities directly, without supporting the government helix.

Most researchers favor budget support. This is because the aid is more likely to be effective when recipients “take ownership” of the aid program, when development policies is less imposed to “conditionality” on recipients, and when aid is not tied to purchase of specific goods or services (Jain, 2007; p. 695). Even if the theoretical works favor budget support, a study from OECD found that in OECD donor countries just 5 % of the aid is channeled directly to the budgets (Jain, 2007). Jain (2007) suggests project assistance still is dominant because it is used as a way to restrict leakage due to corruption in the recipient country or to steer lucrative contracts to donor country corporations. However, Jain (2007; p. 696) sites an OECD report that concludes, there is “...no clear evidence that budget support funds were, in practice, more affected by corruption than other forms of aid”.

Sector Wide Approaches (SWAp) was created as a tool to deliver aid more efficiently. The aim of SWAp is to move from separate donor driven projects towards a more holistic sector-wide approach. In recent years, SWAp is increasingly being used in developing countries (Bermingham et al., 2009). The basic requirements of SWAp is: “Support single sector policy, implement under leadership of the government, use common approaches across the sector, and progressively work towards the use of government procedures” (Bermingham et al., 2009; p. 134). The most aligned modality of support to SWAp is sector budget support, but it could be project support or other forms of support if it fulfills the requirements (Bermingham et al., 2009).

The primary education sector in Uganda was one of the first examples of SWAp in practice in the world (Bermingham et al., 2009). In the early 1990s, the education sector got external assistance through more than 100 different projects, funded by over 20 funding agencies and a large number of NGOs. Almost all these projects were outside the Government Budget and Planning Systems (Development, 2003). Today, almost all donor contribution in the primary education sector is coordinated through the Ministry of Education and is mainly given as budget support (Kuteesa, 2010).

If SWAp is to be successful it is found that inter-ministerial cooperation is necessary and its success is crucial to the broader sector objectives (Bermingham et al., 2009). SWAp has not been very successful in Uganda in sectors with multiple line ministries, such as public administration, justice, law and order. This is because it is very difficult to achieve any sort of consensus at the sector level over the optimal allocation of scarce budget resources (Kuteesa, 2010), thus supporting the general theory of the importance of successful inter-ministerial cooperation. Kuteesa et al. (2010) finds SWAp to be most successful in Uganda in sectors dominated by a single ministry, such as education and health, because it reduces the scope of conflict between different spending agencies within the sector over budget resources.

Bermingham et al. (2009) identify two major obstacles in donor organizations regarding effectiveness of the use of aid in the education sector: the lack of sufficient institutional and staff incentives for coordinated and harmonized behavior; and factors that lead to risk-aversion and discourage innovation in delivering aid effectively. This is supported by Jain (2007) who argue that the preferences as career concerns of aid agency administrators is often preferred rather than the effectiveness of the aid when administering projects or disbursing funds. Administrators may be too narrowly focused on “moving money” leading to the metric output of aid contribution becomes the volume of the aid disbursed rather than the results achieved, which foster a “disbursement culture” (Easterly (2003) and Woods (2006), referred to by Jain (2007; p. 696)).

### **2.3 The Entrepreneurial University**

The *entrepreneurial university* is a part of all advanced economic development theories, but the Triple Helix model in particular emphasizes its role in economic development. Evolving an entrepreneurial university involves an enhancement of the two traditional university roles, which implies that the university must undergo a first and second revolution (Etzkowitz, 2008). The first academic revolution is the incorporation of research as an academic mission, in addition to teaching.

The second academic revolution concerns a role of the university in economic and social development through extensions of both research and teaching missions, and

capitalization of knowledge (Etzkowitz et al., 2000, Etzkowitz, 2003). This revolution arose in the late 19<sup>th</sup> and early 20<sup>th</sup> century in the western societies. Today, both teaching and research are regarded as the traditional roles of the university and they remain the core competence through the second revolution. The new role as an entrepreneurial university is defined as the “third mission” of the university (Etzkowitz, 1998).

An entrepreneurial university rests on four pillars (Etzkowitz, 2008):

1. Academic leadership able to formulate and implement a strategic vision.
2. Legal control over academic resources.
3. Organizational capacity to transfer technology through patenting, licensing and incubation.
4. An entrepreneurial ethos among administration, faculty, and students.

To be entrepreneurial, the university needs a considerable degree of interdependence with the government and industry. At the same time, the most important aspect of an entrepreneurial university is interaction with the other two spheres (Etzkowitz, 2008). There are different degrees to what extent universities take on the entrepreneurial role. According to Etzkowitz (2008), this illustrates different steps in the process of becoming entrepreneurial.

To manage the interface between academia and various external institutions, the entrepreneurial universities usually establish mechanisms such as a Technology Transfer Office (TTO). The tasks of a TTO include, but are not limited to, taking initiative for contact between research groups and suitable firms for their research field and facilitating contracts, patenting and licensing (Jones Evans et al., 1999). Hybrid organizations, such as cooperative research centers, strategic alliances, and incubator facilities, have been created at the interface of academia, industry, and government to stimulate innovation. A possible outcome of entrepreneurial activities at the universities is the establishment of spin-off companies. This is a company based on new technology or available technology in new combinations derived from the

university (Etzkowitz, 2003). Triple Helix interactions have in a few cases led to establishment of science parks. The largest and most known is Silicon Valley.

### **2.3.1 Evolving entrepreneurial universities in developing countries**

Homma et al. (2008) claim that university linking up with the industry will lead to increased funding to the university. This is supported by Gunasekara (2006) who finds funding to be significantly related to applied research. This funding is much needed, especially in the developing world, where the technical competence and capabilities are low (Homma et al., 2008). Further, this means that the universities can benefit greatly from external influence or training from developed countries. Homma et al. (2008) argue that almost all knowledge in the developing world comes from industrialized countries. Thus, as a part of the training phase, they propose direct collaboration with actors from the developed world.

Arocena and Sutz (2005) introduces the term counseling university as opposed to the entrepreneurial university in their conceptual article. A counseling university is a university in a developing country, which is stuck at doing only two types of collaboration with the industry; consulting underdeveloped industry and student internships (Arocena and Sutz, 2005). In their empirical analysis of Bolivian universities, Vega-Jurado et al. (2008) confirms that the counseling university exists. Further, they find that this counseling activity may have a negative effect on research consolidation (Vega-Jurado et al., 2008). Their research also shows that there is "... technological weakness in the productive sector, and the low level of development of university research have produced a vicious circle constituted of a process of linkages based on activities of low scientific content" (Vega-Jurado et al., 2008; p. 213).

Jongbloed et al. (2008) argue that how a university proceed to identify, prioritize and engage with its communities reflect the evolution of the university. Stakeholder analysis is used as a tool to assist the universities. To increase community interaction, including working with industry, three types of barriers are identified at the universities.

1. The determination of the research agenda and the educational offerings of universities.

2. The internal reward structure of universities
3. The lack of an entrepreneurial culture in universities (Jongbloed et al., 2008)

Universities are structured along lines of academic discipline. Developments in the disciplines have traditionally determined the research agenda and the content of the curriculum. Together with how the financial resources are allocated and that interaction between various disciplines are not optimal, this may lead to a public research agenda and supply of educational programs that are very different from the demands expressed by the industry.

Barrier two explain how both funding parameters that determine public budget and the academic`s salary structures do not include rewards for community engagement. This leads to situation where community engagement is not prioritized among the professors. Barrier three is related to how academic staff at the universities perceives their role. Academics feel that research commercialization is not a part of their job as an academic researcher. The same may hold for lecturers. They may be more interested in transferring textbook knowledge instead of teaching the wider potential of knowledge.

### **2.3.2 Incentive structures in the entrepreneurial university**

Guerrero and Urbano (2010) show that the most critical factors for entrepreneurial development in the university are attitudes toward entrepreneurship from academics and students. A way to change this attitude is to establish incentive structures that ensure a pull towards more entrepreneurial activities. Eisenhardt (1989) provides empirical evidence that validates the use of the principal agency theory to incentive challenges in organizations. Thus, the principal agency theory will be used to analyze the incentive structures in the entrepreneurial universities of developing countries.

The agency theory was introduced by Jensen and Meckling (1976, referred to by Eisenhardt (1989)), to describe risk-sharing problems where different parts in an agreement have a different perspective on risk. From this theory, principal agency theory has derived and is applied to different situations (Harris and Raviv (1978), referred to by Eisenhardt (1989)). Through a review of relevant literature, Eisenhardt

(1989) suggests that the principal agency theory should be extended to organizations to solve problems regarding an organization, the principal, and an employee, the agent. In the setting of employee motivation and incentives, the theory seeks the solution to the problem of *Moral Hazard* (Eisenhardt, 1989). Moral hazard can be described by the risk of employees shirking because of an incongruence of goals between the employer and its employee. In the setting of an entrepreneurial university, this can be illustrated by a professor that does not do the work the university wishes of him or her, if the professors achieve a higher profit from other activities.

According to Eisenhardt (1989), two of the solutions to the problem of Moral Hazard that can be validated through the research are:

- Behavior-based contracts
- Outcome-based contracts

Eisenhardt (1989) shows how *monitoring* can improve the contract by ensuring that the employer knows what the employee is doing, and then reward the employee based on the observed behavior. E.g., the university could monitor its professors' work by counting the number of classes they hold, how many hours spent on research, and so on. Then, the university can reward the professors provided that they have a satisfactory number of teaching hours and research hours. A challenge with behavior-based contracts is that the monitoring will be resource heavy. This is especially difficult in universities in developing countries, due to the strain on resources.

As an alternative to behavioral contracts, Eisenhardt (1989) validates the use of outcome-based contracts. These contracts reward the agent by the outcome of the work done. As an example, the university can reward a professor based on the number of industrial research contracts achieved, or the grades of the students. This will give the professor an extra incentive to obtain more contracts, or to ensure that the students get good grades. Outcome-based contracts are advantageous to behavior-based contracts in regard to costs, because monitoring now is unnecessary. The outcome-based contracts also motivate the agents to achieve the actual goals of the principal

and not just imitate a certain behavior. However, the agent is known to be more risk averse than the principal (Eisenhardt, 1989), thus he or she may not strive for the optimal solution if this solution puts the agents' own reward at risk. As both types of contracts have their pros and cons, it is recommended to combine the two. Through a fixed salary and low-cost monitoring, the principal will give agent the required amount of safety to avoid risk aversion. When combining this with a result-based addition to the salary, which motivates the agent to perform at its best, the principal will obtain the most optimal results.

Wu (2010) present an example of how incentives can be used to increase performance in the universities: "Research shows that incentives are important in terms of explaining variation in relative performance and hold a positive relationship with commercialization (Debackere and Veugelers, 2005; Woolgar, 2007; Wright et al., 2008)" (Wu, 2010; p. 207). Further, he argues that the universities should pursuit UI-collaboration to increase funding and production. Wu (2010) suggests that the university should implement shared licensing income, giving the professors a direct profit income from licenses that are commercialized. These claims of UI-collaboration and its effect on productivity are shared with Baldini (Baldini, 2008) and others in the field of Triple Helix.



### 3 Method

An exploratory qualitative research method was chosen to explore the topic of research to great detail. The subject of Triple Helix application on developing countries is still fresh, with several research gaps. Thus, the inductive approach, where the research results leads to theory was a natural choice. The research was conducted by interviewing relevant actors in relation to Uganda and its economic development with a goal of understanding how this social environment works based on its participants action. This is aligned with the epistemological position of qualitative research, described as interpretivism (Bryman, 2001). In addition, this paper has an ontological position aligned with Bryman's (2001) description of constructionist; social properties are results of individuals and their interactions.

#### 3.1 Research questions

Through a literature review on the Triple Helix and the university the fall of 2010, the authors became aware of the strengths and limitations of the model. The fact that the model is an acknowledged theory of UI-interaction, combined with the researchers' knowledge of its limitations, made it a good theoretical framework for this paper. There is limited research regarding the applicability of the Triple Helix model in developing countries and the authors wish to contribute with such research.

#### 3.2 Research procedure and design

##### 3.2.1 Theoretical background

A literature study of the Triple Helix model was conducted the fall of 2010 and is used as theoretical foundation material. In this literature study, a nesting approach and database searches were used as tools. The nesting approach started by examining the article titled *The norms of entrepreneurial science: cognitive effects of the new university-industry linkage* (Etzkowitz, 1998) and the book *The Triple Helix* (Etzkowitz, 2008). *Google Scholar* was used as the main search tool for the nesting process. Database searches were done in *Scopus* and *ISI Web of Science* on the terms "Triple Helix". The results were examined and all relevant articles were read.

Supplementing searches was conducted in the spring of 2011 to extend the knowledge of the model in developing countries. Searches on “Triple Helix” AND “developing countries” were done in the databases Scopus and SpringerLink. Search for literature on Uganda and its economic development were done through the same databases in addition to the use of Google Scholar. The initial searches for material directly related to both Triple Helix and developing countries did not reveal much previous work. Thus, a broader search within economic development and developing countries, with a focus on Africa, was completed to add some more theoretical material. For extra background information, informal conversations with supervisor Arild Aspelund and participants in the NOMA Program from NTNU, Bjørn Otto Elvenes and Tore Haavaldsen, were conducted.

Introductory interviews with Okure Mackay and Eriabu Lugujjo from Makerere University in Kampala were conducted. The interviews with Mackay and Lugujjo led to the discovery of relevant literature on Uganda and its electricity sector. All interview subjects were encouraged to give relevant written material. The interview with the Uganda National Council of Science and Technology (UNCST) led to the discovery of the study “Science, Technology, and Innovation in Uganda” (Brar et al., 2010). Through the interview with Hege Hope Wade at the World Bank, the authors were made aware of the “Country Assistance Strategy for The Republic of Uganda” (International Development Association, 2010) made by the World Bank and other relevant actors. Through the Ministry of Finance, support literature on the budget process in Uganda was derived.

Through consultation with the supervisor, a need for further material outside the Triple Helix was discovered. Material on donors and donor motivations were found through search on the terms “donors” with combinations of the words “motivation”, “strategy”, “incentives” and “economic development in the Scopus and SpringerLink database. The results of these searches were sorted and abstracts were read. Relevant articles were thus selected for further reading. Material on agency theory were found through a nesting approach based on Eisenhardt (1989), which was given to the researches by the supervisor after consultation.

### **3.2.2 Semi-structured interviews**

The main method of research in this paper is semi-structured interviews. The choice of method is based on several arguments. First, interviews are a research method with great flexibility, giving the subjects an ability to focus on what they personally deem important within the given topic. According to Bryman (2001), the researcher needs to see the world through the interview subject's eyes to be able to draw the correct conclusion on the social world. Interviews help accomplish this to a better extent than most other research methods (Bryman, 2001). Second, the choice of a semi-structured interview gives some needed structure when more than one person is doing the fieldwork. As this master thesis is a cooperation project between two persons, this structure was important. The semi-structured interview is better suited than completely open interviews if the researchers know to some extent what to focus on in the research (Bryman, 2001), which is the case in this paper. The purpose of inductive research is to create theory from research results. Thus, to make sure that the research is as close to reality as possible, interview subjects were encouraged to do side steps during the interviews whenever topics of interest appeared.

An interview guide was made for each category of actors; industry actors, university actors, government actors, donors and other actors. Each interview guide is provided in appendix A through E. The interview guide was not followed completely for all interviews, but rather served as a checklist for the researchers to make sure that all the important subjects were covered for each actor type. At the same time, the researchers continuously improved these guides. The research was a learning process for the researchers and as interviews were conducted new questions of interest were added. Thus, some of the topics may not have been included in the early interviews. This was solved by contacting the subjects, where deemed necessary, for a second talk on missing topics. In addition, the researchers spent time researching the interview cases in advance of the interviews to the purpose of being prepared to ask as relevant questions as possible. To some extent the interview guides were adjusted to fit the different actors. For some interviews time was a constraint. In these cases, the researchers chose to focus on the most important areas of topic in the interview

guides, which are the questions under the title “UI-collaboration” (Appendix A through E).

Each interview was conducted while using a tape recorder and writing notes. The tape recorder was used as the main support for the interview transcriptions. As the researchers did not have to concentrate on writing extensive notes, but rather could write down thoughts and observations on paper, they were able to focus on the conversation and follow up the answers of the subjects with new questions. Both researchers were present at all interviews, which reduces the chance of misunderstandings between the researchers and the interview subjects. The transcriptions were written as soon as possible after interview completion. In this way, the conversations and underlying reactions not caught on tape were still fresh to the researchers.

The researchers chose to use purposive sampling, choosing what actors that should be interviewed through their relevance (Bryman, 2001). The choices of relevance were based on conversations with supervisors at NTNU and through the snowball method. The snowball method is a method where the researcher asks its interview subjects if they know people who could be relevant to the study and contacting these, thus expanding the field of subjects for each interview. As a further evaluating of the sample, the researchers compared different recommendations and prioritized those institutions with the most recommendations. Point of entrance of the snowball method was two interviews. One was Okure Mackay, a contact person at Makerere University. As the research was meant to cover the hydropower sector, the researchers made contact with a Norwegian owned hydropower company present in Uganda; TronderPower, a subsidiary company of TrønderEnergi. At least one person within each part of the value chain, regulatory service, government actor or university actor in connection to the hydropower sector was interviewed.

Some of the persons found through the snowball method were not available for an interview during the researchers stay in Uganda. An example of this is that the Commissioner of Finance was not available, due to the fact that Uganda right now is in the middle of the wrap up of their budget planning for 2012. In cases like this, the

researchers asked the relevant person if he or she could recommend someone within their organization that would have the same or similar knowledge as themselves. In all cases the researchers got an alternative within the organization that could answer the questions asked. The *theoretical saturation method* was used to choose sample size. In this method the researchers use their own perception and knowledge to see when one has a saturation of a topic through observing that the same answers are given to the same question over and over again (Bryman, 2001). This way the topics of interests were researched to a satisfactory degree without the need to fulfill a specific sample size.

In some of the interviews, group interviews were conducted instead of single semi-structured interviews. This was because the interview subject wished to have more than one participant present, or because the researchers found it practical due to time and resource constraints. The same interview guides were used, and the group interviews were recorded and transcribed in the same way as described for the semi-structured interviews. This group interview method was used for the interviews with TronderPower, UMEME and PSF.

### 3.3 The interviews

Table 1 - Interviews

Organization type	Sector	Name of organization	Interview subject	Position
University		Makerere University	Mackay Okure	Deputy Dean at the Faculty of Technology
			Eriabu Lugujjo	Professor in Energy
			Florence Nakayiwa	Senior Economist at the Planning Department
			Barnabas Nawangwe	Principal of the College of Engineering, Design, Art and Technology
			David Birimumaso	Student with specialization in hydropower
			Silver Hategekimana	Previous teacher, now self-employed.
Industry	Generation	Eskom Uganda Ltd.	Caroline Nakayo	Communications officer
			Thomas Ssentongo	Human Resources Officer

		TronderPower Ltd.	Erling Legran	Managing Director	
			Arne Kroksæter	Hydropower Engineer	
			Munihizi Bonny	Operator	
			Losio Lemurusuk Chaplin	Operation Manager	
			Kasese Cobalt Company Ltd. (KCCL)	Paul Kasaija	Hydropower Plant Supervisor
	Distribution	UMEME Ltd.	Richard Kaggwa	Human Resource Development Manager	
			Jackie Akello	Employee Service Manager	
	Transmission	Uganda Electricity Transmission Company Ltd. (UETCL)	Frederick C. Zesooli	Manager Human Resource & Administration	
	Others	Private Sector Foundation of Uganda (PSFU)	Sarah Kiebenge	Policy Analyst (Advocacy)	
			Joseph Mawejje	Policy Analyst (Trade)	
Newplan		Lawrence Omulen	Managing Director		
TrønderEnergi		Idunn G. Finnanger	Physical Asset Manager		
	Uganda Investment Authority (UIA)	Doris Mitti	Head of Communications Department		
Government and governmental agencies	National Budget	Ministry of Finance	Juliet Kyokuhaire	Economist	
	Education and research	Ministry of Education	Robert Odok Oceng	Commissioner of Higher Education	
		National Council for Higher Education (NCHE)	Moses Luutu Golola	Deputy Executive Director	
		Uganda National Council for Science and Technology (UNCST)	Ismail Barugahara	Assistant Executive Secretary	
	Electricity	Electricity Regulatory Agency (ERA)	Norbert Semitala	Director of Technical Regulation	
Donors and financial agencies	Royal Norwegian Embassy	Katrin C. Lervik	Energy Councillor		
	World Bank	Hege Hope Wade	Senior Operations Officer		

The interview subjects are presented in Table 1. In total, 25 interviews were conducted with 28 participants.

### 3.4 Data analysis

“Data from interviews and participant observations are not straightforward to analyze and clear rules about how qualitative data analysis should be carried out have not been

developed” (Bryman, 2001; p. 538). A thematic analysis was conducted. Key themes were identified when analyzing transcripts of the interviews. The Triple Helix model was used as a springboard for themes. Further, it was searched for similarities and differences in how interviewees discussed a topic. The thematic analysis was combined with grounded theory method. This implies that data collection, analysis and eventual theory stand in a close relationship to one another and that theory develops from data (Bryman, 2001). Because of time and resource limitations, it was not possible to do more than one period of data collection.

#### 3.4.1 A statistical review of the interviews

As seen in Figure 3 there is an overweight of industrial interviews in comparison to the other actors. This is because the industry sector is split between generation, transmission and distribution, which make it necessary with several interviews to cover the whole industry.

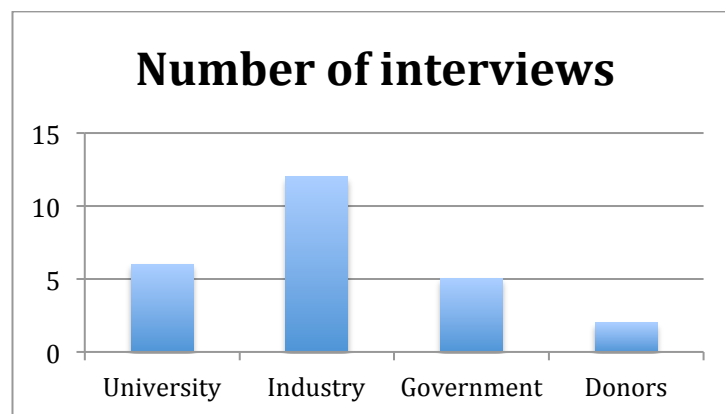


Figure 3 Number of interview within different institutions

The authors wished to interview actors both with and without Norwegian or western ownership. As TronderPower is a main case firm, and from Norway, another small hydropower company without Norwegian connections, KCCL, was interviewed. The authors wished to interview workers at different positions within one company to see if position made any difference to the answers. Thus, interviews were done through TronderPower’s value chain. TronderPower also has a nice spread of foreign and local workers. Thus, the researchers were able to check if any answers differed in regard to nationality. Figure 4 illustrates the division between different generation

firms. TrønderEnergi, the Norwegian mother company of TronderPower, is not included in this chart, as the goal was to show interviews with generation actors situated in Uganda.

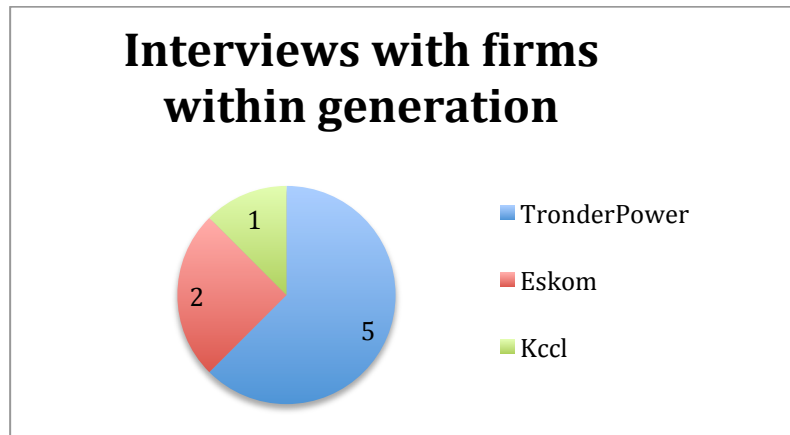


Figure 4 Interviews conducted in different firms within generation

### 3.5 Evaluation of methods chosen

Reliability and validity are difficult to evaluate in qualitative research because of lack of quantifiable data. To evaluate qualitative research, trustworthiness is more suitable (Bryman, 2001). Trustworthiness is made up of four criteria; credibility, transferability, dependability and confirmability (Bryman, 2001).

To establish *credibility*, it must be ensured that the research is carried out according to good practice and members of the social world studied should confirm research findings. Thorough planning ahead of the study, suitable methods chosen and interviews transcribed as soon as possible ensured good practice. Credibility was increased by *triangulation*, i.e. findings from semi-structured interview were compared to other data and literature. Even though good practice is followed, the chance of misinterpretations is present, especially when there is a large cultural difference between the researchers and the interviewees. To limit such misinterpretations respondent validation were used; confirming questions were asked during the interviews. Every interview transcript was sent back to the interview subject for confirmation of the content. This enabled the interview subjects to correct any misunderstandings and made sure that the respondents agreed with the content of



the transcriptions. Supervisor Arild Aspelund has evaluated the final research paper. This increases the credibility of the research.

The results are *transferable* to other developing countries because the problem of low interaction between institutions is characteristic of most developing countries. To make transferability possible, procedures and transcripts are described as detailed as possible in addition to a presentation of the economic situation in Uganda. These transcripts can be made available, within reasonable time limits, upon request if someone wishes to review the material. There is little transferability of the study to western countries since Uganda is at a former stage in the process of economic development.

*Dependability* is difficult to achieve in qualitative research, since it can generate extremely large data sets if all phases of the research process is to be recorded. In this study, interviews are transcribed and other data collections are documented. Since both tape recorder and writing notes are used in interviews and transcriptions are written as soon as possible, the transcriptions are of high accuracy. The triangulation from the interview subjects confirms this, as the authors received few suggestions to alteration. This entails a reasonable level of dependability.

Complete *objectivity* is impossible in qualitative research, but the researchers pursued to be as objective as possible and have acted in good faith. By being aware of, and focusing on the challenge of objectivity, success is more likely. The trip to Uganda was prepared by reading literature of the history and culture, and by contacting people with experience from the country. Two graduated students who did their master thesis in Uganda were contacted, and has been a resource with their experience. In addition, professors Arild Aspelund, Tore Haavaldsen and Bjørn Otto Elvenes, who all have experience from Uganda, have contributed with guidance and practical information. This preparation and guidance increase the objectivity of this study.

## 4 Empirical findings

### 4.1 Uganda as a case country

Uganda has been a republic since it was liberated from the British Commonwealth. The last 25 years, President Museveni has been in charge. Through this period, the country has had a stable growth and is at the moment projected to continue its growth by about 9% per anno (Outlook, 2010). Even with this growth, Uganda is still dependent on donors. On-budget donor support amounts to about USD 800 million per year, which accounts for approximately 30 % of the government's budget (World Bank). In addition to this, donors are supporting various separate projects around the country. The World Bank is the single largest financier with a contribution of about 19 % of the on-budget support.

#### 4.1.1 The history of Uganda and its economic development

The kingdom of Uganda was made a British colony in 1884<sup>3</sup>. The country continued as a British colony, with limited growth, until 1962 when Uganda obtained its freedom and created its first free government led by president Obote. Now Uganda experienced a more rapid development, but at the cost of its citizens. Obote and his regime terrorized and tortured the people and there were frequent food shortages<sup>4</sup>. When troops led by Idi Amin, ousted Obote from the presidency the people of Uganda celebrated what was thought to be liberation from a terrible rule and a prospect for a better future. This however, turned out to be far from the truth. During Idi Amin's rule from 1971-1979 the Ugandan economy and the country's society collapsed in its entirety (Reinikka and Collier, 2001). Idi Amin and his declaration of war on the Asian community in Uganda lead to a reduced economic activity through reduced productivity and destruction (Reinikka and Collier, 2001).

Due to the civil war, the probability for more unrest increased also after the fall of Idi Amin, which made the task of the government that overthrew him even harder. When

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<sup>3</sup> (<http://lcweb2.loc.gov/frd/cs/ugtoc.html>)

<sup>4</sup> (<http://lcweb2.loc.gov/frd/cs/ugtoc.html>)

the Uganda National Liberation Front, UNL, removed Amin from power in 1979, and established a new government, they needed a larger focus on state security than other governments due to the civil unrest (Reinikka and Collier, 2001). According to Reinikka & Collier (2001) the main achievement in regard of economic development made by the UNL government was to introduce national policy changes that resulted in a rapid growth throughout the country. Uganda is a country of many and culturally different regions. Combined with achieving a high growth rate, the government tackled the issues of polarization and demilitarization in a way that lead to continued peace and economic growth.

Reinikka & Collier (2001) illuminates three achievements as the reasons for Uganda's success in the period 1979-1999. As mentioned, the government introduced long-term peace in a country that had been subject to violence and war. Second, the changes to the taxation system of the country made business, both export and import, more successful. Third, the government managed to keep a stable currency that the industrial sector could trust not to be reduced in value in a short period of time. These achievements have helped Uganda into a situation where it have had a larger and more stable growth through the early 21st century compared to its neighboring countries. According to OECD (2010) in their African Economic Outlook report, Uganda accomplished to maintain a growth of above 7% through 2009 and the financial crisis, compared to an average annual growth in Africa of 3,5% in the same period.

“When opportunism is high it implies that many aspects of government will function badly because the professional ethics that normally govern conduct will have eroded” (Reinikka and Collier, 2001; p. 25). Opportunism, leading to corruption, is stated by industry to be amongst the leading risk factors when establishing business in the country. This leads to an increased cost calculation for foreign industries that wants to invest in Uganda. In addition to corruption the country has large challenges in the sector of infrastructure. Reinikka & Collier (2001) states that infrastructure, combined with taxes; corruption and cost of utilities are the top 4 categories limiting growth in

Uganda. African Economic Outlook<sup>5</sup> supports the claim of infrastructure as a large constraint with the following statement: “The major constraint to further growth remains the inadequacy of the country’s infrastructure, particularly electricity and roads, due to lack of investment.” The OECD claims this will be a major focus for the government of Uganda in 2011 and with a lot of activity in the coming years. Uganda has recently discovered oil and is now working on how to benefit as much as possible from this. Because of its oil and the general economic growth, McKinsey Quarterly describes Uganda as one of the developing countries that will be the “main engines for growth”<sup>6</sup>.

#### **4.1.2 The electricity sector in Uganda**

The electricity in Uganda is produced with two main methods; hydropower plants and thermal plants. At this time, about 56% of the electricity comes from hydropower production and 39% from thermal power production (Brar et al., 2010). As of today electricity production is the main source of energy in Uganda. The oil will lead to a change in this situation within the next years. However, as the oil still is underground and no production is started, the work has just begun on building a local sector (Brar et al., 2010). Thus, for the purpose of this paper, the energy sector is considered to consist of just electricity.

The demand for power in the Uganda grows even faster than the population, leading to a situation where the need for electricity is a lot higher than the actual production. About 95% of the country is still without official access to electricity (Outlook, 2010). Even though the demand supersedes the supply by many times, the government works hard to keep consumer prices for electricity at an affordable level for the Ugandan people. Because the consumer price is kept at such a low level, the cost of production is higher than the income on electricity generation. This makes the power production industry unsustainable without subsidies (Brar et al., 2010).

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<sup>5</sup> (<http://www.africaneconomicoutlook.org/en/countries/east-africa/uganda/>)

<sup>6</sup> ([http://www.mckinseyquarterly.com/Africas\\_path\\_to\\_growth\\_Sector\\_by\\_sector\\_2602](http://www.mckinseyquarterly.com/Africas_path_to_growth_Sector_by_sector_2602))

### 4.1.3 The hydropower industry in Uganda

Previously the electricity sector was run by one company; The Uganda Electricity Board (Norplan, 2011). As shown in Figure 5, the electricity industry is now separated into three different areas: Generation, transmission and distribution. *Generation* covers all power production delivered to the national grid and is market driven with different generation companies of various sizes. The market leader is Eskom, which per today run 55% of the generation within hydropower in Uganda (Norplan, 2011).

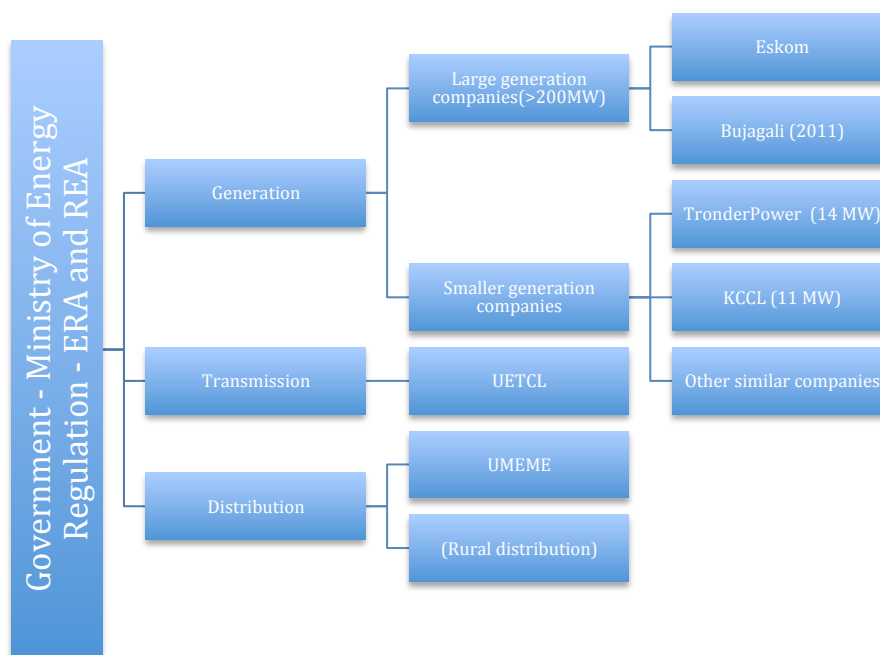


Figure 5 The hydropower industry in Uganda

During the unbundling, *transmission* was given to a monopolist actor, called Uganda Electricity Transmission Company Ltd. (UETCL). UETCL is the only part of the sector that still is owned 100 per cent by the government (Norplan, 2011). Their task is to maintain the national grid. *Distributors* deliver electricity from the national grid to the customer. There are two types of electricity distribution in Uganda. The first is through the National Grid, which is run by UMEME. UMEME is a private company, but it is a monopolist actor with the responsibility for the national distribution of electricity in the country. UMEME shares the total distribution of electricity with smaller rural distributors. These rural distributors have areas of responsibility, which

are small and may only cover a few customers in locations that are hard to reach. This paper will not cover these smaller distributors and the rural part of the sector. The Rural Electrification Authority (REA) regulates the distribution and transmission services of rural areas.

The Ministry of Energy is the top control organ of the electricity sector in Uganda. They are mainly concerned with new projects and how to develop the sector. Electricity Regulation Authority (ERA) was established in 1999 as a part of the unbundling of the sector with responsibility to regulate the day-to-day services (Norplan, 2011). ERA is an independent organization of which the goal is to balance the interests of all parts of the energy supply chain while regulating the whole sector.

#### **4.1.4 Education and research tied to the hydropower sector**

The Ministry of Education and Sports is the top organ of the education system in Uganda. The education system follows a 7–4–2–3 pattern: seven years of primary education, followed by four years of lower secondary, two years of upper secondary, and three to five years of tertiary education (Liang, 2004), i.e. university and vocational training. Within the Ministry of Education and Sport, the Commissioner of Higher Education is in charge of all education development above upper secondary level. The assignment of curriculum revision and control is delegated to the National Council of Higher Education (NCHE). This council has mandate to revise and correct curriculum at all higher education institutions. No new institutions for teaching can be established without the permission of NCHE (Golola).

Uganda National Council of Science and Technology (UNCST) is a government agency established to promote the interests of science and research in Uganda. Compared to the strong mandate of NCHE, this institution does not have a mandate to change any policy or directly influence without government approval. The UNCST's official mandate is “to advise, develop, and implement policies and strategies for integrating Science, Technology and Research development in Uganda”<sup>7</sup>. The line

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<sup>7</sup> ([http://www.uncst.go.ug/site/index.php?option=com\\_frontpage&Itemid=1](http://www.uncst.go.ug/site/index.php?option=com_frontpage&Itemid=1))

ministry for the Uganda National Council for Science and Technology is the Ministry of Finance, Planning and Economic Development.

Education is one of the key elements of the Uganda Poverty Eradication Action Plan (PEAP) launched in 1997. Simultaneously with PEAP, Universal Primary Education (UPE) was introduced. UPE focused on improving primary education and free primary education for up to four children per household was implemented through SWAp. This almost doubled the enrolment; from 2,9 to 5,3 million in short time (Kuteesa, 2010). Because of the increase in primary education enrollment, the higher education sector increases as well, both in the number of institutions and the size of total enrollment. In 2003, Uganda had 16 licensed public and private universities and several colleges (Liang, 2004). In 2011 Uganda have 5 public and 24 private universities, with a total of 120 000 students and the government plans to expand further the next years (Oceng). There has been little focus on higher education in PEAP or governmental budgets. 20% of the total National Budget goes to the education sector (Kyokuhair), and the last years around 11 % of the educational budget was allocated to public universities (Liang, 2004). The government of Uganda are increasing the focus on higher education the next years, but budget allocations to higher education is still 11 % of the educational budget for 2012 (Kyokuhair).

#### **4.1.5 Other relevant actors**

There are several institutions established to promote the industry or its investments in Uganda, like the Private Sector Foundation Uganda (PSFU) and Uganda Investment Authority (UIA). The PSFU is an apex of the industry in Uganda. They represent all private industrial actors, whether or not they actually are members of the organization. Their mandate is to<sup>8</sup>:

- Carry out policy research and advocacy on behalf of the private sector
- Provide a forum for the discussion of policy issues, and the impact of those policies on the private sector in Uganda
- Maintain a dialogue with Government on behalf of the private sector

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<sup>8</sup> (<http://www.psfuganda.org/psfu%20mandate.asp>)

- Undertake capacity building for the private sector through training and the provision of business development services

Uganda Investment Authority is a government owned agency, which deals with new and past investments in Uganda. Their main purpose is to promote and facilitate investment in the country<sup>9</sup>. They mainly work with the government and the private in how economic growth can be promoted through investment and infrastructure development.

## 4.2 Existing UI-interaction in the hydropower industry in Uganda

### 4.2.1 Internships

Within the hydropower industry in Uganda there is some interaction between the university and the industry. Mostly, this interaction is through internships. Since 2010 all students at Makerere University must complete industrial training during their master studies to get a diploma (Nawangwe). This is usually done after their third year of study and the students do this as a part of their recession. All actors interviewed claim internships are a good way for the students to get practical experience. Among the industry and government, all actors except TronderPower accept students for internships. TronderPower's reason for not accepting interns is that the company still is in an early phase of establishment (Legran). They hope to accept interns after 2011 when the production is stabilized (Chaplin). UMEME has established a formal agreement regarding internship programs with Kyambogo University and has reached out for a similar agreement with Makerere University. According to UMEME this process stopped at Makerere University. UMEME says they are willing to take on more interns with a formal agreement.

A student at the Faculty of Technology at Makerere University says that the internship program is popular among the students (Birimumaso). Birimumaso is very happy with the possibility to go for an internship in the industry and says it helps students get some experience before they go out to work. He felt his capacity was

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<sup>9</sup> (<http://www.ugandainvest.com>)



build during the internship. The government support the student’s view on internships (Oceng). Both the Commissioner of Higher Education and the representative from the Ministry of Finance claim that the industry doesn’t take on enough interns (Oceng, Kyokuhaire). They both believe the reason for this is lack of interest in the industry.

Several industrial actors say professors do not visit while their students are there for internships. The university contributes with a letter of introduction and a phone call to see if the students show up. Eskom says that professors sometimes visit the students and the firm during the internship period (Ssetongo). The goal with these visits is to check that everything is going well. Five companies that accept internships say the students ask for internship and not the university (Figure 6). These companies are UMEME, ERA, PSFU, UETCL and UIA. Kasaija says both the universities and the students contact KCCL, while Ssetongo says the universities contact Eskom.

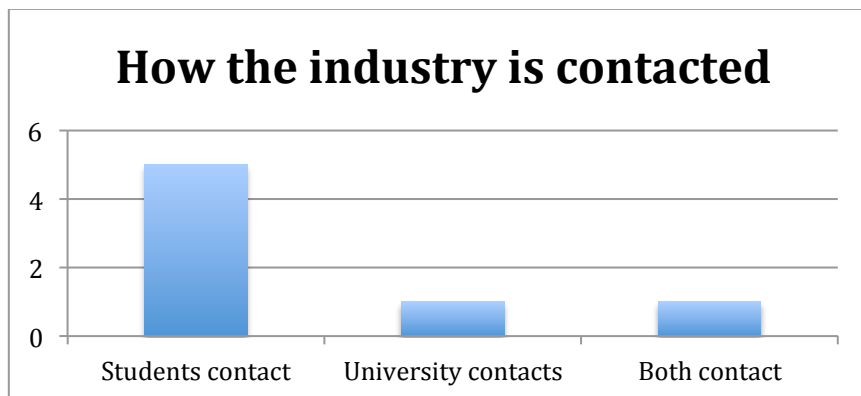


Figure 6 How the industry is contacted about internships

Investigating the internship collaboration in more detail reveals that it can be described as interactions between students and the industry. The university as an actor, and its professors, are not part of the collaboration:

I would not call the internships direct collaboration. What we are doing is that we get students who apply to come work with us. The only interaction with the university is that the students have to bring a letter of introduction (Kagwa and Akello).

PSFU is building an internship center. Through this center they plan to connect universities and students with the industry (Kibenge and Mawejeje). This comes as an initiative from the private sector. The internship center process has just started and Kibenge and Mawejeje do not have any more official information at this time.

#### 4.2.2 Collaboration regarding curriculum

When asked about the curriculum at the universities, almost all actors answered they found it either very theoretical or outdated (Figure 7). There is very little connection between what is taught at the universities and what is needed by the industry. PSFU states that one of the main challenges of the private sector is that the universities produce graduates that cannot provide the skills needed by the businesses. They think the university should work with the private sector in developing curriculum. Zesooli, HR manager at UETCL, goes as far as saying the quality of the education has gone down and that there is a national outcry from the industry to change the curriculum. Zesooli says that the industry wants the curriculum to be changed from the theoretical frame it is in now to a more practical and applicable form. When asked, no interview subjects from the industry have contacted the universities or others directly to initiate a curriculum revision.

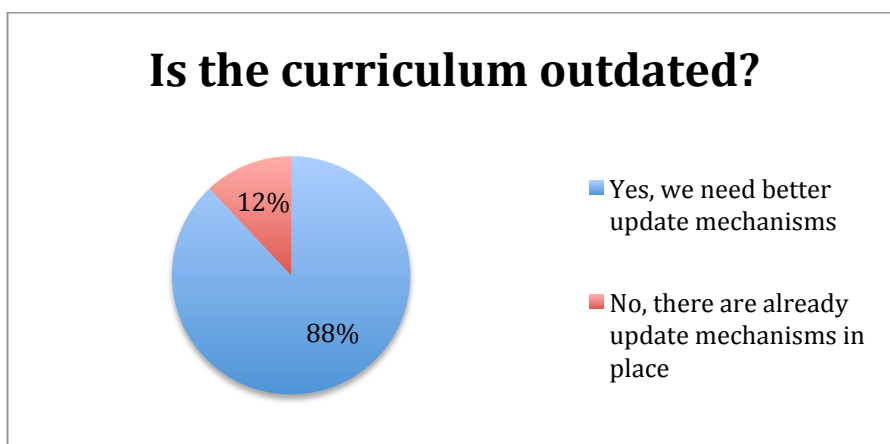


Figure 7 Illustration of how many who thinks the curriculum is outdated

Oceng says the university have several ways of ensuring that programs that are taught is what is required by the industry sector and that they work with the industry sector on this. He admits some programs are a bit behind and confirms that the university teaches very theoretical curriculum. He also says this makes a lot of students feel that

they are irrelevant to the industry when they finish. According to Nawangwe, Makerere University reviews the curriculum so that it is responsive to the need in the industry, and that this is a mode of collaboration between the university and the industry in addition to internships. No industrial or governmental actors agree with Nawangwe, as they all agree that the curriculum is not being revised properly at the universities. Nawangwe confirms that Makerere University has a very theoretical curriculum, but does not agree with the industry about it being outdated. He defends this by the fact that MU is training engineers and not technicians.

Some industrial actors say they think the curriculum is not updated because the professors have never been in the industry (Bonny). The professors are recruited straight from the university and are not able to see what is happening in the industry (Kagwa and Akello). When Nawangwe is confronted with this, the Principal admits it is true that most professors are recruited among students and claims this makes it even more important that the university collaborate with the industry. He says this is why the lecturers are required to supervise the students when they have industrial training, and that this exposes the professors to industrial input.

#### **4.2.3 Research collaboration**

None of the industrial actors mentions research as mode of collaboration between the university and the industry. Those companies who can afford to conduct research are often large multinational companies and would rather bring research from abroad than contacting the universities in Uganda (Barugahara, Nawangwe). In Uganda, Eskom and TronderPower are examples of such companies. Research from multinational companies is often of good quality and is in general usable in Uganda. However, there are country specific conditions that demand local knowledge, which makes local research advantageous (Barugahara). PSFU believes there will be more applied local research in the future, but they have no solution to how or why that should happen other than general belief in the country's development (Kibenge and Mawejje).

Oceng claims that Makerere University has tried to open incubation centers within the Faculty of ICT and the Faculty of Technology, to share their new ideas with the local industry. He says they bring in the industry and work together in these incubation

centers. However, none of the industrial actors in this study say they collaborate with the university through research centers. The two incubators are both donor initiated. Barugahara says that Makerere and Kyambogo universities have started research projects, but that the universities do not open up to the industry to come. He admits there is a gap when it comes to research within energy and claims this is because the knowledge for research on energy does not exist in Uganda.

According to the Triple Helix model, both teaching and research are regarded as the traditional roles of the university (Etzkowitz, 2008). Oceng says he thinks lack of research is the most important challenge at the universities. According to him, a university that cannot create new knowledge is a high school and not a university. Oceng suggests that the university should reduce the number of students enrolled and focus more on research.

#### **4.2.4 Other collaboration**

Some industrial actors accept field trips from universities and technical colleges, among them TronderPower, UMEME, UETCL and Eskom. TronderPower says they accept anyone that asks to come on a field trip, provided they have someone available to show the students around (Chaplin). Namyalo tells that Eskom welcomes field trips from different educational levels every Thursday. Okure claim that Makerere University has a different experience. He says the industry promise excursions, but often postpones the agreement. This postponement can continue for a long time, often until the universities give up.

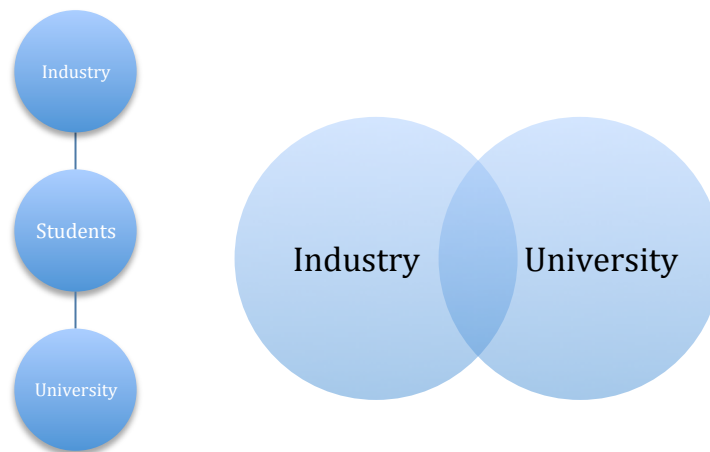
Guest lecturing is not usual in the hydropower sector in Uganda. The interviewers must ask directly about this, no one mention it by own initiative. UETCL and ERA are the only actors who say they do guest lecturing. Semitala first says that if they were contacted they would like to come. Later in the interview he says ERA visits sometimes already. The rest of the actors asked say they do not do this. Lugujo at Makerere University confirms that it is not normal that representatives from the industry visit the university to lecture.

There are sporadic mentions of joint seminars (Zesooli). There are also a few who mention industrially oriented events and student initiated industry tours at the

universities. These mentions are interpreted to be initiatives of individuals rather than organized initiatives.

#### 4.2.5 Main findings for question a)

The interactions between the university and industry in the hydropower sector in Uganda are mainly focused on student internships. The internships do not work as intended, as the professors do not fulfill their part. The result is that internships have become a form of interaction between the industry and the students, with the university as an institution just responsible for the formal letters introducing the two. This reduces the benefits of UI-collaboration. Figure 8 shows the situation in Uganda to the left and the optimal Triple Helix solution for UI-collaboration to the right.



**Figure 8 UI-collaboration in Uganda to the left and the optimal Triple Helix UI-interaction to the right**

In terms of research collaboration, there is no evidence of such activity. There seems to be a lack of research within hydropower in general in Uganda. This reduces the benefits of the university as a part of Triple Helix collaboration. There are few indications of other kinds of collaboration, and these are all unsystematic. The few that are structured are all donor initiatives.

### 4.3 Foreign actors and how Uganda can utilize their knowledge

#### 4.3.1 Profit as motivation

Almost all industry is profit driven (Kibenge and Mawejje). TrønderEnergi confirms that their main motivation for expanding to another country is profit (Kroksæter and Legran). Mitti explains that Uganda is seen as a good investment choice because of its

geographical location and the stable political situation. The fact that industry is profit oriented is presented as a challenge when the university hopes to achieve collaboration on areas where there is no direct possibilities to profit (Golola, Oceng). However, this problem seems to be the same for all types of industrial actors and is not specific for foreign initiatives (Barugahara, Oceng, Semitala).

#### **4.3.2 Expanding into the developing world**

TrønderEnergi explains how the Norwegian hydropower market was completely exhausted for new projects. This was their second reason to search for projects in foreign markets (Finnanger). By finding markets with new hydropower projects, they could utilize many years of expertise from the Norwegian market and keep developing their human resources. Being part of new and international markets is also used as a marketing tool in their search for new employees (Kroksæter and Legran). What is important to note is that all these reasons for foreign investment are general and not connected to why TrønderEnergi chose Uganda as their country of investment.

The government in Uganda is interested, and involved, in the expansion of the hydropower industry. This is because of the potential benefit of price reduction when moving from expensive thermal energy to relatively cheap hydropower energy (Semitala). Legran and Kroksæter explain that the government's interest in progress within the hydropower industry has helped TrønderPower's smooth progress and operation without corruption. They explain that the alternative would not be to succumb to corruption, but rather to avoid the investment or accept even longer stalling for some parts of the project.

#### **4.3.3 A need for local knowledge**

Omulen emphasizes the importance of local knowledge and local workers as part of the workforce when investing in foreign countries. TrønderPower agrees on this and all their workers at their plant are from Uganda (Chaplin). Legran and Kroksæter are very clear: Their Norwegian expertise of hydropower is not enough to run a plant in Uganda. There are local conditions that apply and using foreign workers, compared to training locals would be a drawback. Eskom confirms that they both appreciate and

need local workers to be able to run their plant. Finnanger explains that using local workers has been a strategic choice from the start and that TrønderEnergi are happy with the result so far, even including the challenges concerning cultural differences.

Newplan's business model is based on doing consulting work for foreign actors who want to establish in the Ugandan market (Omulen). These foreign actors need help from firms like Newplan to understand the cultural, political and social differences of operating in Uganda compared to their home country. Kroksæter and Legran explain that if TrønderPower can contribute to the development of better candidates coming from the university this is an advantage. Finnanger says this is something that TrønderEnergi already has a positive experience with from Norway. Thus, many foreign firms have positive thoughts of UI-collaboration due to experiences from their developed home-countries. Even if there is no research collaboration today, Eskom say they would like to do this, if the universities asked. Namyalo says that they would benefit from such collaboration, as long as the research was useful for the company.

Oceng mentions how some firms, especially from the Asian world, has been known to bring a lot of work force from their home country when coming to Uganda to do projects. Due to the high unemployment rate, this is no longer accepted in the country. Uganda will not accept someone who apply for a work permit if there is already a local labor force that can do the same job (Oceng). Because of this, the knowledge of local workers is very much needed by foreign companies, provided the immigration of workers is stopped, as Oceng says it is.

#### **4.3.4 Other challenges and motivation for investment in Uganda**

As a result of all the legal and governmental differences from country to country, the entry costs into new developing countries are high (Omulen). Thus, companies like TrønderPower are interested in staying in a country when they first have established business (Kroksæter and Legran). This means that the government in Uganda has some hold on foreign actors that already has invested in the country. Oceng says the rivalry between countries in Africa to attract foreign industry makes this a two-edged sword. At the same time as the government is best served with policies that control

the foreign industry as much as possible, they risk that new industrial actors choose to invest in one of the neighboring countries if the policies are too hard.

#### **4.3.5 Main findings for research question b)**

The industrial actors are driven by the same goals of profit whether they are local or foreign. In the Ugandan hydropower sector it is beneficial that the government is involved and wants progress to reduce prices of electricity.

Expanding to foreign markets bring new challenges to companies, who say they are in need of local labor to operate. This need for local labor makes the university an important player, as many of these workers need university education. The empirical data reveals that applied research considering local conditions would be beneficial for foreign industry.

Entry costs and political challenges with investments in foreign markets make foreign companies susceptible to government influence after the first investment. The differences in the political and cultural arena are areas where the university could contribute with its knowledge through collaboration.

### **4.4 Challenges and incentives of increased UI-collaboration**

#### **4.4.1 Finances as a challenge in developing country**

All subjects asked about challenges with UI-collaboration states that finances are one of them. Many of the industry or university subjects claim lack of financing is holding them back from doing more of this work. When companies accept interns, some of them chose to pay the interns a small salary in addition to the money the interns get for food and accommodation (Kagwa and Akello) Other companies (Mitti) do not pay the students (Mitti). The representatives from Eskom and UETCL both wished they could pay more to the students, but claim they are held back by government regulations.

When asked why the university does not organize events or initiatives to promote collaboration with the industry more often, Barnabas replies that the university cannot afford such events. Thus, it becomes something that the students or others must do on their own. Okure and Nakayiwa both explain how the resources at the university are



so strained that almost all budget money needs to go to salaries and financing students' food and accommodation. When the budget cannot cover these essentials, Nakayiwa explains that other initiatives have to be directly donor funded, or they will not be initiated.

The Ministry of Education does not have the exact same impression as the universities when it comes to the financial situation. Oceng accepts the fact that there is not enough money, but claims this is the same for all sectors. Education get about 20% of the total national budget funding (Kyokuhaira). As the country is developing rapidly, the shortage for capital will always be there. This is supported by both of the donor actors (Lervik, Wade). Following, Oceng argues that the strain on resources at the government means that the universities should look elsewhere for an increase in financial support. 50% of Makerere University's budget income comes from the government (Kyokuhaira). 40% of the money comes from school fees, while 10% comes from donors (Kyokuhaira). Oceng suggests that instead of looking to the government for more budget money, the universities should develop research projects with the industry that can benefit both parts. By doing this, they will get increased funding and at the same time help develop local industry (Oceng).

#### **4.4.2 Communication between helices**

Etzkowitz (2003) claims that one of the challenges in UI-collaboration is that communication between the helices can be difficult due to differences in language and norms. Zesooli confirms this and says it is a challenge to the industry to explain a situation to someone who is not part of it, indicating the university professors. Barugahara supports this through research conducted by UNCST. He explains that they have found challenges in communication when the actors discuss use of time; the universities may look at the term "finished soon" as within 4 years, while the industry get restless if something has not happened within 4 months. Makerere University has established a TTO with the purpose of dealing with industry interaction, but Nawangwe admits that this office does not work to a satisfactory degree.

#### **4.4.3 Attitude challenges in the industry**

Lugujjo and Okure both say that the industry is reluctant to UI-collaboration. Okure explains that the industry looks at collaboration as something they do for charity to help universities. Nawangwe and Nakayiwa have the same impression, but they say this attitude is not present as often as before. At government level, Oceng claims that this attitude problem in the industry is much of the reason for slow progress within UI-collaboration.

All industrial actors claim that they see the benefits of UI-collaboration. For example, UMEME acknowledges that the benefits are not short-term or necessarily profit oriented, but claims this does not make a difference as long as there are long-term benefits for human resource development (Kagwa). TronderPower point out that the hydropower industry may be different than other industries in terms of seeing these long-term benefits because it is a long-term oriented business with a need for higher education and an advanced workforce (Legran).

Even though the industrial interview subjects emphasize their benefits of UI-collaboration, many of them show an attitude that corresponds with Okure and Lugujjo's despairs. The representatives from both UETCL and Eskom say the internship collaboration with the universities is a part of their CSR. They look at it as a social responsibility more than a direct benefit to the organization itself. PSFU confirm this view, explaining that some of their members look at the internship program as a time and resource sink and all that the firm gets is an increased risk for someone else getting better labor, which their firm have trained for them.

#### **4.4.4 Universities are slowing down the process.**

As identified in 4.1, the industrial interview subjects unanimously claim that they get few, or no contact requests from the university other than internship and master's research requests. All industrial contacts also claim they can handle more requests from the university. For example, both the representatives who said they did some guest lectures were positive to more such initiatives, but said they need to be asked by the university if this is to happen. When confronted with this observation, Okure claim that part of the problem is that the industry often postpones agreement until the

university grows tired. However, Okure admits the problem of the university being without much initiative is true. Some of this is explained by bureaucracy problems. UMEME's reach for a memorandum of understanding, which stopped at the university bureaucracy, is an example of this.

Okure, Lugujo, Nawangwe and Nakaiywa all admit that the university still has problems with professors that cling to the ivory tower approach. These professors are reluctant to any collaboration with the industry and fail to see how the industry can contribute in any useful way to the development of the universities. However, all our interview subjects within the university claims this is a diminishing group. The Commissioner of Higher Education agrees with these claims (Oceng).

The industry wants more interaction, and wish for more contact with the universities in relation to the already existing internships. When confronted with the findings of 4.1.1, Okure agrees that the universities have a problem with professors that do not bother to follow up students when they go for internships. He believes that the low degree of contact from the university can be explained by lack of monetary incentives for the professors. The professors would rather spend their time doing other, often more profitable tasks. Semitala elaborates on this: "If people do not have enough money to feed their children it is not difficult to understand why they are distracted or absent from their work. To get somebody who is 100% dedicated to doing his work is extremely rare, as there are so many challenges for people in their day-to-day life." (Semitala) This situation results in the professors doing a lot of moonlighting, which means they have more than one job. The university job will always give a stable salary, as the payment is uniform and there are few mechanisms of tracking a professors' work (Nakayiwa). However, their spare job may be more dependent on their effort, thus the professors prioritize the industrial spare job ahead of university teaching and research (Golola). Okure explains that there are few or no mechanisms of punishment if a professor does not fulfill his duties. Nakayiwa confirms that the economical departments do not have any such mechanisms in place for ordinary cases of professors that neglect their duties. The only means of punishment are disciplinary boards that are meant for serious cases of misbehavior.

The subject representing UETCL claims that Kyambogo University is better than Makerere University at UI-collaboration (Zesooli). As mentioned in 4.1.1 Umeme also considered Kyambogo as more active in their approach to UI-collaboration than Makerere University (Kagwa and Akello). Zesooli suggests that this might be because Kyambogo University is in a challenging position, meaning that the professors and management wishes to establish the school as a key player. Makerere University is an old university that is so well established that it does not need to make an effort, Zesooli suggests. Ssetongo claims the universities are just about equal, and that technical colleges are better than the universities.

#### **4.4.5 The government is lacking as a facilitator**

TrønderEnergi explains how the Norwegian government acts as a facilitator and supports the industry and the university. Both TrønderEnergi and TrønderPower say that the Ugandan government can be a challenge, instead of acting as support. No industry actor can remember that the government has facilitated UI-collaboration. Barugahara confirms this with his description of the UNCST: The UNCST does not have a mandate that allow them to interfere and directly influence any of the actors, even though they are a governmental institutions created with a vision to improve the development of science and technology (Barugahara). The NCHE has a mandate that should make the agency a facilitator for curriculum improvements, but the research subjects of this study imply that the agency has a low degree of influence. Multiple interview subjects downplayed the importance of the researchers' need to visit this institution. This was not formally recorded in any of the interviews.

The industrial actors wish for more governmental involvement and they especially need a national framework (Kibenge and Mawejje). UMEME, ERA and Newplan are among the actors that want a national framework from the government, although there are differences in details of their suggestions. PSFU, which get their data from the entire industrial sector and are used at working with the government, see the situation from a different angle. Kibenge and Mawejje argue that the policy alone would not be enough. There are a lot of will in the government to introduce policies and new initiatives. What seems to be missing is the implementation of these plans. Plans stop before implementation due to heavy bureaucracy, lack of resources and because

people sometimes follow their personal agenda instead of working for the common good (Kibenge and Mawejje). Wade describes the same experiences from her work at the World Bank. There are a lot of examples of planned projects that never go further than the drawing board because of the reasons mentioned, according to Wade. Legran and Kroksæter agree on this, saying that their impression is that the government of Uganda seems to have challenges with project implementation.

All actors interviewed in this study say they do not support corruption. Some of the interview subjects indicate that corruption is a challenge especially when dealing with the government of Uganda. TrønderEnergi describes how corruption can be a challenge when dealing with government officials in the third world. Neither TrønderEnergi, nor TronderPower, wish to elaborate on own experiences with this, but they say they have the impression that corruption is viewed by others as a part of doing business in Uganda. Kasaija tells that corruption is everywhere in the world, but that it is in really big figures in Uganda. Corruption is a general challenge that makes all initiatives take more time and cost than it should.

All actors, including the ones at the governmental agree that the lack of a framework for interaction and collaboration hinders the development of both industry and universities. This is in alignment with the theories of Etzkowitz (2003). Lugujo suggests a catalyst is needed to start the development of broader UI-collaboration. Multiple industrial actors seem to question whether the government is able to be this catalyst. Often the researchers were met with suggestions of using donors as such a catalyst instead of the government. In other firms, the response was positive when the researchers suggested using donors as this catalyst.

#### **4.4.6 Low degree of industrial development**

Both Oceng and Nawangwe claim that part of the reason why the universities cannot interact more with the industry is that there is a general lack of industrialized firms in Uganda. They both emphasize that this is a more general challenge that may not be true for the hydropower industry. The operations manager at TronderPower confirms this based on his own experiences, and tells about students not getting places for internships due to a lack of somewhere to apply.

Almost all industrial actors interviewed say they have more capacity for UI-collaboration than what is utilized today. Chaplin suggests that one reason why the universities have not contacted TronderPower is that they do not know that the company exists. This indicates that the universities could expand their collaboration compared to the situation today and that the universities have not exhausted the search for possible organizations for collaboration.

The unemployment rates are high in Uganda and many of the unemployed have master's degrees (Oceng). The majority of interviews confirm this. This situation leads to high competition amongst students for few jobs. Bonny suggests this as part of the reason why some organizations don't have to bother with UI-collaboration and this is confirmed by PSFU (Kibenge and Maweje).

#### **4.4.7 Awareness to UI-interaction**

Barugahara confirms via UNCST studies that there is a low awareness of science and research in general in Uganda. Kasaija and Chaplin both suggest that part of the reason why there is not more focus on collaboration is that the topic is just recently brought into the light. ERA suggests that UI-collaboration might be something the government is not aware of at all (Semitala). Golola confirms that UI-collaboration have not been in the attention of the government until recent years. He claims this is a challenge in itself, but states this has already changed. In the last five-year plan, the government were aware of the importance of the topic and thus there will be some development during this five-year period (Golola).

Within the institutions, there is an awareness issue regarding what types of collaboration could be beneficial for the helices. Both the university (Okure), the government (Oceng) and the industry come to a hold when asked *how* they could collaborate more and benefit from it, even though they are quick to point out that they know there are many benefits to collaboration.

#### **4.4.8 Providing policies and national frameworks to promote UI-collaboration**

“You need to start with the policy” (Omulen, 2011). There is a unanimous outcry for a national policy that can ensure communication and sustainable UI-collaboration. The industry suggests shared communication with the university, which is supported

by the university. Within both the industry and the university there is support for a national policy (Semitala, Okure). Semitala explains that the industry probably will not take much initiative for increased collaboration, but if someone pushes, they are both positive and willing. Oceng and Golola explain that a framework is planned, but again the government seems to have some trouble with implementation.

Several industrial actors suggest financial gain as an incentive for increased collaboration. Kagwa and Akello suggest tax relief to industries that support internships. Namyalo also suggests this. Semitala agrees on financial gain as an incentive, but rather suggests doing this through government coverage of increased expenses due to e.g. internship programs. Oceng doubts more money would be effective, as he believes the market would sort financial challenges on its own. If the universities were able to sell their products better to the industry, the industry would be willing to pay (Oceng). He points out that the government budget is incredibly strained as it is and questions where the money would come from (Oceng).

Both Eskom and PSFU would like to introduce a fixed agreement for Public-Private Partnerships (Namyalo, Kibenge and Mawejje). Once again the interview subjects believe the government or someone else from the outside must make the first step. This is in agreement with Lugujo's statement of a needed catalyst to increase UI-collaboration.

#### **4.4.9 Donor influence**

Interaction between university, industry and government is highly influenced by donor organizations and financial institutions in Uganda. Even though the trend within aid has moved from project support to budget support, the donating or financing organizations have demands to how the money is spent (Wade). This makes these organizations a powerful player in economic development in the country. Donors discuss with the government and affect their decisions regarding how the budget is prioritized (Wade). Within the hydropower industry, Norway suggested a restructuring of the industry that was later implemented, and was central in writing the Energy law in Uganda with help from NVE and donor funding. This illustrates the

influence of donor actors within both industry and government in a country like Uganda.

At Makerere University, many of the university buildings are financed by donors, among them the Faculty of Technology building which is funded by Norad. 10 % of the university budget comes from donors, in addition to the fact that some of the money from the government can be traced back to donor organizations because of the government budget support (Nakayiwa). When university actors were asked about collaboration with the industry apart from internship programs, Makerere University quickly mentions projects that are funded. Nawangwe talks about the Uganda Gatsby Trust, which is basically funded by the trust of the UK, and the Innovation System and Cluster Program, which is heavily funded by SIDA of Sweden. According to Nakayiwa, Makerere University got a direct intervention for industry-university relationship from the government in 2009. All of them are building on projects that have been there through donor support. In addition, all incubation centers originate from donors before the government was involved (Nakayiwa).

#### **4.4.10 Main findings for research question c)**

Lack of financial capital is identified as a problem that goes through the entire Ugandan society and not just the hydropower sector or the educational system. The financial challenges in the universities influence their ability to do projects and other initiatives than rather low cost internships. The industry is in a constant battle to make profit, while the government needs to prioritize between an abundance of needed initiatives.

Communication, lack of capital, weak governmental institutions and lack of awareness are all identified as challenges that must be overcome if Uganda is to increase its UI-collaboration. None of these are unique for Uganda, but rather common challenges in developing countries.

The universities are identified as the institutions that are holding back UI-collaboration the most. The universities can benefit the most from collaboration and is the best starting point to change, but they do not manage to increase collaboration.



This is a result of financial challenges and attitude problems in the university and the industry.

The most suggested solution to increase collaboration is that the government should establish a framework that promotes such interactions. However, the interviews show that the government has problems with implementation of strategic plans. Several interviewed actors request a different catalyst. The empirical data shows that donors are influential and already a part of the governmental support functions, and several interview subjects are positive to donors as a catalyst for change.

## 5 Discussion

### 5.1 Foreign industry and its influence on the Triple Helix model

Foreign industry brings knowledge and experience to developing countries. These actors are often large and have well-established R&D departments in their home country. An example is how TrønderEnergi acts as support to the local Ugandan established TronderPower. With foreign industry influencing the country from outside, a different situation than the one described by the closed Triple Helix model is created. However, the results of the case study show that the companies are still dependent on local knowledge. This knowledge can be divided into two areas; labor and research. Hydropower companies are dependent on local labor forces to be able to run as efficiently as possible. This increases their benefits from collaboration with universities to influence the quality of the graduates, thus strengthening the Triple Helix model. Foreign industry's R&D may not be applicable in developing countries due to country specific geographical and social differences. This provides an opportunity for the universities in such countries, as they can sell local applied research to foreign industry, which increase their industry funding. This is in alignment with Homma et al. (2008), and his claim of how linkage between the university and the industry will lead to increased funding for the universities. Through financial incentives and industry involvement, this could help the universities to get past Jongbloed's (2008) first barrier, of determining research agenda and curriculum, to increased UI-collaboration.

The possibility of Asian or other companies to bring the majority of knowledge from their own country to Uganda is limited because of the government's choice of tightening the borders. This reduces their influence on the Triple Helix model, as the country is establishing a more closed system. Thus, all foreign or local industry becomes dependent on local labor force. The problem of Asian companies that bring their own labor force is general for all developing countries. It is recommended that these countries close their borders and stop work immigration, like in Uganda, if they are to benefit from Triple Helix collaboration with foreign industry. This is in alignment with Reinert (2007), who states that control of country borders and taxation

to protect local interests are a necessary, and beneficial, for developing countries to develop their own industry.

Since foreign companies are in need of local knowledge at the same time as they bring knowledge to the country, both the foreign actors and local institutions benefit from collaborating. This is in alignment with the main purpose of the Triple Helix model; free flow of information between helices will increase collaboration. UI-collaboration demands some initiative from the industry, as well as the universities. This study has shown that there are benefits for the industry to be a more involved part of the Triple Helix in developing countries, but to utilize this, the industrial actors needs to realize the benefits and not look at UI-collaboration as a form of CSR. The industry should be focused on how it can improve its influence on the university in areas of interest.

## **5.2 A need for a catalyst to implement change in the university**

The empirical results presented in chapter 4 show that UI-collaboration within the hydropower sector consists of mainly ad hoc internship agreements. When delving more into these results, it is revealed that the actual collaboration is missing. There is almost no flow of information between the industrial actors and the universities, as the flow of information is only one-way and goes through the students. Other types of collaboration are limited, and most of these are donor-initiated projects. This indicates that the universities of Uganda are “counseling universities” and not “entrepreneurial universities”, following the descriptions of Arocena and Sutz (2005) and Vega-Jurado et al. (2008). This strengthens the critique of the Triple Helix model that claims the model is lacking dimensions to describe the situation in developing countries. Being a counseling university continuously deteriorate university research (Vega-Jurado et al., 2008). Thus, counseling universities should strive to get out of this situation and become an entrepreneurial university.

The problem of one-way interaction in relation to internships is described by lack of incentives for the professors to involve. A large amount of moonlighting is revealed within the universities. This is not unique for developing countries; discussions with the supervisor revealed that there are instances of moonlighting even in developed

countries. The difference is that within the universities of developed countries there are incentive mechanisms that prevent the professors from abandoning their university work. This confirms that lack of proper internal incentive mechanisms in the universities is a barrier to UI-collaboration, as Jongbloed (2008) states.

Uganda's universities operate with uniform salaries to all professors regardless of performance and have no mechanisms to ensure that the professors perform. According to the problem of moral hazard (Eisenhardt, 1989), there are ways to act if the university management wishes to make sure the professor performance is satisfactory when uncertain of their motivation. The university can monitor the professor behavior and reward them accordingly. If not, it should introduce incentive based rewards. In the case of Makerere University, the university management has failed to do both. If the university is to use uniform rewards, monitoring must be used. At Makerere, such pay is used without any monitoring. As monitoring will be costly for an already strained budget, an alternative is to change the reward structure to be partly incentive based. The recommendation of incentive based rewards for university work and research is supported by Wu (2010) and Baldini (2006).

Wu's (2010) suggestion of shared licensing income is a good suggestion for universities in Uganda, as this would give the professors direct economic benefits from research collaboration. A shared licensing income agreement would increase applied research in accordance with the conclusions in 5.1. In addition, other incentives for applied research should be made. This can be to e.g. earmark funding to professors that create UI research partnerships. Regarding rewards for collaboration through internships, professors that visit and follow up their students during internships should be rewarded. Such rewards could be based on student and industry reviews of the professors, e.g. completing a survey form after the internship is finished. This would lead to more direct interaction between professors and the industrial actors. It is important to note that performance-based salaries should be introduced by 'removing' parts of the uniform salary and redistributing it. Thus, these suggestions do not require any additional funding other than the resources needed for the implementation process.

When applying the Triple Helix model in Uganda, this paper has revealed how the incentive systems at the universities should be improved to stimulate more UI-collaboration and research. Based on the empirical data it is hard to see how such a system will be implemented without someone outside the university intervening. The universities are weak institutions without champions that can drive the change. It is reasonable to suspect that such a system would meet resistance amongst the already employed professors, as it would mean less room for the shirking than today. In the interviews the government is often mentioned as the required party to implement such systems, however their ability to do so is doubtful. The government is itself a weak institution in developing countries, according to both theory and the case study. The industry is too profit oriented and without enough long-term view to be a catalyst for change. Thus, the main contribution of this discussion is that there is need for a fourth, external actor to be the catalyst for change in developing countries.

### **5.3 Advantages and disadvantages of donors as a catalyst for change**

As presented in the empirical findings, donors play an important role and are the ones initiating the few interactions that exist between universities and industry. It is clear that donor organizations have taken some of the role of the government, both in general and within UI-collaboration. Both Easterly (2003) and Bermingham (2009) confirm the importance of the right type of donor support and that this support may hurt the developing country if done in the wrong way.

Empirical findings support the argument of budget support as a way to create government ownership to ongoing projects. Higher education is an area with several examples of project support where the government is not involved. If the government is circumvented, they may show lack of initiative to reclaim and further develop the projects. Project support may ensure a certain level of progress, but it is a short-term solution that may lead to negative development, as proposed by Bermingham (2009). Even though budget support is found as the most beneficial in both previous research and this study, just 5% of donor organizations represented by OECD uses it, which reveals a large potential for improvement.

There is a collision of donor project goals within higher education in Uganda. At the same time as some donor organizations work for improved education and research through budget support, other donors hire professors for consulting work, which contributes further to the problem of moonlighting. This work is a lucrative business for the professors because of high salaries. It takes their focus off teaching and research, as these contracts are given to the professors personally, outside the university system. Donors involved with professors through consulting may thus hinder the larger development of the universities. There are ongoing initiatives to improve the problems of lack of communication and coordination within the donor community in Uganda. However, the findings of this report show that this process is not completed, and there are still many examples of separated project involvement from donors.

The Triple Helix model explains economic development as something that is boosted out of interaction between the university, industry and the government. The empirical findings reveal that all local institutions are weak and unable to be the catalyst to initiate increased collaboration. This calls for a certain level of involvement from an external actor to drive change. Donor organizations are in this study found to be the only actor able to act as a catalyst for change. If donors are to be the catalyst, as supported by both interview subjects and chapters 5.1 through 5.2, they need to work in a way that facilitates the possibility of the institutions to continue collaborating on their own to secure long-term benefits for the country. To enable this, they need to collaborate and secure that the institutions take ownership of the projects. This is in line with the goal of SWAp. SWAp has had challenges, but it is a step in the right direction of donor work in developing countries. The implementation within primary education in Uganda is seen as a success because all donor support in this sector contributes to the same goal and is allocated through the government. The sectors in Uganda where SWAp has the most challenges are the ones with high degree of dependence on inter-ministerial collaboration. This indicates that some improvements to SWAp in terms of securing good collaboration within the government helix are needed. SWAp has not been introduced in the area of higher education in Uganda. Based on the match of the problems within higher education and the focus of SWAp,

combined with success of SWAp in primary educational, the authors suggest implementing this model within donor support for higher education. The main strength of using this model is that donors will be able to coordinate their work and thus avoid problems like professors moonlighting. Through such coordination it is possible for the donors to avoid hiring professors personally. They should rather hire a specific university for consulting or research, which will strengthen the research at the university instead of weakening it.

Some alterations are suggested to the SWAp model. As mentioned, support functions to improve inter-ministerial collaborations are recommended. At the same time, donor organizations should make sure that they are not intermeddling with the responsibility of the government. Donors should be involved to the degree of strategic decisions in the government and should do so unanimously through a single initiative. Through specific demands to the government, of implementation rate and other measurable positive results, a system like SWAp can ensure progress without project specific meddling in developing countries.

Empirical findings suggest that there is a challenge with donor motivation and incentives for donor work, as claimed by Jain (2007). There are examples of donor organizations that focus on short-term goals. Through informal conversations and observations during the research period, the researchers are of the impression that the donor communities in the case country base their success on whether or not the allocated donor budget is distributed and not on actual project success, again supporting Jain (2007). This challenge of incentives in donor organizations can be tackled if a control system for incentives is included within SWAp. However, it is unlikely that donors will initiate this change on their own. Such an initiative would reduce their power and ability to shirk compared to the current situation and has no direct benefit to single donors. This may explain why so few donors use budget support.

Since donor organizations are financially dependent on givers, large financial contributors could be the force enabling change in donor support and organization. They can change the attitude of donors, how they use their knowledge and capital,

through financial demands. The challenges of donor involvement are complex. This research provides insight to problem through the research conducted in Uganda. The findings are controversial and should be further explored. The main contribution of this study is that there is a need for an alteration of donor support in developing countries, as there is discrepancy between the goal of donor support and the donors' actual work.

#### **5.4 The validity of the Triple Helix in developing countries**

Based on findings from chapters 5.1 through 5.3, the validity of the Triple Helix model applied on developing countries is discussed in this chapter. To determine the validity, the three main institutions and their role must be reviewed in an open system. In chapter 5.1 it is concluded that foreign industry benefits from Triple Helix interaction due to the need of local knowledge and labor. This confirms a Triple Helix system with a local industry helix that is supported by the foreign companies. The foreign companies contribute with external knowledge that would otherwise be unknown to the local institutions, thus becoming a part of, and further strengthening, the Triple Helix arrangement.

Empirical evidence from this study shows that the universities are unable to fulfill their role as an entrepreneurial university. Through the discussion presented in 5.2 it is found that this is because of missing professor incentives to contribution of UI-collaboration. Thus, there is a need for a change in the universities, but the universities will not be able to initiate this change alone. According to the Triple Helix model, changes in one helix could be supported by the other two helices. In developing countries the government and the industry have been identified as weak institutions and are not likely support the initiation of change in the universities. This weakens the university institution as a part of the Triple Helix. However, it is found that UI-interaction works well when the university is supported from outside. This indicates that Triple Helix interaction is possible in developing countries with influence from an external catalyst.

The government is identified as a weak actor in developing countries and in need of support to function as a part of the Triple Helix system. Discussion presented in



chapter 5.3 shows that the government should be influenced in a way that encourages self-sustained development, rather than short-term project goals. Through the empirical findings and the discussion in 5.3 it is clear that donors are the only identified catalyst that are able to help universities and governments achieve their role in developing countries. However, it is revealed that donors may influence developing countries in a negative way, if their work is not done correctly. The correct way for donors to act is to be a supporting party that contributes to the local Triple Helix with knowledge and capital, without taking the role of any of the local institutions. This strengthens the validity of the Triple Helix model with its original institutions, as donors and other external actors should allow the local Triple Helix to develop to spur local long-term economic growth, in alignment with Reinert (2007).

As presented in 2.1.4, several voices argue how the Triple Helix model should be changed to fit certain sub dynamics. Dzisah and Etzkowitz (2008) reply that there are benefits of a general model and that country specific adjustments are allowed and recommended. The research of this paper confirms the claim of a general Triple Helix model, as the external actors that influence the local Triple Helix system should be a part of, or act as support to the original structure. In Uganda, donor organizations directly affect the Triple Helix institutions, but this way of conducting donor work is neither supported by the empirical findings nor previous research. Donors should be distancing themselves from the local institutions, further strengthening the use of the three main actors of the original model in developing countries, without any alterations. Thus, in regard of the main research question, it is concluded that the model and its three main institutional spheres are valid in open systems of developing countries.

#### **5.4.1 The Open Triple Helix Model**

Even though internal Triple Helix interaction is validated, how the model as a whole describes the situation in developing countries must be further investigated. Some Triple Helix interactions are present in developing countries, but these interactions are initiated and influenced by external sources. Because Triple Helix interactions found to support external sources, this does not change the validity of the model, but the model still does not describe *how* the open system interactions in developing countries

function. Thus, it is argued that an extension of the Triple Helix model to *illustrate external influence* is beneficial. Based on the empirical findings and the discussion, the Open Triple Helix model is suggested (Figure 9). The blue background circle illustrates the different types of actors that can influence the system from outside, with the blue arrows indicating such influence directly on a helix. In this model, donor organizations are part of the extended influence, affecting the main institutions only through support functions. The main institutions are kept unchanged at the same time as the model better illustrate the reality of developing countries and their open system influence. Further, the Open Triple Helix model should be used in developing countries as an illustration of how the Triple Helix state of free flow of information should be, and use this as a comparison to the current situation to detect improvements.

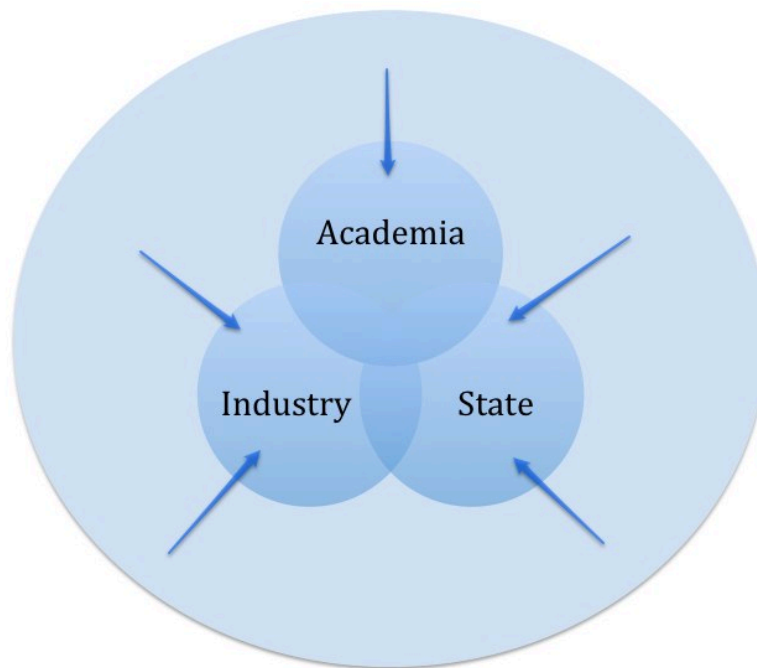
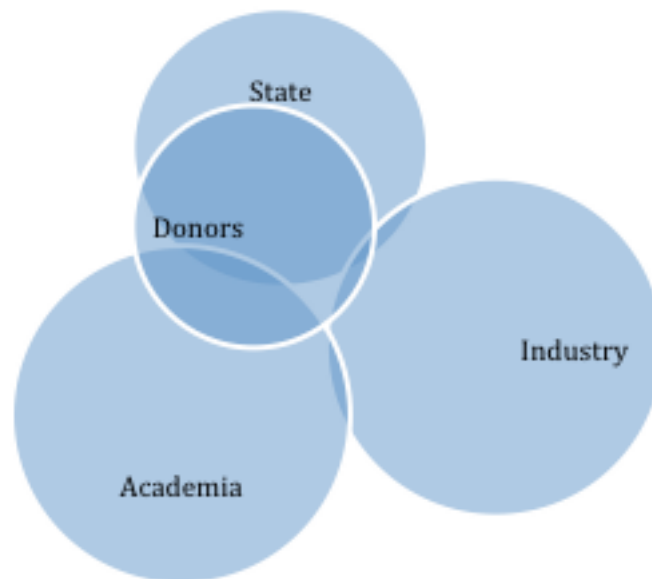


Figure 9 - The Open Triple Helix model

#### 5.4.2 Applying the Open Triple Helix to Uganda

As an example of the use of the Open Triple Helix model, it is now applied to the case country of this paper. Before applying the model, an identification of the situation today is necessary. Based on the empirical findings, it is found that Uganda still is in stage one of its evolvement towards a Triple Helix system. The country has barely left

its original laissez-faire state and donors have taken the role of the government. Thus, donors are interfering all three helices directly. The illustration of interactions between institutions in Uganda today is presented in Figure 10. From the figure, the small areas of overlapping helices illustrate the low degree of collaboration between institutions without donor influence.



**Figure 10 Illustration of interactions between institutions in Uganda**

When compared to the Open Triple Helix model, it is clear that the situation in Figure 10 is not beneficial for Uganda. The donors are not interfering in a way that benefits the long-term development of strong institutions. At the same time, the donors are not well coordinated, further reducing the actual benefit of donor influence in Uganda. To find areas of improvement, the extended model should be applied. In Figure 11, the optimal model for Uganda is presented, based on the Open Triple Helix framework presented in 5.4.1. In this model, donors and other actors influence from outside, supporting a local Triple Helix in Uganda without interfering in a disruptive way. This will help the universities of the country get out of the negative spiral of being counseling universities through increased development and UI-collaboration. Foreign actors like TrønderEnergi share their knowledge to improve their local firm TrønderPower. If the knowledge is shared openly, through collaboration with academia and the government, this knowledge can be utilized in Uganda. This is in

line with the thought of free flow of information, which is a core thought of the Triple Helix model. In the suggested model, donors support the government institutions with knowledge and capital without any direct influence that hurts long-term economic development. At the same time, donors can work as catalysts for change in the universities through joint donor programs like SWAp.

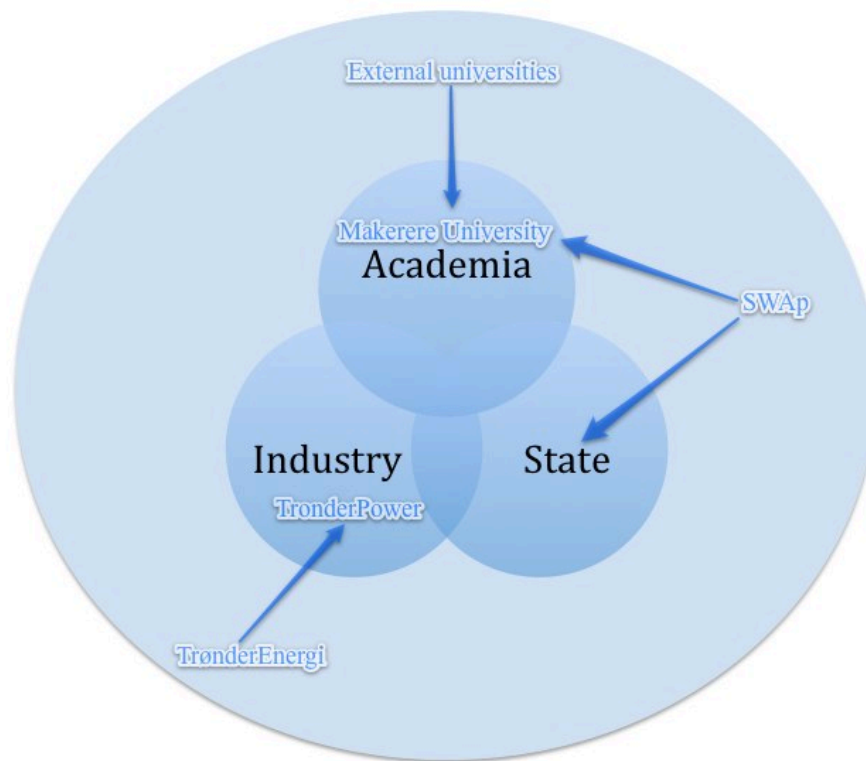


Figure 11 The optimal Open Triple Helix model in Uganda

## 5.5 Implications for managers

The chapter on implications for managers is divided in sub-chapters to fit the triple helix arrangement. The sub chapters include implications for managers for the case of Uganda and more general implications for developing countries.

### 5.5.1 Implications for university management

Makerere University is struggling with professors' motivation and this is identified as a main reason for the lack of UI-collaboration. It is suggested that Makerere University implement split salaries, where the professors are paid based on performance in addition to a uniform base salary.

This study has shown that foreign industry can benefit greatly from local knowledge. At the same time, local industry is dependent on knowledge from the universities to develop, as many are still not properly industrialized. This gives the universities an important role, with a potential for benefit through industrial funding. The universities in developing countries should prioritize applied research with local conditions and revise teaching material to ensure that the students are relevant for industrial positions after graduation. The university management can do this through two approaches, in accordance to Jongbloed's (2008) barriers for increased UI-collaboration. First, the university management should make applied research a part of their strategic focus and thus improve the university's entrepreneurial culture. Second, the management should give the professors incentives to do this through result-based pay that promotes applied research and UI-collaboration.

One reason for lacking UI-collaboration is capacity and financial resources from the university. The universities are increasing the number of students, but the quality of the students graduated is not at the level needed in the industry. These two factors contribute to unemployment among university graduates. Since most of the capacity and resources are used on teaching, instead of research and UI-collaboration, a shift in focus is recommended. By limiting the number of students, the universities are able to conduct more applied research and by this increase both financial resources and UI-collaboration. This will also benefit the students, as the professors get better knowledge of the industry.

### **5.5.2 Implications for industry management**

The universities are slow and bureaucratic institutions, and even with the recommended changes to universities, there is no guarantee for improvement. Thus, the industry should prioritize to put more pressure on the universities for increased collaboration. This is not required of the industry, but it will be of great benefit, both in terms of economic long-term gain and human resource development. All industrial actors complain about the curriculum at the universities, but none of them have informed the universities, leading to a status quo. The study shows that where the industry initiates collaboration, like UMEME has done, there are observed benefits for both actors. The benefit of industrial involvement in UI-collaboration is further

increased by the fact that the government institutions in developing countries are weak and often unable to implement positive change.

### **5.5.3 Implications for government**

The governments in developing countries should play an important role in providing national frameworks and policies that can support further development. A framework that supports UI-collaboration is needed. This is a matter of priorities and implementation rather than finances. Establishing a policy or framework for collaboration does not demand large financial investments. The research has also revealed that universities that are in a challenging position are better at promoting themselves to the industry than those that feel safe. Thus, the government should make policies that encourage competition between universities to increase motivation for UI-collaboration.

This study has shown how applied research and curriculum development that includes communication with the industry are of great benefit. Thus, the government of such developing countries should provide framework and policies that support the development of more applied research with local conditions and curriculum development as stated above. Result-based salaries in the universities have been suggested to improve research and UI-collaboration. As the government is in charge of most educational institutions, it should implement this as a framework.

## **5.6 Suggestions for further research**

As this paper suggests an extension of the Triple Helix model to the Open Triple Helix model in developing countries, this calls for further research to confirm this model and the findings presented. The applicability of the model in other developing countries than Uganda should be validated through further research.

The findings show that donor initiatives in developing countries may work against their intentions. This is disturbing for the donor communities and should be researched further. Research to find ways donor work can be better implemented is suggested. As discussed, some donor communities may have initiated a shift to avoid some of the problems found in this case, but further research to identify whether this

shift have been effective or not is strongly suggested. This research has identified a problem with donor work and their methods in developing countries and further research is suggested to explore this problem.

An industry sector with high demands to its workers' knowledge and experience was chosen for this study. This was a conscious choice, as argued in chapter 1.1. However, there may be differences to the benefits of and conditions for UI-collaboration between sectors. Thus, the transferability of the findings in this paper to industries without a similar need of higher education is suggested as a topic for further research.

Asian companies are not yet established in the hydropower sector in Uganda, but are involved in other sectors. The impression from this study is that the Asian industry prefers to use their own instead of local knowledge in foreign projects, reducing the possibility for UI-collaboration. Thus, further research on cases where the Asian involvement is present is suggested to fill this gap in the research material.

## **5.7 Limitations and evaluation of the study**

There are limitations to this study in addition to the topics discussed in chapter 3.5. The study is based on a single case country. Thus, the discussion on generalization of developing countries and their challenges is based on previous works and theoretical material, not firsthand research.

All interview subjects of this thesis were chosen due to their relevance to the case. The subjects' opinions may be influenced by their own agenda in the sector. However, without their specific knowledge the research would lose its purpose and the authors have tried to balance this by being as objective as possible and weighing the different opinions of the field against each other to get a picture as realistic as possible. Due to time and resource limitations it was not possible to conduct more than one period of data collection. This is a possible area of further research.

Uganda is a developing country that has been politically and socially stable the last 25 years and this paper is most relevant to other developing countries with long-term stable conditions. According to Etzkowitz, stable conditions are needed to apply the

Triple Helix model. Countries in Africa have experienced an unexpected amount of turmoil in 2011, and it is uncertain how the Open Triple Helix model can be applied to these countries when their situation again is stabilized.



## 6 Conclusion

This paper has given answers to three sub-questions and used these to discuss the main topic. Following is a conclusion to the three sub questions and then a conclusion to the main question based on the empirical findings and the discussion.

Sub question a) asked what interactions between universities and industry that is present in Uganda today. It is concluded that within the hydropower industry of Uganda there is some degree of interaction through internships and a few sporadic activities. Internships cannot be described as real collaboration, as the professors seldom contribute beyond a letter of recommendation to the students. There is no evidence of any research collaboration within the hydropower industry.

In sub question b) the authors wished to identify the motivation and incentives of foreign industry in Uganda to see how this influences the local Triple Helix. The conclusion is that the foreign industry is motivated primarily by possibilities of profit, but that they are motivated to contribute to the Triple Helix of the country because of their need for local knowledge.

Sub question c) was prompted to find challenges and ways to influence the Triple Helix system in Uganda. It is concluded that most of the challenges found are not unique for Uganda, but rather general challenges of developing countries, i.e. lack of capital, weak institutions and lack of initiative to more collaboration. The universities are identified as the institutions that are holding back UI-collaboration the most. In addition, implementation problems are found at the government. Donors are revealed as important actors that influence the Triple Helix relationship.

Based on the empirical findings, it is concluded that the influence of foreign industrial actors on the local industry helix supports the validity of the Triple Helix model. At the universities, empirical findings show a lack of incentive structures promoting UI-collaboration and research. To implement changes and such incentive structures there is need for a catalyst. As no local institutions are found to be able to drive the change, donors are suggested to be this catalyst. Through this donor support, it is argued that

the universities will be able to contribute to the Triple Helix system as an entrepreneurial university. However, there is a challenge with donors acting as a catalyst, as it is revealed that donor work is organized in a way that may slow economic development. Further research, with this as a main topic, is suggested to investigate the generalizability of these findings. The study contributes with a suggestion to how donors can organize their work to align the different donor actors and focus on incentives for government involvement.

The conclusion to the main research question is: *The Triple Helix model is influenced by open system conditions, but the model is valid in developing countries.* Even though the model is valid, it is designed to fit the western societies. To be more suitable to the situation in developing countries, the Open Triple Helix model is suggested. This extended model illustrates how external actors influence the local Triple Helix system in developing countries. The Open Triple Helix model is a tool to further increase economic development in the country and should be used to understand where developing countries are failing to arrive at a Triple Helix state.

University management in developing countries should reward their professors through a combination of result-based and fixed rewards. At the same time, a strategic focus on entrepreneurial activity is suggested. Governments in developing countries should establish policies and frameworks that encourage UI-collaboration. The industrial actors in developing countries should increase their own initiatives to UI-collaboration, as this will be of long-term benefit. The findings of this paper come from a case of the hydropower sector in Uganda, but are generalizable and useable in other developing countries.

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## 8 Appendixes

### 8.1 Interview Guides

#### 8.1.1 Appendix A: Interview guide for university actors

1. Introduction of us, the NOMA project and the research we are doing.

##### **Introductory questions**

2. What are you doing in Uganda? Can you explain to me the details of your work?

3. What would you describe as the main purpose of the university?

##### **Current university situation**

4. To what extent do you have connections to industry in your work?

(-- What is needed for a better collaboration between UI?)

6. What is your experience with the NOMA masters program?

7. If any knowledge, what are your positive/negative experiences with it so far?

8. How many students are finishing the NOMA project compared to starting?

9. Do the students of the NOMA project get relevant work in Uganda?

10. How are the relations between this university and the government?

11. To what extent can the curriculum and purpose of the university be altered without government interference?

##### **UI-collaboration**

12. What could be done to make the people at the university more interested in collaboration with the industry?

13. Do you have any concerns with the low degree of UI collaboration today?

14. What about disadvantages with more collaboration? Any special concerns?

##### **Uganda as an economy**

15. What do you see Uganda's greatest challenge for continued economic development?

16. How do you view the western industry and its contribution to Uganda and the local universities?

17. Are there any governmental limitations to university development in Uganda?

18. Are there any other country limitations?

##### **Finishing remarks**

19. Do you have anything else to add?

20. Can you suggest any other organizations, associations or companies you think will be interesting for this research?

21. Is it OK if representatives from NOMA contact you later to follow up this research?

### **8.1.2 Appendix B: Interview guide for local industrial actors**

1. Introduction of us, the NOMA project and the research we are doing.

#### **Introductory questions**

2. What are you doing in Uganda? Can you explain to me the details of your work?

3. What projects is your firm involved in?

#### **Current workforce, local influence, university connections**

4. How many workers are working in your business?

5. At what level of education are these workers?

6. Where do you recruit new workers?

7. How does your firm help workers learn?

8. How does your firm see newly educated students from the universities in Uganda?

#### **UI-collaboration**

9. Can you describe your firm's relationship with the universities in Uganda?

10. Do you see any advantages for your firm in collaborating with the university?

11. On what premises would your firm be interested in collaboration with the university?

12. What do you see as the greatest challenges holding back more UI collaboration?

13. Who/what would motivate you to do more collaboration?

#### **Uganda as an economy**

14. What do you see as the greatest challenge for Ugandan industry to become self-sustainable?

15. How do you view the western industry and its contribution to Uganda and its local industry?

16. How do you view the Asian industry and its involvement in Uganda?

17. Are there any governmental limitations to your business in Uganda?

#### **Finishing remarks**

18. Do you have anything else to add?

19. Can you suggest any other organizations, associations or companies you think will be interesting for this research?

20. Is it OK if representatives from NOMA contact you later to follow up this research?

### 8.1.3 Appendix C: Interview guide for foreign industrial actors

1. Introduction of us, the NOMA project and the research we are doing.

#### **Introductory questions**

2. What are you doing in Uganda? Can you explain to me the details of your work?

3. Can you please describe the projects in Uganda that your firm is involved in?

4. Do you have any thoughts on why your firm is doing projects in Uganda?

5. What factors were important for your firm's choice of doing business in Uganda?

Current workforce, local influence, university connections

6. Can you describe your workforce in terms of origin, education and tasks?

7. How do workers locally differ from your regular applicants from your home country?

8. How does your firm value newly educated students from the university?

9. Can you describe the nature of your connections to local industrial actors?

#### **UI-collaboration**

10. On what premise would your firm be interested in collaboration with the university?

11. How is your experience with UI-collaboration from other countries?

12. What do you see as the major challenges that are holding back more university-industry collaboration in your business?

13. Who/what could persuade you/influence you to collaborate more with the universities in Uganda?

#### **Uganda as an economy**

14. What do you see as the greatest challenge for Ugandan industry to become self-sustained?

15. Are there any governmental limitations to your business in Uganda?

16. What are your thoughts on the Asian involvement in Uganda?

17. Are there any other country limitations?

#### **Finishing remarks**

18. Do you have anything else to add?

19. Can you suggest any other organizations, associations or companies you think will be interesting for this research?

20. Is it OK if representatives from NOMA contact you later to follow up this research?

### 8.1.4 Appendix D: Interview guide for government actors

1. Introduction of us, the NOMA project and the research we are doing.



### **Introductory questions**

2. What are you doing in Uganda? Can you explain to me the details of your work?
3. What do you see as your Government's most important part in the development of Uganda as a country?

### **UI-collaboration**

4. How does the government help industry and universities develop?
6. How could this help be improved?
7. What about university-industry collaboration. How is/could the government help with this?
8. What advantages do you see from UIG-relations?
9. What can motivate you to do more to encourage UI collaboration?
10. What is needed from the university if the government is to help with such collaboration?
11. Do you have any concerns with the low degree of UI collaboration today?

### **Uganda as an economy**

12. What do you see Uganda's greatest challenge for continued economic development?
13. How do you view the relationship with foreign actors (industry, NGO, donors) and its contribution to Uganda and government?
14. Is there any difference between support from western and Asian countries?
15. How do you see donor contributions as a part of Uganda's development? Important?
16. Are there any limitations to development in the government of Uganda?
17. Are there any other country limitations?

### **Finishing remarks**

18. Do you have anything else to add?
19. Can you suggest any other organizations, associations or companies you think will be interesting for this research?
20. Is it OK if representatives from NOMA contact you later to follow up this research?

### **8.1.5 Appendix E: Interview guide for other actors**

1. Introduction of us, the NOMA project and the research we are doing.

### **Introductory questions**

2. What are you doing in Uganda? Can you explain to me the details of your work?
3. What are your organization's goals with its work in Uganda?

4. Can you please describe the results of your organization's work in Uganda?

**Project involvement**

4. Can you please describe the nature of the involvement of your organization in the project?

5. What demands do you normally pose for other actors in the projects?

**UI-collaboration**

6. How is your organization connected to the local industry in Uganda?

7. How is your organization connected to the western industry in Uganda?

8. How is your organization connected to the universities in Uganda?

9. How is your organization connected to the government in Uganda?

**Uganda as an economy**

14. What do you see Uganda's greatest challenge for continued economic development?

15. How do you view the relationship with foreign actors (industry, NGO, donors) and its contribution to Uganda and government?

16. Is there any difference between support from western and Asian countries?

17. How do you see donor contributions as a part of Uganda's development? Important?

17. Are there any limitations to development in the government of Uganda?

18. Are there any other country limitations?

**Finishing remarks**

19. Do you have anything else to add?

20. Can you suggest any other organizations, associations or companies you think will be interesting for this research?

21. Is it OK if representatives from NOMA contact you later to follow up this research?