Opportunity for Change

A Study of Innovation Culture as an Analytical Tool and the Case Study of Ethiopian Civil Engineering Students

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Final Thesis

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ABSTRACT

Innovation offers opportunities for modernization and development. In recent years it has become a buzzword in the world of NGO's, IGO's and governments in developing countries and is featured in the UN Sustainable Development Goals. Different types of innovation are increasingly recognized in research, complicating the classic notion of innovation as a tool for high-tech advancements of the market. It is now possible to see the benefits of social innovations, user innovations and inclusive innovations emerging in both developed and developing countries. However, the concept is often used indiscriminately without a clear definition and proper knowledge of the local context. With a focus on civil engineering students at the Addis Ababa Institute of Technology in Ethiopia, this paper introduces the notion of an innovation culture present in society as a factor with far-reaching influence on the way the innovation process takes shape among students and members of society. Engineering students, being the future engineers and innovators of the country, articulate the nature of present and future innovative processes in the country.

A series of observations, interviews and policy documents show students' understanding of innovation, how it takes shape, individual and collective aspirations and expectations of using innovation as a tool for the development of their country. In addition, a model has been developed based on the concept of culture in organizations while seeing universities as a specific type of organization. The model provides a framework for the qualitative analysis of innovation culture in universities or specific university programs. Its purpose is to provide insight into the cultural process around innovation by looking at the goals and aims of universities, the material inputs, the learning process and the university context. The underlying relations and structures presented in these lead to the output of students' discourse and behavior concerning innovation.

The main finding in this study is that some discrepancies can be found between government goals and aims for the present and future behavior of students at the Addis Ababa Institute of Technology, while discourse shows great similarities with goals and aims. The main policy focus is now on quantitative results, leading to a lack of innovative capabilities in the general student population. On the other hand, there are great opportunities for change initiated by individuals and groups within and outside the university. I argue these can provide the low-cost quality changes required to achieve policy goals in this context.

By contextualizing these findings within broader development policy frameworks, this paper provides insight into what kinds of innovation are relevant and feasible and in what way these could and should be used to promote national development. In Ethiopia, inclusive innovation with top-down strategy seems most feasible. It also shows what factors influence innovation culture, providing a framework for further research. The study supports a "rest-to-the-west" approach that supports local and national knowledge creation and can be used for future endeavors by NGOs, IGOs and government.

Key words: Innovation – Inclusive Development – Innovation Culture – Ethiopia – Structures – Development Policy

CHAPTER 1. INTRODUCTION

(The goal is to…) *'Support domestic technology development, research and innovation in developing countries including by ensuring a conducive policy environment for inter alia industrial diversification and value addition to commodities'* [1]

Innovation is often seen as a great promise of our time for both developed and developing countries. In the 1970's and 80's, a significant amount of research was done on the role of innovation in economic growth. In recent years, the concept of innovation as a tool for the advancement of developing countries has been gaining popularity. It is argued that 'the generation, exploitation and diffusion of knowledge are fundamental to economic growth, development and the well-being of nations'[2]. This study contributes the global knowledge base on using innovation as a tool for development and how we can acquire context-specific knowledge on innovation processes. I approached innovation from a cultural perspective, focusing on innovation culture as a factor with far reaching influence on innovative output. Culture consists of discourse and behavior in a dynamic, dialectical relationship with underlying structures. These are part of a process that can enable and promote an innovative mind-set and produce useful output in line with policy or other goals.

In this thesis, I discuss the case study of the Addis Ababa Institute of Technology (AAIT) and present a model as a tool for data collection and the qualitative analysis of innovation culture in universities that allows innovative output to be compared with goals and aims concerning innovation. In addition, I argue specifically what contributions can be made to Western theory from the AAIT students' perspective.

1.1 INNOVATION AS A TOOL FOR DEVELOPMENT

The popularity of innovation in development studies is clearly reflected in the Sustainable Development Goals. Currently, the 9th Sustainable Development Goal is to 'Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation'[3]. The purpose of this goal is to encourage innovation and increase the use of innovation for industrial purposes like diversification, by developing domestic research and development (R&D) strategies. Innovation is also mentioned as a supporting factor to achieve Goal 8 ('Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all') and 17 ('Strengthen the means of implementation and revitalize the global partnership for sustainable development').

The Oslo Manual, first developed by the OECD in 1992 and revised in 1997 and 2005, has served as a tool for the promotion and measurement of innovation across the OECD and increasingly in developing countries as well. The purpose is to gather internationally comparable data on the relationship between innovation and economic growth[4]. The focus of their data collection however, lies mainly on formal market actors and their role in economic growth. Questions have been posed on the inclusiveness of economic benefits from innovation when firms are seen as the central actors and firm performance as the main goal [5'6'7]. Unfortunately, both the revised Oslo Manual and the Sustainable Development Goals focus on

[1] Sustainable Development Goals Working Group (2015): *Preliminary Sustainable Development Goals.* https://sustainabledevelopment.un.org/sdgsproposal (accessed 16 June 2015)
[2] OECD and Eurostat (2005): *The Oslo Manual: Guidelines for Collecting Innovation Data.* Third Edition, OECD 2005. – p3
[3] Sustainable Development Goals Working Group (2015): *Preliminary Sustainable Development Goals.* https://sustainabledevelopment.un.org/sdgsproposal (accessed 16 June 2015)
[4] OECD and Eurostat (2005): *The Oslo Manual: Guidelines for Collecting Innovation Data.* Third Edition, OECD 2005. - p14
[5] Lizuka (2013): *Innovation systems framework: still useful in the new global context*? UNU-MERIT Working Paper, 2013-005
[6] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada
[7] Fagerberg, J. and Srholec, M. (2008): *National Innovation Systems, Capabilities and Economic Development.* Research Policy 37 (2008) 1417–1435.

technological R&D for the benefit of the formal sectors. However, it has become clear that for developing countries, this focus innovation in formal sectors only is too simplistic. This will be further explained in chapter two. Research used to argue for a focus on technological R&D is often based on Western experiences and does not sufficiently consider local context and knowledge. In many countries for example, the informal sector has as much influence as the formal ones. This study supports a rest-to-the-west approach to broaden our knowledge base. A study conducted at the Addis Ababa Institute of Technology (AAIT) in Ethiopia gives insight into the innovation culture in place and proposes context-specific opportunities for change.

1.2 THESIS OUTLINE

The thesis consists of seven chapters. First, in chapter two I discuss the theoretical framework for the study. The concept of innovation and the use of this as a tool for development in the context of Africa from a western perspective are explained. Next the model for qualitative analysis is presented and its use is explained. In chapter three I present research design. This concerns the research questions and problem statement, a conceptual scheme on innovation culture, the operationalization, research limitations and ethical considerations of the project. In chapter 4 an overview of the gathered data is presented. Subsequently, chapter six and seven present an analysis of the gathered data based on the theoretical perspectives presented in chapter two. Finally, the discussion and conclusions are discussed in chapter 7. Here I elaborate on the findings and explain what can be contributed to theory on innovation as a tool for development from an Ethiopian perspective.

1.3 THE CASE STUDY: ETHIOPIA

Ethiopia

Ethiopia is deemed one of the 'least developed countries', with a population of 94.1 million[8]. This means international organizations deem it as a country at risk of remaining 'underdeveloped' or even further deepening poverty. They are said to be disadvantaged in the development process for structural, historical and geographical reasons[9].

The main strategies for Ethiopia's further development are reflected in the national 'Growth and Transformation Plan' (GTP) of 2010[10] and 2015[11]. In the first GTP, some but limited attention is paid to the role of innovation. Science and technology are seen as a 'cross-cutting sector' that can benefit the development of all other sectors. The main strategies are focused on formal market actors. They include attracting investment, building the capacity of governing bodies and rule of law, creating and enhancing capacities of technology institutes to generate talented & competent scientists and engineers'[12]. In addition, there is a focus on knowledge transfer to the general population.

Local Culture

Ethiopia's development policies are implemented in a traditionally hierarchical culture. Growing up, most Ethiopian citizens learn that all people are not equal. Major resources are in the hands of the ruling party, the EPRDF[13]. This party has adopted some policy reforms including decentralization, civil society development and economic liberalization. In reality however,

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[8] World Bank (2015): *Ethiopia Country Overview* (http://www.worldbank.org/en/country/ethiopia, accessed 24 June 2015)
[9] UN (2015): *UNCTAD: Least Developed Countries (LDCs)* (http://unctad.org/en/Pages/ALDC/Least%20Developed%20Countries/LDCs.aspx, accessed on 24 June 2015)
[10] World Bank (2011): *The Federal Democratic Republic of Ethiopia Joint IDA-AMF Staff Advisory Note on the Growth and Transformation Plan (GTP) (2010/11–2014/15).* Document of the World Bank.
[11] National Planning Commission (2015): The Second Growth and Transformation Plan (Draft) 2015/2016 – 2020/2021. September 2015, Addis Ababa, Ethiopia.
[12] World Bank (2011): *The Federal Democratic Republic of Ethiopia Joint IDA-AMF Staff Advisory Note on the Growth and Transformation Plan (GTP) (2010/11–2014/15).* Document of the World Bank. – p76
[13] Vaughan, S. and Tronvoll, K. (2003): *The Culture of Power in Contemporary Ethiopian Political Life*. Sida Studies No. 10.

democracy in the country is disappointing. There is a lack of willingness to acknowledge different political stances that, with the government controlling all major resources, has made political dialogue or competition difficult. Meanwhile, access to resources is dependent on personal relations with politicians on a regional level.

The focus of this government is on popular democracy, where the strategy is to have 'communal collective participation'[14]. This strategy is related to Maoist and Marxist conceptions of revolution, the original ideologies of the party when taking control in 1991[15]. The Ethiopian government sees Universities as the main actors providing human capital, one of the main pillars of the Growth and Transformation Plan[16]. There are many policies that aim to have the universities provide both relevant knowledge and a skilled workforce. This study indeed shows the relevance of the strategy of communal collective participation in Universities. Using innovation for development and the role of Universities and graduates therein is clearly reflected in common discourse. When we look at behavior however, we see something different. There is a large discrepancy between behavior of students and staff at the university in comparison to what the goals and aims of the government reflect. In the final four chapters, I discuss this further and present an explanation and opportunities for change.

1.4 THE ADDIS ABABA INSTITUTE OF TECHNOLOGY

The Addis Ababa Institute of technology (AAIT) is not the only one in the country, but the largest and oldest and part of the Addis Ababa University. They have a special autonomy structure that increases its independence from the larger university structure. On their website[17], it is argued that the goal is to become one of the 'top five pre-eminent Technological Institutes in Africa by 2023'. Their mission is to 'To educate competent graduates and researchers in Engineering and Technology by advancing relevant, innovative and creative teaching, research and Technology Transfer to foster social and economic development of the country'[18]. From the website, it is clear that they aim to contribute to the development of their country through the creation and adoption of new and existing knowledge. However, it is also clear that this is still a work in progress. Looking under the heading 'research' leads to a page 'under construction' as does the link to documents on 'research and technology transfer'. This is not to say nothing has been done in these areas so far, but any progress made could only be analyzed on location. Again, the lack of knowledge on developing countries' knowledge ecology becomes apparent, so choosing this location as my research location seems fit to pose and answer questions on these pressing matters.

Because of time limitations the focus of this study is on the civil engineering department only, as focusing on all engineering students would make generalization difficult. The reason for choosing civil engineering specifically is that these students are the ones most likely concerned with developments among the general population and the populations at the bottom of the pyramid (BoP). Accordingly, the mission of the department of civil and environmental engineering is to 'provide high quality civil engineering education and training, to undertake basic and applied research focusing on local problems while maintaining international standards, and to render professional services for national development' [19]. In the context of this mission, chances are these students have an interesting outlook on innovation, possibly including informal actors and adopting different strategies to benefit the national population

[14] Vaughan, S. and Tronvoll, K. (2003): *The Culture of Power in Contemporary Ethiopian Political Life*. Sida Studies No. 10. - p117
[15] " "
[16] Education Strategy Center (2015): *Compendium of Policy Briefs. Education Strategy Center*. June 2015 Publication Series No.2.
[17] Addis Ababa Institute of Technology (2015): *Background Page* (http://www.aau.edu.et/AAIT/, accessed 24 June 2015)
[18] http://www.aau.edu.et/AAIT/acadlocals/school-of-civil-and-environmental-engineering/overview-of-soc/, accessed 24 June 2015
[19] http://www.aau.edu.et/AAIT/acadlocals/school-of-civil-and-environmental-engineering/overview-of-soc/, accessed 24 June 2015

and contribute to inclusive development. In the next chapter, I introduce theoretical perspectives on innovation this study contributes to.

CHAPTER 2. INNOVATION CULTURE: CONCEPTS, THEORIES AND MODELS

'The generation, exploitation and diffusion of knowledge are fundamental to economic growth, development and the well-being of nations'. [20]

The main concepts in this thesis are innovation and culture. In this section, First, I discuss the concept of innovation and its use in a context of development. Next, I explain how I explored innovation from a cultural perspective. Finally, a model for data collection and analysis is presented. This is adapted from a model for quality assessments at Universities combined with theory on cultures in organizations.

2.1 INNOVATION: CONCEPTS

The concept of innovation is undergoing many changes and is being used in multiple ways throughout the globe. It is often seen as a 'first world activity' concerning 'brand new, advanced solutions for sophisticated, well-off customers, through exploitation of the most recent advances in knowledge'[21]. Innovation can however, also be defined in a broader sense as the activity of trying out new products, processes or 'ways to do things', not necessarily including a contribution to the global knowledge base. As I was especially interested in the perspective of the research participants instead of imposing my ideal view of innovation, I chose to use a broad definition of innovation going into the field. Innovation is 'the process of converting new or existing knowledge to value for the benefit of individuals, groups or communities'[22]. When measuring innovation, activities concern 'significant changes, with the intention of distinguishing significant changes from routine, minor changes'[23].

Besides knowledge creation, a crucial concept is knowledge diffusion. 'Diffusion is the way in which innovations spread, through market or non-market channels, from their very first implementation to different consumers, countries, regions, sectors, markets and firms'[24]. Both the development and diffusion of new knowledge are relevant in the innovation process. These processes can thus be divided into innovation that is 'new to the world' or 'new to the market'[25].

2.2 INNOVATION FOR ECONOMIC GROWTH: CLASSIC THEORY

In classic economic theory, capital accumulation was seen as the explaining factor to income and productivity. This lasted until the 1950s, when the neoclassical growth theory was developed. This theory states that productivity keeps decreasing when the working class accumulates enough capital. From this it follows that growth per capita can only be maintained with the prevalence of technological innovation. The availability of technology or knowledge combined with the starting point of a country then determines the growth rate towards an eventual global convergence[26]. Similarly, in modernization theory it is argued that the difference in countries' development stages can be explained through differences in the adoption of technological advances [27]. Leap-frogging by adopting knowledge from more advanced countries is seen as a viable possibility for developing countries to 'catch up'. Policy recommendations for developing countries usually included investment in science and technology (S&T) and research and

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[20] OECD and Eurostat (2005): *The Oslo Manual: Guidelines for Collecting Innovation Data.* Third Edition, OECD 2005. – p3
[21] Fagerberg, J. , Srholec, M. and Verspagen, B. (2010): *The Role of Innovation in Development.* Review of Economics and Institutions. - p2
[22] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada. – p 42
[23] OECD and Eurostat (2005): *The Oslo Manual: Guidelines for Collecting Innovation Data.* Third Edition, OECD 2005. - p40
[24] " " - p17
[25] Lizuka (2013): *Innovation systems framework: still useful in the new global context*? UNU-MERIT Working Paper, 2013-005.
[26] Fagerberg, J. , Srholec, M. and Verspagen, B. (2010): *The Role of Innovation in Development.* Review of Economics and Institutions
[27] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada. - p40

development (R&D)[28]. The first Oslo manual, developed in 1992, mainly focused on technological product and process (TPP) in the manufacturing sector[29].

Kraemer-Mbula and Wamae[30] recognize that the benefits of innovation can indeed stem from imported knowledge. However, they also argue that the benefits of knowledge are mostly attributed to the innovator, usually comprised of actors with the resources available for high-tech R&D. This has 'propelled advances in certain pockets of the world's population. The unequal distribution of knowledge and technological advances and technological capabilities has led to marked inequalities, not only across but also within countries'[31]. This inequality, caused by the unequal distribution of resources and knowledge, provokes us to question the classic notion of innovation: We may not be able to use technical innovation and imported knowledge as a tool for economic growth and leap-frogging for developing countries. That notion is developed based on research on innovation in the Western context and it's indiscriminate use is being questioned more and more in literature on innovation in developing countries.

This can partly be explained by a shift in international development studies from looking at development as economic growth to development as economic *and* social transformation, usually described as inclusive development. The Oslo Manual[32] now includes service innovations and non-technical innovations as well. In addition, scholars that analyzed the relationship between knowledge and growth during the 20th century argued that knowledge was in the hands of private firms and not as easily accessed as the neoclassical growth theory supposes. The expectation of catching-up and convergence was too simplistic. Scholars argued that there were opportunities for less developed countries to catch up, but these were dependent on firm institutional structures and 'social capabilities' like education and organizational skills[33]. This all culminated in the term 'technological capability' as an explaining factor to growth; the ability [...of nations...] to develop, search for, absorb and exploit knowledge commercially', using production capabilities, investment capabilities and innovation capabilities[34]. The next section elaborates on incorporating innovation on to the development agenda in a way that promotes inclusive development.

2.3 INNOVATION AS A TOOL FOR DEVELOPMENT

The relevance of including innovation in the development agenda[35] is that it is assumed that wealth created by innovation can reduce income gaps and inequality. Especially under the influence of globalization, tacit knowledge and knowledge networks gain prominence, which open up opportunities for previously marginalized groups. However, globalization could also lead to a widening of the 'innovation gap' and inequality within and between countries. Therefore development policies are seen as necessary to use innovation's full potential. The next section discusses developments in these policies.

Developments in Innovation Policy

The book *'Innovation and the Development Agenda'*[36] describes the OECD policy regarding innovation in developing countries in 2010. The change in OECD policy was already taking shape

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[28] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada - p41

[29] OECD and Eurostat (2005): *The Oslo Manual: Guidelines for Collecting Innovation Data.* Third Edition, OECD 2005.

[30] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada.

[31] " " - p30

[32] OECD and Eurostat (2005): *The Oslo Manual: Guidelines for Collecting Innovation Data.* Third Edition, OECD 2005.

[33] Fagerberg, J. , Srholec, M. and Verspagen, B. (2010): *The Role of Innovation in Development.* Review of Economics and Institutions. - p5

[34] " " - p6

[35] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada. - p23

[36] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada.

in the 2005 Oslo Manual, which was revised in three ways since 1992[37]. The focus on linkages with other firms and institutions in the innovation process was introduced, it started recognizing the importance of non-R&D intensive industries like the service sector and low-tech manufacturing and finally, innovation was more broadly defined to include organizational innovation and marketing innovation. In 2010, the OECD organized a workshop and an expert meeting, with the promising name 'innovating out of poverty', specifically to address issues of innovation in developing countries[38]. In these meetings, the OECD took the notion of innovation one step further towards policy and research advice for developing countries. The concern of the book is to explain how to implement innovation policies in developing countries while considering inherent instability, inequalities and heterogeneities. An important finding is that measuring innovation in developing countries should include a focus on innovations from the informal sector and a focus on government policies[39]. The reason is that the formal market is often not functioning properly and the proper institutions to foster innovation are not in place. Promotion of innovation therefore lies in the hands of governments, which justifies the use of government policies to enhance the innovation process. The OECD meetings led to a summary of points meant to 'innovate people out of poverty'. This includes putting innovation on the development agenda, building government capacities (to measure, understand and influence innovation), enhancing the horizontality of innovation for development and finally creating joint action by IGO's and donors[40].

Innovation systems framework

The complexity of formulating innovation policies lies in the fact that innovation is not isolated, but part of a 'system of innovation'. Creating value from knowledge is dependent on structural, institutional and social factors that are all linked and highly dynamic, always changing and evolving[41]. These are referred to as 'the framework conditions for innovation'[42]. The limited availability of these conditions in developing countries is said to have negative effects on the innovation process. Because of developing countries' heterogeneity, policy needs to be context-specific. However, the viability of using the classic innovation systems framework in the context of developing countries is questionable.

The innovation systems framework focusses on the actors of innovation and the contextual factors influencing them[43]. Traditionally, firms are identified as the driving forces of transforming knowledge into value and take central stage. Institutions are seen as the regulating force behind stakeholder communications by these firms. Policy interventions can then be used to solve the imperfections of the market, where actors influence the outcomes of these policies. However, this innovation systems framework is identified based on classic theory developed in Western countries and the situation in the heterogeneous group of developing countries is quite different. Lizuka[44] identifies the informal networks and markets as an important 'actor' usually underrepresented in the framework. He concludes that two factors require classical innovations systems framework analysis to be adapted to fit the context [45]. First, globalization allows for easy access to and the fast emerging of, horizontal networks. Second, new types of innovation have emerged that go beyond the classic notion of Research and Development (R&D). Lizuka[46] mentions user innovations (consumers adapting products to fit their requirements), social innovation (where the focus lies on social value instead of profits), public sector innovation

[37] OECD and Eurostat (2005): *The Oslo Manual: Guidelines for Collecting Innovation Data.* Third Edition, OECD 2005. - p11)
[38] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada. - p15
[39] " " - p16
[40] " " - p18
[41] " " - p42
[42] " " - p23
[43] Lizuka (2013): *Innovation systems framework: still useful in the new global context*? UNU-MERIT Working Paper, 2013-005. - p1
[44] " " – p 4
[45] " "
[46] " "

(improving efficiency and productivity) and innovation for inclusive development (focused on the poor and developing countries, often with a bottom-up approach). Inclusive innovation is discussed further in the next section.

In sum, the essential mismatch between the classic innovation systems framework and the types of innovation now emerging in developing countries is that the focus is classically on formal market actors, while it should also be on 'non-market-problems'[47]. Lizuka[48] argues the framework can still be used, but only when taking unconventional actors and heterogeneous contexts and conditions into account. Similarly, Kraemer-Mbula and Wamae[49] argue that more research is necessary to 'explore the applicability of the innovation systems framework to Africa and the routes for adapting it to the developing country context'. She argues that to overcome the challenges of research on innovation in developing countries, some unexplored areas need to be addressed. First, we need to look at how we can support innovation in extraction industries and the informal market. Second, we need to expand and improve measurement. Finally, we need to find ways to combine local and foreign knowledge.

Technological Capabilities

In terms of capabilities, learning is seen as the base of innovative activity. Innovation, then, is 'the consequence of a process of accumulation of codified and tacit knowledge'[50]. This relevance also shows in The Oslo Manual's [51]recognition of the importance of human capital to facilitate innovation. They argue 'appropriate skills are needed to make intelligent use of external sources or codified knowledge'[52]. In developing countries, it is crucial to focus on local knowledge and knowledge transfer to promote innovative activities, but also to develop capabilities for innovation[53].

Fagerberg et al. [54]argue the most important setback for research done on the role of innovation in developing countries is a lack of available data on these technological capabilities. One of the questions that have been difficult to answer so far has been what the role of education levels and organizational skills is in the catching-up of developing countries. Research here is usually done quantitatively and it lacks sufficient data on the education levels beyond literacy and enrollment rates. There is also an acknowledgement that government policies regarding innovation can be analyzed, but are also influenced by social and cultural values which are much more difficult to research. This study contributes to this knowledge gap by looking at innovation culture in the education sector.

An important issue in literature is that we see a focus on capabilities like ICT infrastructure, financial access, certifications, publications and patenting[55]. These seem to be derived from the classic innovation systems framework, where the capabilities are centered around official actors like government and industry, and on experiences in Western countries. If we were to look at innovation from a different perspective and also focus on other actors, it seems necessary to include other capabilities. Kraemer-Mbula and Wamae[56], who argue contextual factors like history are crucial in determining the value of innovation for development, mention the same.

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[47] Lizuka (2013): *Innovation systems framework: still useful in the new global context*? UNU-MERIT Working Paper, 2013-005. - p14

[48] " "

[49] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada. - p31

[50] " " - p31

[51] OECD and Eurostat (2005): *The Oslo Manual: Guidelines for Collecting Innovation Data.* Third Edition, OECD 2005

[52] " " - p43

[53] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada. - p34

[54] Fagerberg, J. , Srholec, M. and Verspagen, B. (2010): *The Role of Innovation in Development.* Review of Economics and Institutions

[55] Fagerberg, J. and Srholec, M. (2008): *National Innovation Systems, Capabilities and Economic Development.* Research Policy 37 (2008) 1417–1435. - p1421

[56] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada. - p54

In sum, technological capabilities are key to the innovation process and one of the key capability is about education and learning. At the same time, we need to consider other factors related to the context and not focus only on factors that derive from the classic innovation systems framework in the West, namely government, institutes and the large companies. The next section explains more about innovation in the context of Sub-Saharan Africa, where Ethiopia is located.

Innovation in Sub-Saharan Africa

There are some specific challenges to innovation in Sub-Saharan Africa[57]. First, research on innovation is often focused on foreign direct investment (FDI) by multinationals. The assumption is that the presence of multinationals enhances knowledge transfer to local entrepreneurs. The first problem is that in literature, the focus is usually on the manufacturing sector, this focus is derived from studies done in Latin America and Asia, while that is a very small contribution to the African economies This has created a knowledge gap on these processes in Africa. Extractive industries (like agriculture) and infrastructure are much more relevant here, but how (most) learning takes place in these sectors is 'insufficiently understood'[58].

The second problem is that it is assumed that the mere presence of FDI leads to the transfer of knowledge, even when no special attention is paid to this process. This is often not the case. Fagerberg and Srholec for example, show this in a study[59] on the relationship between capabilities and development. The development of an innovation system, part of this being openness to FDI, was one of the capabilities studied. As it turns out, the relationship between FDI and development is hardly significant if all countries in the study are included. It is only clearly relevant when the low-income countries are excluded. They conclude that openness to foreign direct investment cannot be seen as relevant to development, which can be explained by a lack of absorptive capacity of technology by developing countries[60].

Another challenge is identified in this context, related to the strategies of donors of developing countries. There has been a growing focus on the creation and accumulation of new knowledge for the benefit of developing countries. These are usually focused on creating and strengthening public research institutes, who take center stage for donors. Kraemer -Mbula and Wamae[61] argue however, that donors are only likely to have an influence on the 'innovation dynamism' if and when they address the design, engineering and management capabilities necessary. More generally, they claim 'the peculiar nature of technological learning in non-R&D-specific activities requires concerted attention within the broader effort of strengthening the general innovation environment'. This means innovation projects; policies and research require a holistic approach to enhance the 'innovation environment'. This includes Lizuka's approach to the innovation systems framework with a focus on unconventional actors and contexts, and includes a focus on capabilities like learning and contextual factors like history and culture, as mentioned in the previous section.

That relates to the final challenge mentioned by Kraemer[62]: the large informal sector in Sub-Saharan Africa. It is important to note that this does not consider illegal or underground activities, but entrepreneurs that are in no way legally separated from their 'enterprise' and are generally not registered or monitored. The lack of available data and the high degree of heterogeneity in this sector makes it difficult to address the challenges to innovation in the

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[57] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada. - p68

[58] " " - p70

[59] Fagerberg, J. and Srholec, M. (2008): *National Innovation Systems, Capabilities and Economic Development.* Research Policy 37 (2008) 1417–1435.

[60] " " - p1427

[61] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada. - p71

[62] " " - p74

informal economy. The sector is crucial however, because it is so demand-driven and is able to provide the products and services most necessary. Further, the informal sector is an important source of competences, skills, linkages between sectors and tacit knowledge and could contribute greatly to the innovation climate[63].

It is important for the least developed countries (LDCs) to also focus on low-tech innovation, and innovation in different sectors. This should then lead to local spillovers and an increase in productivity across sectors[64]. In addition, there is a lack of focus on informal institutions like codes of conduct and norms of behavior; the focus now lies only on formal institutions like rules and laws[65].

The above implies that if we look at knowledge accumulation for the purpose of developing technological capabilities, this knowledge should include a focus on local sources instead of only on FDI, learning about non-R&D-specific innovation to enhance the innovation environment, and finally a focus on learning in and learning about the informal sector. This learning takes place within and outside of institutions, and is related to contextual factors like history, culture and informal institutions. The next section explains how learning should contribute to a 'knowledge ecology' leading to a more enabling environment for innovation.

Knowledge Ecology

It has been argued that the higher education system in African Universities is severely impacted by the rise of the 'knowledge economy' and the subsequent 'internationalization' of education[66]. Internationalization is generally seen as 'the process of integrating the international, intercultural or global dimension into the purpose, functions or delivery of post-secondary education'[67]. In previous sections we learned that there is an increased focus on innovation in international organizations. The same can be said of pan-African organizations. The African Union has developed the Pan African University (PAU) whose aim is to 'strengthen education standards, enhancing science and technological innovations and fostering faster regional integration and development through quality higher education in targeted areas'[68].

It is clear that students are seen as the driving force behind enhancing technological innovations. This is also mentioned by UNESCO, who argue that it is crucial to build capabilities in developing countries in regards to science, technology and innovation[69]. This means the international orientation of Universities should lead to a focus on innovation, which would also be noticeable in students and staff members.

Kraemer-Mbula and Wamae make a similar argument[70]. They propose to look at the knowledge ecology as the basis of the innovative capabilities as one of the additions that should be made to literature on the least developed countries (LDCs). The knowledge ecology is defined as 'involving all kinds of institutions and organizations dedicated to the production, dissemination and utilization of new and 'superior' knowledge[71]. This can consist of activities of R&D institutions, by public and private firms or as educational programs enhancing the knowledge of the technical workforce. It is not the innovation system itself, but the basis of countries' research capabilities within the innovation system. Universities and students can

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[63] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada - p79

[64] " " - p96

[65] Bhatti, Y.A. (2012): *What is Frugal, What is Innovation? Towards a Theory of Frugal Innovation.* February 1, Imperial college, London. - p10

[66] Jowi , J.O. (2012) *African universities in the global knowledge economy: the good and ugly of internationalization*, Journal of Marketing for Higher Education, 22:1, 153-165, DOI: 10.1080/08841241.2012.705799

[67] (Knight, 2004).

[68] Jowi , J.O. (2012) *African universities in the global knowledge economy: the good and ugly of internationalization*, Journal of Marketing for Higher Education, 22:1, 153-165, DOI: 10.1080/08841241.2012.705799. - p156

[69] (UNESCO, 2011).

[70] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada.

[71] " " – p96

therefore be seen as crucial, although not the only, actors in defining a countries' knowledge ecology.

It is argued that four factors often disable a knowledge ecology in LDCs[72]: 1) efficient distribution of knowledge, which is now prevented by the high costs of patented knowledge, 2) the difficulty in selling knowledge that is useful in developing countries to the developed world at a reasonable price, 3) having the resources necessary to make the most of the available knowledge and 4) measurement. We can add to this that, based on the previous sections, we should also include learning that takes place outside of institutions, like learning about culture and history.

Radjov et al.[73] published a study based on 'Jugaad innovators' in India. I discuss the contents of their arguments in the section on frugal innovation. They argue that especially in the context of developing countries, but increasingly also in the Western world, the focus should be on this type of innovation. We can therefore argue that the characteristics of Jugaad innovation should be instilled in a knowledge ecology that supports these kinds of innovations. They mention a number of crucial principles to this kind of innovation. Additionally, they argue one of the things needed for successful and sustainable innovation in the present industrial setting is what Radjov et al.[74] call a 'growth mindset'. This means the industry needs leaders that are not fixed on using past solutions to challenges, but are confident, optimistic and curious, which enables them to generate groundbreaking and sustainable solutions. These are the types of traits that should be instilled in students to create solid knowledge ecology in place in the country. The next section explains a shift from the classic theory on innovation, innovation systems framework and technological capabilities to inclusive innovation, a type of innovation that seems more promising for promoting inclusive development. Frugal and Jugaad innovation can also be seen as inclusive innovations.

Inclusive Innovation

In the development context, inclusive innovation is an emerging but promising concept that stems from the assumption that development should be inclusive, also for marginalized groups. It is therefore important to focus on both economic and social transformation. Inclusive innovation is thus defined as 'the development and implementation of new ideas which aspire to create opportunities that enhance social and economic wellbeing for disenfranchised members of society'[75]. It is a distinctive innovation process as well as an outcome. This distinction is made to include the aspiration of inclusiveness, even if the results are disappointing. In addition, inclusive development can concern both innovative industries that benefit communities through employment and/or ownership, or products targeted specifically at communities at the bottom of the pyramid[76].

These inclusive innovations are said to be facilitated by three factors, related to organizational processes[77]. First, global challenges both restrain innovation by for example, a lack of resources and human capital, but can also provide triggers for new and innovative knowledge to be created. Organizational processes can enhance innovation by addressing constraints and turning them into opportunities, or 'reframing constraints'. Second, 'enacting new models', adopting new organizational models can lead to enacting and implementing innovations in a way that achieve inclusive growth. Finally, 'bridging access' refers to the organizational process of identifies, locates and creates access for marginalized communities. It

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[72] Kraemer-Mbula, E. and Wamae, W. (2010): *Innovation and the Development Agenda*. OECD International Development Research Centre. Canada - p100

[73] Radjov, N., Prabhu, J., Ahuja, S. (2012): *Jugaad Innovation: Think Frugal, Be Flexible, Generate Breakthrough Growth.* Jossey-Base, San Fransisco, USA

[74] " " - p48

[75] George, G. McGahan, A.C. and Prahbu, J. (2012): *Innovation for Inclusive Growth: Towards a Theoretical Framework and a Research Agenda.* Journal of Management Studies 49:4 June 2012 doi: 10.1111/j.1467-6486.2012.01048.x. - p663

[76] " "

[77] " " - p675

is recognized that these innovations come from organizations in both a top-down and bottom-up manner, when sometimes-entrepreneurial employees on the periphery of an organization make a difference. It is also recognized that small firms often have more motivation to develop inclusive innovations than multinationals, but lack the resources to implement them effectively. The article by George et al.[78] however, only pays attention to innovations coming from formal business organizations.

In the inclusive innovation context, attention has also been raised for low-cost but high-quality inclusive innovation products originating from developing countries, which also lend themselves to export to other developing countries or even developed countries[79]. These economic innovations meant for populations at the bottom of the pyramid are often termed 'frugal innovations'. In terms of inclusive innovation, this is an up-and-coming strategy with great promise. The concept is even introduced as a method for western industries to increase their profits while remaining socially beneficial for societies and communities in which they are active.

Frugal Innovation

Although frugal innovations are not a new phenomenon, they have been given increasing attention in recent years in the context of inclusive innovation. In the discussion chapter I explain the status of frugal innovation in Ethiopia. It has been used as a strategy only to a limited extent so far.

Frugal literally means 'simple and plain and costing little'[80]. Economic frugal activities favor ethical and disciplined action 'for the sake of some higher ends'[81]. It is essential to recognize not only the cost-benefit is crucial, but also the idea of not wasting anything is just as important. A frugal philosophy can therefore be defined as 'doing more with less'[82].

It is argued that innovations from the bottom of the pyramid are often more efficient and require less infrastructure than innovations from the multinationals and such[83]. It is these kinds of innovation that serve the ever growing number of populations at the bottom of the pyramid that are termed frugal innovations. Some even argue adopting frugal innovation strategies can be a competitive advantage in terms of the capability to respond to changes in consumer tastes and competition.

Frugal innovation is not unique to developing countries and is not only promoted as a bottom-up process and a tool for development of low-income countries. The book 'Jugaad Innovation'[84] describes how the principles of frugality can be, and increasingly should be applied in Western Industries in order to keep up with market demands. They argue that six principles used by successful innovators in India are crucial in a globalizing context with a more and more heterogeneous customer base: 1) Seeking opportunity in adversity, 2) doing more with less, 3) thinking and acting flexibly, 4) keeping it simple, 5) including the margin and 6) following your heart.

The crucial idea behind this Jugaad innovation is that the rigid- top-down process of high-tech innovations based on lengthy and expensive research projects is no longer viable in the current context. Innovation should happen flexibly, based on what consumers want and should take place rapidly according to market developments. The key to this is allowing autonomy within the industrial sector, allowing creativity to thrive to come up with quality solutions to challenges without trying to find a one-size-fits-all. Innovations should be inspired

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[78] George, G. McGahan, A.C. and Prahbu, J. (2012): *Innovation for Inclusive Growth: Towards a Theoretical Framework and a Research Agenda.* Journal of Management Studies 49:4 June 2012 doi: 10.1111/j.1467-6486.2012.01048.x.

[79] " "

[80] Oxford Dictionary (2015)

[81] Bhatti, Y.A. (2012): *What is Frugal, What is Innovation? Towards a Theory of Frugal Innovation.* February 1, Imperial college, London - p14

[82] " " - p15

[83] " " - p11

[84] Radjov, N., Prabhu, J., Ahuja, S. (2012): *Jugaad Innovation: Think Frugal, Be Flexible, Generate Breakthrough Growth.* Jossey-Base, San Fransisco, USA

by real challenges and should be addressed as quickly, and simply as possible without losing sight of quality. Finally, the margins of society should be included in this process. They are often ignored by industry as they are seen as 'unprofitable'. Radjov et al.[85] however, argue that next to the 'moral imperative', emerging markets are characterized by scarcity in for example infrastructure and financial services, while dealing with a growing population. In the spirit of creating opportunity from adversity, these margins should be seen as potential customers.

One could question the ethical considerations made when using this Jugaad mindset that has developed in a context of scarcity, and use it for large Western companies to increase their profit. Including the margins however, may have a positive effect in emerging markets independent of 'pure motives'. In addition, if knowledge ecology in a developing country enables this mind-set the benefits may also be reaped there, without having to depend on a trickle-down effect from large multinationals using frugal strategies. The Jugaad mind-set also does not exclude a bottom-up approach to innovation, but increasingly promotes an egalitarian approach to innovation and where ideas should come from. The same can be said of frugal innovation.

In the next section I argue that innovation culture is a crucial element of learning and the knowledge ecology, and eventually determines whether discourse and behavior concerning innovation is more supportive of innovation for economic growth or of inclusive innovations, such as frugal or Jugaad innovation.

2.4 INNOVATION CULTURE

In the previous sections, I have elaborated on the concept of innovation and what kind of learning would ideally take place to create a mindset for 'Jugaad innovation', frugal or inclusive innovation. This learning can take place within institutions, but also through history and culture outside institutions.

A certain mindset, and subsequent behavior, is created within the context of what I call the 'innovation culture'. This section explains what I mean with innovation culture and how this can be analyzed. The research project is focused on this innovation within the Addis Ababa Institute of Technology, and considers the culture coming from within the university, which is subsequently being influenced by factors from outside.

To summarize the arguments in previous sections, there are several players in the innovation systems of LDCs. The market is seen as a driving force of innovation and technology transfer. In developing countries, which are often characterized by heterogeneity and instability, other players are just as or even more important. In addition, international organizations and donors contribute to the 'innovation environment'. Different players have different incentives and make different contributions with a different influence on development and its inclusive effect on marginalized groups. These actors, incentives and actions make the 'innovation system' of developing countries, which is supported by the 'knowledge ecology'. In this ecology, learning can be seen as the basic tool for developing innovative capabilities. These innovative capabilities are defined in part by the development of human capital. This concerns both technology transfers from the global knowledge base as technology transfer in horizontal networks. It also includes the resources made available to the education system, especially in the field of engineering. The latter require specialized and sophisticated knowledge and the ability of 'learning how to learn'.

This learning can lead to a certain ecology, which determines the inclusiveness and frugality of innovation processes. In organizations, learning takes place in the context of a certain culture. This project's focus is on the innovation culture at the AAiT, as a factor with a far-reaching influence on the countries' knowledge ecology and therefore innovative capabilities.

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[85] Radjov, N., Prabhu, J., Ahuja, S. (2012): *Jugaad Innovation: Think Frugal, Be Flexible, Generate Breakthrough Growth.* Jossey-Base, San Fransisco, USA - p133

Innovation Culture

There has been an ontological discussion going on about the way culture is defined in research since the adoption of the term by early anthropologists. The main discussion revolves around looking at culture-as-systems or looking at culture-as-practice. Sewell[86] argues these definitions are not mutually exclusive and should be combined to reflect a dialectic relationship within what we call culture. This means we can look at systematic factors and practices as both relevant, and influencing each other. Systems, here, are seen as systems of symbols and meanings[87]. These systems then determine actions, like how people talk and behave. If we look at culture as practice, we give more agency to individuals and can see culture as a set of practical activities, constantly changing and contradicting realities[88]. If we combine these two, we can see the systems as influencing discourse and behavior, while the latter two can be seen as confirming these systems, but also as possible sources of contradiction and change.

In this thesis I use the concept of culture as consisting of three elements: Structures, which can be seen as the systems mentioned by Sewell[89], and behavior and discourse, which can be seen as the aforementioned 'practice'. Structures are like the backbone of the culture, running through all elements and influencing general discourse and behavior. This is where these structures can be observed. However, discourse and behavior are also seen as the place where opportunities for change can be observed. These three factors all influence each other and are part of the process of culture. The aim of analyzing innovation culture is therefore to look at these three factors and see how these influence each other. First, I look at discourse: How do students discuss innovation in its current and ideal situation and how does that influence behavior and structures? Second, I look at behavior: What can I learn about current and future behavior by participants and society in general and how does that influence discourse and structures in place? And third, I look at structures: Which structures can be identified as relevant to innovation discourse and behavior, and how are these influenced by this discourse and behavior?

The focus of this project is on innovation culture and how the three elements of culture influence each other to create a certain outcome. This outcome is related to the two approaches to innovation, which can be seen as on a scale, as either being more inclusive and/or frugal, more focused on economic growth and all the characteristics that are part of this typology. The idea is to look at discourse and behavior at the university in comparison the goals and aims that are formulated for the institute. The subsequent analysis revolves around identifying the structures or systems related to this discourse and behavior and how these all influence each other. In the next section I discuss how I created a model for data collection and analysis to be able to compare discourse and behavior with policy, and subsequently let the structures and systems emerge from this data.

2.5 TOWARDS A MODEL FOR THE QUALITATIVE STUDY OF INNOVATION CULTURE IN UNIVERSITIES

The knowledge available on the knowledge ecologies of specific developing countries and the role of education therein is limited. Although innovation as a tool for development has gained prominence in the last years, this knowledge is still lacking. The model presented in this paper contributes by providing a tool for the qualitative assessment of innovation culture in Universities, being one of the key institutions fostering the possibility of creating and diffusing knowledge. The subsequent case study that is presented provides a local perspective of

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[86] Sewell, W.H.Jr. (2005): *Chapter 1: The Concept(s) of Culture.* '*Practicing history: New directions in historical writing after the linguistic turn* (2005)': 76-95.

[87] " " - p43

[88] " " - p44

[89] Sewell, W.H.Jr. (2005): *Chapter 1: The Concept(s) of Culture.* '*Practicing history: New directions in historical writing after the linguistic turn* (2005)': 76-95.

engineering students on the concept of innovation as a tool for development and compares this to the goals and aims of the institute they attend.

This model has been created based on the theoretical works by two authors: Joanne Martin [90]and A.I. Vroeijenstein[91]. This framework has been used in order to provide a model that gives a holistic insight into cultures in Universities in a way that provides the most useful insights into the structures in place and possible opportunities for change. First, I started to look for a way to analyse certain factors and processes at Universities. Vroeijenstein provided an example of a model used for the quality assessment of Universities. This model is presented in figure 1. Vroeijenstein was struggling with the available quality assurance models, which did not provide enough insight into the reality in Universities, because they did not allow analysis of relationships between different aspects of the model[92]. The model he subsequently developed, presented in figure 1, is meant for the analysis of the organization of Universities, which have the function of providing educational services, conduct research and do community service[93]. The model can also be used for departments, faculties or programs separately. Vroeijenstein[94] argues a crucial difference between Universities and other organizations is that not only the input and output is relevant, but also the learning process should be seen as a crucial element in quality assessments. It is therefore that I have taken the model of Vroeijenstein as a framework to create a model for the analysis of culture in Universities. Specifically the inclusion of the elements goals and aims, inputs, processes and outputs. The contents of these sections have been adapted slightly to make the model more fit for the analysis of culture. For example, outputs are not things like graduates and scientific production, but discourse and behaviour. The behaviour of graduates and scientific behaviour then, can be seen as part of 'behaviour'. A further discussion on each section of the model is presented in chapter 4.

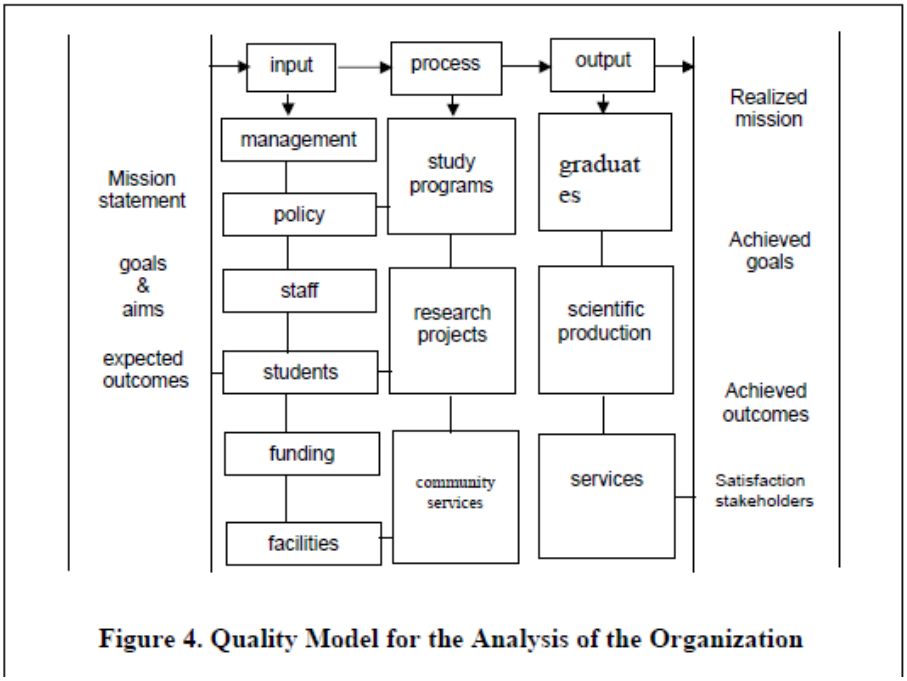

Figure 1. Quality Model for the Analysis of the Organization. Vroeijenstein, 2003:84)

Besides looking at Universities and their assessment as a specific type of organization, the model is meant to provide a tool for cultural analysis. It was therefore essential to add a cultural 'layer' to the analysis. Joanne Martin's[95] approach is used for this purpose. After studying literature concerning cultures in organizations over the years, she argues any analysis of culture in organizations should be approached from three perspectives: the integration perspective, the differentiation perspective and the fragmentation perspective. Martin's

[90] Martin, J. (1992): Culture in Organizations: Three Perspectives. Oxford University Press
[91] Vroeijenstein (2003): Towards a Quality Model for Higher Education. Journal of Philipine Higher Education Quality Assurance.
[92] " " - p82
[93] " " - p83
[94] " "
[95] Martin, J. (1992): Culture in Organizations: Three Perspectives. Oxford University Press

definition of culture is slightly different from the one used for this project. For her, culture consists of forms, practices and content themes[96]. Generally, the factors studied are similar. Forms are similar to norms reflected in discourse, practices concern behaviour and content themes are the topics around certain cultural forms and practices revolve. For this study, the only content theme studied is innovation, while forms and practices are called discourse and behaviour, and are studied according to the theory presented in the previous section on innovation and culture.

Martin[97] argues that to include these forms, practices and content themes in a holistic analysis, three approaches classically used for the analysis of organizational culture should be combined. Usually, studies use only one perspective, which leads to a distorted view on reality. First, I discuss the integration perspective. In this perspective, the focus on culture is one-dimensional. The aim of organizational culture is seen as achieving coherence among members of an organization, it's all about 'harmony and homogeneity'[98]. This approach is often used in studies meant for a managerial audience, and assumes a leader can 'create' a certain coherent and productive culture within an organization. Views on content themes are described as an organization-wide consensus. These views are enacted in cultural manifestations, while individuals know what to do and why that is the most productive thing to do. Changes in this culture can only happen through changes in leadership[99], while discrepancy between members of the culture and it's leadership, implies a 'weak' culture and a failure from a management perspective.

Second, the differentiation perspective recognizes 'separation and conflict' as part of culture, and its main focus is on divergence of conflicting subcultures[100]. The integration perspective is seen as a façade, behind which different, overlapping subcultures can be found that eventually determine organizational culture. Views on content themes are seen as inconsistent across the organization, consensus mainly exists within the boundaries of subcultures instead of being organization-wide, but within the sub-cultural boundaries the consensus is clear. Individual ambiguity receives little to no attention. So while the integration perspective focusses on things that are similar, the differentiation perspective focuses on divergence. This approach is often used for a groups that lack power and are seen as undermining the unifying effect of consensus from a management perspective, and are therefore seen as the dichotomous other, and having less value. Change within this approach, is seen as coming from subcultures. Even when it's an individual taking action, these are still submerged in their subculture and the subculture is seen as the source of change[101]. The focus of cultural change here is usually on the differential information flows between loosely tied groups within an organization. Martin however, also calls for an approach including a focus on low-level employee attitudes, offering an insight into opportunities for collective action from a context of subordination[102].

Finally, the fragmentation perspective focuses on individual ambiguity as essential to cultural complexity, the focus is on 'multiplicity and flux'[103]. The dichotomous thinking of the differentiation perspective, which is said to exclude the complexity of lower-status members of group[104], is thereby abandoned. While the two other perspectives look at the coherence of cultures and subcultures, this approach brings ambiguity to the foreground. Content themes are seen as open to multiple interpretations, with limited possibility for consensus. Between these interpretations are complicated relationships. Taking this approach means seeing subcultural

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[96] Martin, J. (1992): Culture in Organizations: Three Perspectives. Oxford University Press - p37
[97] " "
[98] Martin, J. (1992): Culture in Organizations: Three Perspectives. Oxford University Press – p45
[99] " " - p61
[100] " " - p79
[101] Martin, J. (1992): Culture in Organizations: Three Perspectives. Oxford University Press. – p 104
[102] " " - p106
[103] " " - p130
[104] " " - p135

boundaries as being permeable[105]. The focus is on the multiple and dynamic reactions possible to group identities, in contrast to forming a stable subculture[106]. Change is seen as a constant process, where people often do not have control over what happens. Some fragmentation studies then take an activist stance on individual agency, while some underrepresent agency and focus mostly on outside influence[107]. Martin argues that from a fragmentation perspective, we could also look at the de-construction of discourse and behaviour by everyday action as a source of cultural change[108].

The argument behind taking a three-way approach is that every approach has its flaws and leaves out crucial elements of what constitutes a culture: *'Any cultural context can be understood more fully if it is regarded, at any point in time, from all three perspectives. To exclude any of these perspectives from the domain of organizational culture research would be to limit what we could try to understand'*[109].

In conclusion, the model has been developed based on Martin's approach to studies on cultures in organizations, while Vroeijenstein's model has been used as a framework to study quality of Universities in general. The model is presented in figure 2 and the functions of the different components are explained further in the methods section.

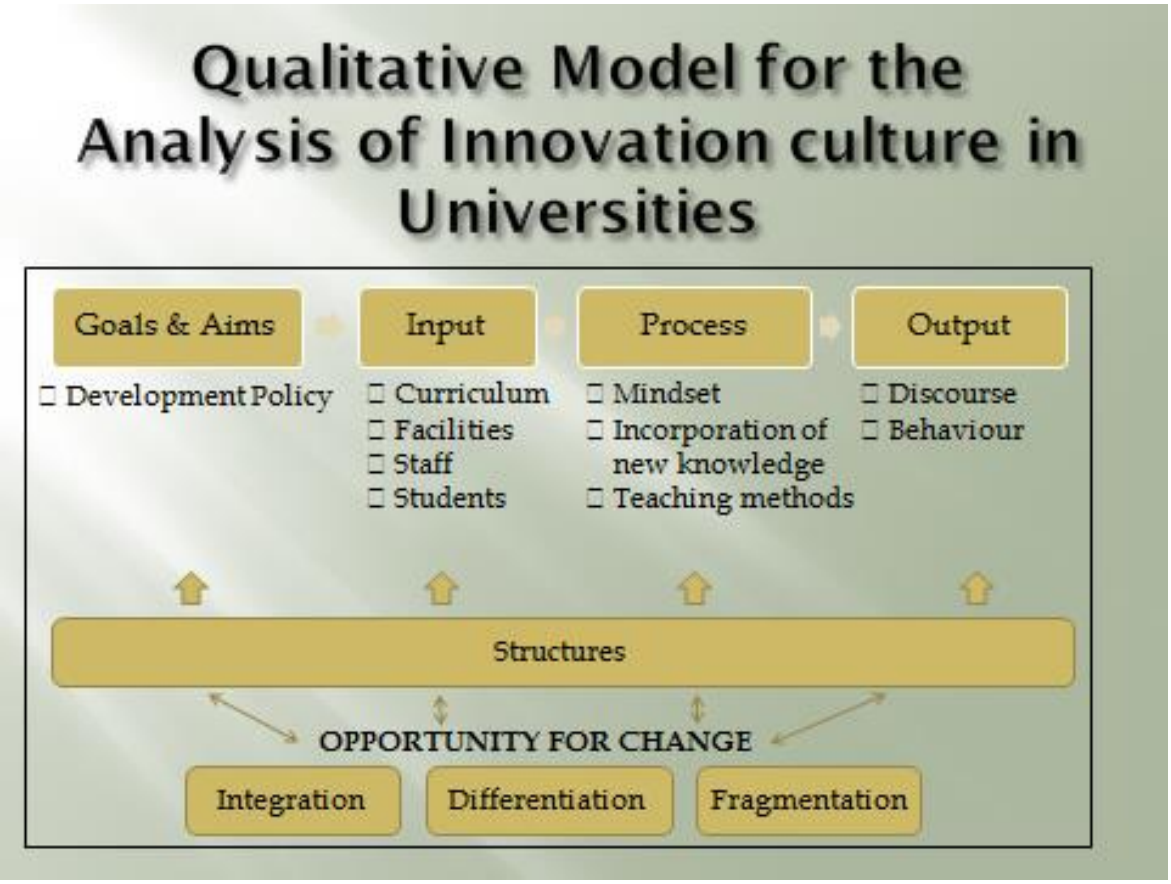

Figure 2. Qualitative model for the analysis of innovation culture among students in Universities

[105] Martin, J. (1992): Culture in Organizations: Three Perspectives. Oxford University Press - p132
[106] " " – p151
[107] " " – p160
[108] " " – p161
[109] " " - p174

CHAPTER 3. RESEARCH DESIGN AND METHODS

3.1 PROBLEM STATEMENT AND RESEARCH QUESTIONS

Problem Statement

The research problem addressed in this research project is three-fold. First, there is a shortage of data on the knowledge ecologies in developing countries and on the benefits of innovation for economic growth and inclusive innovation to effectively inform innovation policies. This thesis aims to contribute by describing the innovation culture at the AAIT and looking at challenges and opportunities that can be addressed to improve the innovation environment according to set goals and aims. Second, in international development studies in general, most knowledge flows from the West to the Rest. This thesis aims to contribute to a body of literature with a rest-to-the-west approach. In chapter 7 I discuss theoretical contributions flowing from Ethiopian students' conceptualization of innovation and development. Finally, there is no model available for qualitative research designs developed to study innovation culture. A combination of theoretical perspectives and data analysis has led to the development of a model for the process of data collection and qualitative analysis of innovation culture in Universities, which are presented in this thesis. This model was presented in chapter 2.

Research Questions

❖ **How does the innovation culture at the AAIT take shape?**

- *How do students discuss innovation in its current and ideal situation and how does that influence behavior and structures?*
- *What does current and future behavior by participants consist of and how does that influence behavior and structures in place?*
- *Which structures can be identified as relevant to the innovation discourse and behavior, and how does this influence discourse and behavior?*

3.2 CONCEPTUAL SCHEME

On the next page, figure 1 presents the central concepts in this project, their definitions and operationalization. This represents the 'innovation culture' in chapter 2.4 where I explain how innovation culture can be seen as the interplay between discourse, behavior and structures that places the eventual innovation culture along a scale ranging from innovation for economic growth to inclusive and/or frugal innovation. This is to be compared with what is formulated in the goals and aims of the institute and used to contribute to the theoretical knowledge base on the relationship between innovation and development.

Concepts	Definition	Operationalization
Innovation ⇨ Culture ⇩	1. Innovation for economic growth Incentive: Economic growth through industry, leading to trickle-down effect Main actors: Top-down innovation system consisting of formal actors Government, University, Industry Type of innovation: High-tech R&D 2. Inclusive innovation Incentive: inclusive growth through focus on marginalized groups Main actors: both formal and informal, bottom-up or top-down Type of innovation: Can be R&D or non-R&D specific, including frugal innovations **Knowledge diffusion is also included in the definition of innovation as 'creating value from knowledge'.*	
Discourse	The practice of culture through language	• *How do students talk about innovation?* • *What do students say about innovation?* • *How is innovation spoken about in classes?* • *Why is innovation discussed in this way?*
Behaviour	The practice of culture through current and planned action	• *What actions of students and staff are related to innovation?* • *What type of actions can be identified?* • *What is said about possible future actions?* • *Why can we identify this current and future behaviour?*
Structures	The underlying 'system' of culture, in a process that is always changing, influencing and being influenced by discourse and behaviour	• *What structures can be identified that influence discourse and behaviour (concerning innovation)?* • *How do these structures influence discourse and behaviour?* • *How are structures influenced by discourse and behaviour?*

Figure 3. Conceptual scheme on innovation culture

3.3 OPERATIONALIZATION

This section concerns the operationalization of the model presented in chapter 2.5. I provide information on how it has been used and how it can be used in other contexts. As it is a model for qualitative analysis, no values are assigned to the different elements in the model, leaving it to the researcher to determine which elements are most important in the studied context. The model is meant for both the data collection and analysis in a project. The top sections, consisting of goals and aims, inputs, process and output can be seen as tools for data collection and can be used for coding the data before analysis. The bottom part consists of the three analytical tools integration, differentiation and fragmentation, which give us more insight into the relevant underlying structures in the innovation culture.

Goals and Aims

This model is used to look at innovation culture in a context of development. The idea therefore, is to analyse innovation culture in terms of how conducive it is for the national development process. In Ethiopia, this process is highly regulated through government; its general policy being represented in the Growth and Transformation Plan. In addition, I explained in chapter two that it is argued that government policies are a useful focus for innovation in developing countries, as the markets are often not organized in a way that is conducive to innovation processes.

The innovation culture in place is to be compared to what it 'ought to be' according to the national development policies. An additional reason I chose to compare the innovation culture to

what the government has planned for the university is that I believe that ownership and national autonomy is crucial. The development strategies of the nation itself should be the main focus. Especially in the context of Ethiopia, which has always retained a high level of autonomy towards NGOs, IGOs and the international community, imposing ideas would most likely be unsuccessful. In addition, the strategy the Ethiopian government is implementing is grounded in scholarly analysis of the current situation and, when taking into account different perspectives on development and growth, has great promise of being successful. When using this model in a different context, it should be considered whether the goals and aims of the government should be the main focus, or whether these should be formulated based on different actors. This can, for example, happen when marginalised groups don't benefit from a university system and the government does not promote change in that area. You might then choose to formulate goals and aims relevant to that group.

Input

In order to attain the goals as presented in the goals and aims section, certain inputs are used to achieve these. This section concerns the 'tangible' inputs going into the program based on the policies developed.

Curriculum

The curriculum is a central factor in any university. It determines what kind of topics students are taught and how theoretical or practical their knowledge base becomes. It is also a political issue, as there are always preferences in a university, which need to be balanced with what policy requires the universities to teach. Curriculum development and revision is therefore, an important influence on both students and staff at a university.

Facilities

The facilities in a university are an important factor in how successful a curriculum can be implemented. If there is a mismatch between what is required from the curriculum, the number of students and/or the number and quality of the facilities. This determines to a great extent whether students are able to learn what they are 'supposed to'.

Staff

Using the curriculum and facilities, staff members are the ones responsible for the organization of the institute and teaching the classes. In addition, they are important for the research output of a university. Next to student's innovative behaviour, staff usually does research in the name of the university to enhance the national innovation system and process. This section is meant for the analysis of the quality of staff members, related to their education levels, their availability and motivation to teach.

Students

Students are one of the 'products' produced by the university. They are the future possible innovators in the country and will determine to a great extent future developments in the development in their sector in the future. This is even more important in developing countries, as often these students are one of the first generations to get a chance at this high a level of education. The model is to analyse the students' innovation culture at present, while this section is mostly concerned with the way students come into the university. It concerns their background, education levels and motivation to get into the program studies. This has a high influence on the way they go through the university system and create and maintain a certain innovation culture.

Process

The learning process is identified by Vroeijenstein (2003) as what sets the study of learning institutions like universities apart from other enterprises. The process influences the quality of education, but also the culture in the institute and the innovative discourse and behaviour reflected by students. I see the learning process as what happens in-between the material inputs that are put into the program and the output of innovation culture. It concerns the influence of immaterial factors in the university, like teaching methods, the instilment of a certain mind-set and the attitude towards spontaneous incorporation of new knowledge. In sum, it concerns the daily experience of learning within the program.

Mind-set

If we look at theories on innovation, we see that a certain mind-set can lead to different innovation outcomes. This section is on what kind of research mind-set is instilled in students, either through personal development or external influence from the university. It concerns whether students feel research and innovation is important and whether they learn how to do this, and how innovative the research is they do in their program.

Incorporation of new knowledge

If students are to become future innovators, they need to have current knowledge on what is happening in their field. This can be incorporated into the curriculum, but can also be instilled in different ways through the learning process. This section concerns what is done in addition to the curriculum and organization to provide students with this knowledge.

Teaching methods

Because we are looking at a certain mind-set, teaching methods are an important factor in the way students learn about and think about a topic. This section concerns how student- or teacher centred classes are, related to interactivity between students and teachers, and the general relationship between students and teachers. This can for example be a very open, closed or one-sided relationship can be very hierarchical or egalitarian.

Outputs

This section of the model concerns the output of innovation culture. This is to be compared with the goals and aims formulated in the first section to see whether these are met. It is likely to find that some goals are met and some are not. Using the integration, differentiation and fragmentation approaches give insight into the structures that influence the inputs and learning process to eventually lead to this output of discourse and behaviour.

Discourse

Discourse concerns how people talk about a certain topic. This section is part of the comparison with the goals and aims. Data is needed on how students define innovation, how they feel it should be used and whether they feel there is a relevant link between innovation and development.

Behaviour

Innovative behaviour is also compared to the goals and aims. It concerns innovative behaviour within and outside the university as seen by students, and their own present and expected future behaviour. In addition, it is telling to gather data from staff on their own innovative behaviour to see the more general research output of the university and it's function for society. However, student's behaviour is what is to be compared with the goals and aims.

Structures

The identification of structures is not part of the data collection process; this section of the model is to be used in the analysis only. The data gathered on the previous sections should be analysed using the three perspectives presented in chapter 2.4: **Integration**, **differentiation** and **fragmentation**. When using these it is possible to identify certain recurring structural factors that influence the innovation culture in different and interlinked ways. At the same time, they give insight into how these structures are changing through individual and group behaviour, and see opportunities for change that can inform policy, if that is the purpose of the study.

3.4 LIMITATIONS

There are a number of limitations regarding this study. Some occurred during data collection and some during analysis and presentation of the data. First and foremost, one of the most important limitations in doing research in Ethiopia in general is the relationship between citizens and the government. In the introductory chapter we already saw that Ethiopia can be seen as a highly imperfect democracy, where government has a high level of power and communal collective participation is one of the main goals. This is visible in interviews and daily life, as people are clearly hesitant to utter any critique on government policy and implementation. During my research, it was clear in interviews with both students and staff that this was an issue. However, when promising anonymity people were often willing to give their honest view on government action and it's relation to the development of the country. One reason for this may also be that the target population is students, who are traditionally more resistant to government domination. Across the world, but also specifically in the history of Ethiopia, revolutionary action has usually been undertaken by the student population.

Another limitation was the abundance of policy documents, which were often not translated into English. This was especially relevant for the second Growth and Transformation Plan. It was released in the summer of 2015 but only recently became available in English through the World Bank website. Fortunately, a good friend was able to provide me with the Education Sector Development Plan 5, a document derived from the GTP2 but with a specific focus on the education sector. In the end, this provided enough data to continue data collection based on a comparison with policy in place.

A final limitation in terms of data collection was the language barrier. Students in Ethiopia, and especially in Addis Ababa, have a relatively good proficiency of the English language. This is required, as all education in Ethiopia is officially taught in English. However, some students' knowledge of English is still limited. This is especially relevant for students coming from remote areas, where education is often of much lower quality than in the city. This hinders their education, and was sometimes a problem during interviews. Still, if it became clear they did not understand the question I posed it in a different way until I received an answer that reflected the question posed. In the end, the language barrier was possible to overcome. Still, for the students that had some difficulty they could have probably provided me with more extensive explanations had they had the confidence and ability to do so.

In terms of data analysis, the problem lies in the richness of the data. All interviews were recorded and these quotes in themselves have great value from an anthropological perspective. Before interpreting and analyzing the data, I would have been pleased to present the reader of this thesis with what was actually said, in the words of my participants. These were often extraordinary people with such valuable words that a pure description would be fit. However, readability and word limitations inhibit this. I would therefore recommend, if interested, keeping the appendix at hand while reading the data section, as additional quotes are presented there.

Another problem is that the interviews were semi-structured, and therefore many additional topics were eventually discussed. Large parts of this data are not used to keep the

focus of the study limited. A lot more could be said however, on the concept of innovation and it's ideal uses and the role of the university and government in society, while the main focus now remains on the discrepancy between the goal and aims of the institute, explanation of this and opportunities for change in this specific context. I could also elaborate more on how the model was revised during the process based on the data already available and my experiences in using the model practically. Unfortunately, this thesis does not provide enough space to elaborate on this too much.

3.5 ONTOLOGICAL APPROACH: CRITICAL REALISM

This research was conducted keeping critical realist ontology in mind. This means there is the assumption of a real world out there, independent of our knowledge of it. This reality consists of events and objects such as structures that influence reality in a not necessarily linear way. However, as social situations are not controllable or closed but socially constructed, critical realism acknowledges that the knowledge we acquire is inherently fallible and dependent on these social constructions. In other words, 'although we always perceive the world from a particular viewpoint, the world acts back on us to constrain the points of view that are possible'[110]. This view became especially clear in this project during the interviews. In later chapters, I explain how students often present dichotomous relations with students showing behavior that is seen as negative. The social situation of the interview may inhibit them from admitting they also present such behavior. In addition, critique on government is not socially accepted in most situations, which sometimes inhibits honest critiques on policy and policy implementation. My status as a young student myself resolved this partially, as both staff and students seemed comfortable and relatively honest in their critiques on government and management. Still, the social situation needs to be considered and I realize I can approach the lived reality only partially.

One of the things that makes critical realist studies interesting to me, is that although we see a certain reality, or at least try to approach this reality as closely as possible, the situation is not seen as 'fixed'[111]. A crucial part of this research is therefore to look for systems that offer opportunity for change, and see if there are opportunities available to change these. As we see from theory on cultures in organizations, these changes can come top-down from a management position, but groups or individuals can also provide opportunities through divergence.

In using critical realism for a case study, certain steps need to be taken[112]. First, the boundaries of the phenomenon to be studied, in this case the innovation culture of students at the Addis Ababa Institute of Technology's civil engineering department. Then, a question needs to be formulated that includes questioning the cause of events. Third, there needs to be a clear unit of analysis, namely identifying the object(s) to be studied. In this project a model has been created during the first steps of data collection to provide an overview of objects. Then the data collection takes place, with a flexible stance towards the type of data that can be gathered. Finally, data is interpreted and we can search for explanations. Here it becomes relevant that we recognize the nature of the knowledge that has been acquired as being fallible, as has been mentioned before.

Taking a critical realist approach means the focus of this projects is on events, that are influenced by different objects, or mechanisms[113]. When analyzing culture herein, structures can be seen as the objects while discourse and behavior can be seen as events. From the data events emerge that are analyzed to identify the underlying structures (objects) working through these. The model presented in chapter 2.5 is meant to enable simplifying this process by providing a step-by step tool for data collection and analysis.

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[110] Seale (1999): *Quality in Qualitative Research*. Qualitative Inquiry, Volume 5 Number 4, 1999 465-478 © 1999 Sage Publications, Inc. – p470

[111] Easton, . (2010): *Critical Realism in Case Study Research.* Industrial Marketing Management 39 (2010) 118–128

[112] " " – p122

[113] " "

3.8 METHODS

Five methods were used in this project. The data collection concerns 1) observation during classes and more generally in daily activities and interaction, 2) interviews with students, staff and a policy maker and 3) the gathering of relevant policy documents. For data analysis I used 4) the software program Nvivo8. I coded the data according to the section of the model; the results of this are presented in chapter 4. Finally, 5) the model can be seen as an overarching method guiding the step-by-step use of the four methods just explained. For an overview of the gathered data, see Table 1.

Overview of Data Collection	
Interviews	**Total: 22**
Staff	5
Undergraduate Students	10
Postgraduate Students	6
Coordinator of engineering education policy	1
Observations	**Total: 6**
Undergraduate classes	3
Postgraduate classes	2
General day-to-day interaction	1
Policy Documents	**Total: 3**
Growth and Transformation Plan (GTP) 1	1
Growth and Transformation Plan (GTP) 2	1
Education Sector Development Plan (ESDP) 5	1

Interviews took place around campus. Semi-structured interviews were conducted, where the list of topics was constantly revised according to the further development of the model. There were five interviews conducted with staff members, including the dean of the civil engineering department. Ten interviews were conducted with undergraduate students, six with postgraduate students. In addition, one interview was conducted with a policy coordinator.

Observations took place in daily interaction with students, staff and others I met while conducting fieldwork. In addition, three undergraduate and 2 postgraduate classes were attended. The focus was on every element of the class, but mainly on the teaching methods, the relationship between students and teachers and the nature of knowledge that is being taught.

Policy documents developed by the national government were gathered, both policy formulated for the country in general and specifically for the higher education sector. Unfortunately, it was difficult acquiring these documents from the government itself, but I was fortunately provided with the relevant documents through an acquaintance of mine and through the World Bank website.

3.9 ETHICS

A crucial ethical element for this project is that social science research influences processes outside of the academic world. Results may influence behavior of international organizations, government policy or multinationals. It is therefore always important to find a balance between the responsibilities I have towards my informants and towards these other parties[114].

Second, although the topic of this project seems relatively neutral, in the field this turned out different. Government policy and daily life are heavily interwoven, and any critiques of policy or policy implementation can be seen as negative. It was therefore important to meet with students and staff off-campus as much as possible. This was done by selecting a few restaurants

[114] Caplan, P. (2004). *The Ethics of Anthropology.* Routledge, London. – p15

in the street where interviews could be conducted safely. It is also important that the identity of my participants is protected and is not reflected in this thesis. Interviews are therefore reflected with numbers, such as ‘interview 10’ or ‘interview 4’ instead of reflecting their names.

CHAPTER 4. INNOVATION CULTURE: DATA PRESENTATION

In this chapter the data that was collected on the elements of the model are presented. Data was gathered per section of the model. If needed, the operationalization in chapter 3.3 explains the relevance of the sections and their connections further.

The goals and aims section discusses policies or general goals and aims that are to be compared with innovative outputs. The inputs section reflects the material inputs put into the university or program that are supposed to enable policy implementation. The learning process is what sets universities apart as a specific type of organization, and concerns the immaterial factors in the daily reality of learning in the program. Finally, the aforementioned elements, in combination with underlying structures, results in the observable output of innovation culture: discourse and behaviour. These elements are to be compared with the goals and aims to see where discrepancies lie and where change is desired and offered.

One of the main findings in this chapter is that there is a discrepancy between the goals and aims of the AAIT and the output of discourse and behaviour. This discrepancy is most obvious in data on behaviour surrounding innovation, less obvious when discussing discourse. Structures are introduced in chapter 5 as the explanatory factor for this discrepancy. In that chapter I discuss which structures can be identified and how they influence innovation culture as emerging from the data presented in this chapter.

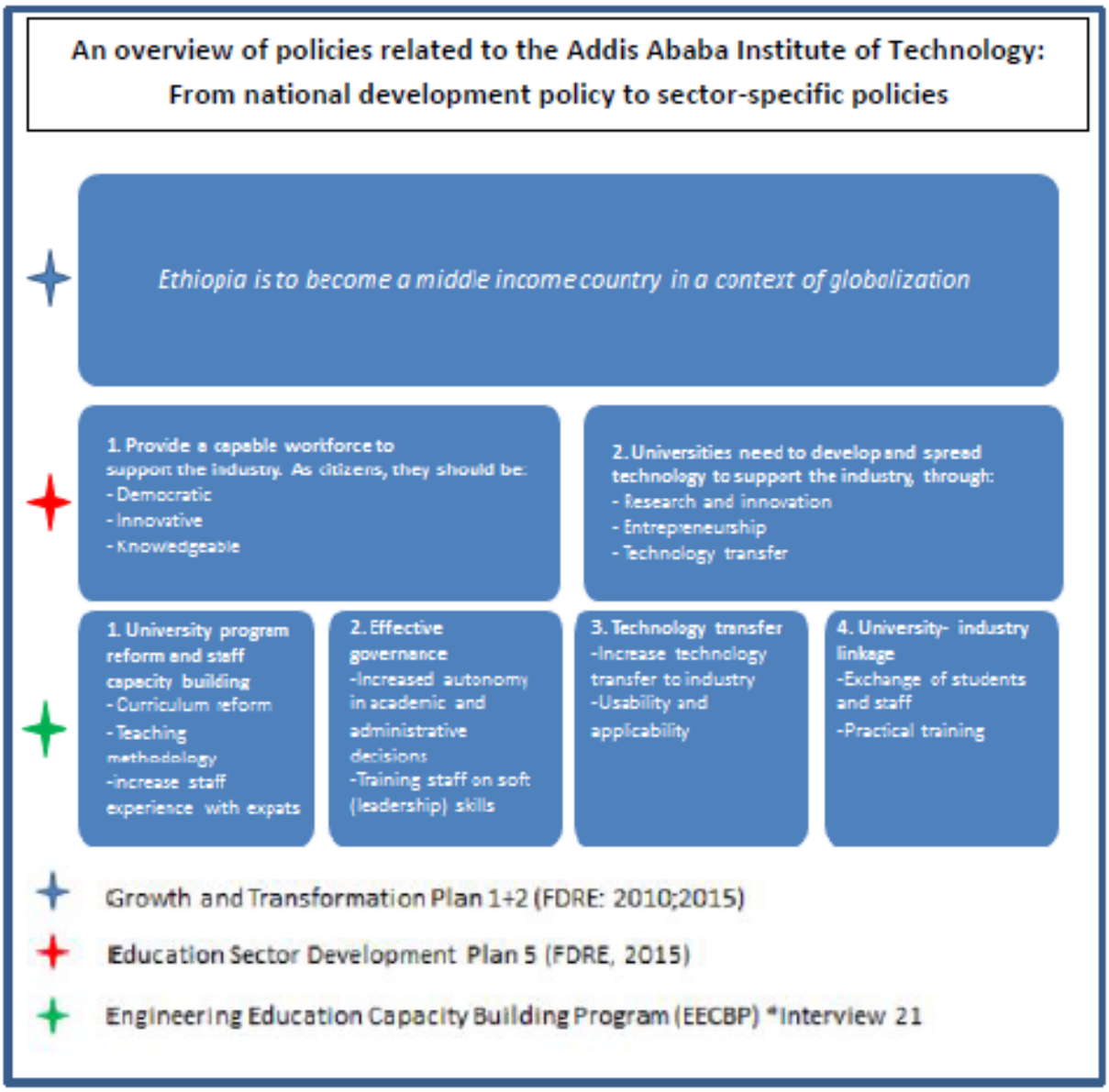
Many findings are illustrated by quotes copied from interviews with participants. In addition, you can find quotes in appendix one that are related to the topic. References are made to these quotes in footnotes. This choice was made from a cultural and anthropological standpoint. Although this project is too limited to produce a full ethnography on civil engineering students, it is my aim to approach an emic perspective as much as possible. I therefore feel that it is important to present the data in participants' own words as much as far as I can before presenting my analysis to the reader.

4.1 GOALS AND AIMS

In this section, the goals and aims of the AAIT are presented. In this particular project the focus is on government policies. These are highly relevant in the AAIT because it is a government institution and in the case of the Ethiopian government their influence is pervasive. Relevant policies stem from the national development strategy, from which all subsequent policies are derived. In addition, I feel goals and aims should stem from national initiatives in order to increase ownership and make the most use of local knowledge.

Government Policy

This section is based on a content analysis of policy documents published by the FDRE Ministry and an interview with a policy maker on technical higher education. The idea is that the innovation culture in place can be compared to what the innovation culture in the University should look like according to the goals and aims of the institute. Here, I discuss the priority program on higher education in Ethiopia as part of an overarching policy on education, which is itself a component of the national development strategy, the Growth and Transformation Plan (GTP) of Ethiopia. Available for this project were the complete document of the first version of the GTP, presenting the phase from 2010 to 2015, and the Education Sector Development Plan as document derived from the GTP2, representing the phase from 2015 to 2020. In addition, data was gathered through an interview with a policy maker at the Ministry of Education, working on the engineering education capacity building program. For a general overview of the policies analysed, see the figure below. Each section is explained further below.



GTP1

I will first discuss the content on education presented in the GTP 1, to give a clear context to the policy documents formulated later on. Crucially, the first sentence of the GTP 1's introduction is that 'the main development agenda of the Ethiopian government is poverty eradication. All the country's development policies are, therefore, geared towards this end' [115]. If we look at the section on the role of education herein though, we see that the goal is reformulated into 'making Ethiopia into a Middle Income Economy'[116].

According to this document, general education can contribute to achieving this goal by providing a workforce necessary for the industry required: 'the next five year education sector development program, ESDP IV, has the goal of producing democratic, efficient and effective, knowledge based, inspired and innovative citizens who can contribute to the realization of the long term vision of making Ethiopia into a Middle Income Economy. It focuses on educating

[115] World Bank (2011): *The Federal Democratic Republic of Ethiopia Joint IDA-AMF Staff Advisory Note on the Growth and Transformation Plan (GTP) (2010/11–2014/15).* Document of the World Bank. - pVII

[116] World Bank (2011): *The Federal Democratic Republic of Ethiopia Joint IDA-AMF Staff Advisory Note on the Growth and Transformation Plan (GTP) (2010/11–2014/15).* Document of the World Bank. – p49

and/or training the workforce that is demanded by industry, particularly the growing manufacturing industry, at all levels'.

The university then, is meant to provide a workforce aiding in the industrialization of the country. One of the policies meant to achieve this is the 70/30 policy, where 70% of students should be enrolled in scientific programs, when 30% is enrolled in other programs like cultural and historical studies. Surprisingly, this 70/30 policy is only briefly mentioned in the GTP itself, but is often mentioned, as have far-reaching consequences on the higher education system [117].

GTP 2

In the fall of 2015 the second Growth and Transformation Plan has been released. The second GTP will also be implemented for 5 years, it is meant for the period until 2020. Unfortunately, the only review of the GTP 1 policy on education is on numbers, reflecting increases in enrolment rates in both basic and higher education[118]. There are no comments related to the quality of education or the mind-set of graduates. There are also no comments made on the output of technology and the affectivity of technology transfer. This again confirms we can speak of a knowledge gap. Quality is an element of the policy, but is not evaluated properly and presented in following policy documents.

If we look at the general aim of the GTP 2, we see this is now formulated as 'becoming a middle-income country by 2025'[119]. Poverty eradication is only mentioned once, in the subsection on capacity building and good governance[120], but is no longer a main aim of the GTP nor is it mentioned in the introduction. The section dealing specifically with the education sector now mentions as its main goal to build 'an education and training system which assures quality and equity in education by the year 2019/2020 which aims at producing competent citizens'. Access, quality and relevance are the main pillars of all education level polices[121]. The difference between GTP 1 and 2 is mostly in the increased attention to quality education, although it is not clear how that will be done while also still increasing enrolment rates.

Education Sector Development Plan 5

The Education Sector Development Plan 5 (ESDP 5)[122] is the document dealing specifically with policies on education, derived from the more general GTP policies. The main problem in education as identified by policy makers is that globalization causes changes and poses challenges that require 'a generation of competent individuals'[123]. According to policy makers, universities can offer a solution to these challenges by increasing human capital and generating and applying knowledge relevant to the community.

One of the policies that are meant to increase the universities' role is attention to 'research, technology transfer and community engagement'. The problem addressed is that Universities are currently not fulfilling the role in technology transfer and community engagement that the government feels is necessary to keep up with the development of the country[124]. The introduction to this policy shows that the cause of the problem is identified by policy makers as a lack of funding for research, and a disconnect with industry and the rest of the education system [125]. We see here that the university is to have a dual function: First, providing a capable workforce of 'competent citizens'. From the GTP, we have learnt that this

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[117] See appendix 1 for quote nr.1
[118] " " – p12
[119] " " – p16
[120] " " – p44
[121] " " – p41
[122] FDRE, Minstry of Education (2015): *ESDP V, Draft 22 June 2015 GTP 2*. FDRE Ministry of Education. Addis Ababa, Ethiopia
[123] World Bank (2011): *The Federal Democratic Republic of Ethiopia Joint IDA-AMF Staff Advisory Note on the Growth and Transformation Plan (GTP) (2010/11–2014/15).* Document of the World Bank. – p80
[124] FDRE, Minstry of Education (2015): *ESDP V, Draft 22 June 2015 GTP 2*. FDRE Ministry of Education. Addis Ababa, Ethiopia. – p80
[125] " " – p85

means democratic, innovative and knowledge based individuals. Second, the university is to play a central role in knowledge creation and diffusion. See figure 4 for a schematic overview.

Engineering Education Capacity Building Program (EECBP)

To achieve the goals set for technological institutes offering engineering programs, the Engineering Education Capacity Building Program (EECBP) was set up in 2004 in cooperation with the German government. This program is still running and an interview with the program coordinator gives us insight into the goals and aims of these institutes during and before the GTP1 policy period. The program coordinator[126] explained how the German government provided consultants for policy development. Together, the ministry and German consultants identified 5 major challenges in the engineering education sector:

1. Education was very theoretical, while it needed to be practical to provide knowledge to the industry.
2. There is a weak link between education institutes and the industry.
3. Academics in the engineering field are mentioned as 'low profiled'. They are not visible and do not conduct the necessary research
4. The system is highly bureaucratic, with many command chains
5. Institutes have a weak infrastructure and facilities

Four reform packages have been introduced to deal with these challenges; these are reflected in figure 1.

The idea behind this policy is that it is a cooperative effort between Ethiopia and Germany, where knowledge- and experience sharing is affected through the exchange of staff and the appointment of a German scientific director in the institutes of technology (IoTs). These German directors could share experience concerning leadership, technology transfer and university-industry linkages and increase linkages between IoTs internationally. Unfortunately, this programme has not been entirely successful at the AAIT, the last scientific director having resigned in 2015, now leaving an Ethiopian professor to do the job. Meanwhile, the position of managing director, responsible for the organization the administrative section of the IoT, is from Korea. As presented in the quote below, the EECBP program coordinator argues this has been not as effective as intended due to the lack of a good supporting team[127].

> *'The IoT structure has two wings. One is focusing on the academic, the scientific director, one is focusing on the administration. That is the managing director. So the IoTs at that time understood that need to decide by a foreigner especially the Germans because they have a good experience in technology areas in the engineering discipline. This is a tension. They were needed, but they need to have also a crew, a team to mobilize, to bring on board on this change process the establishment of the technology institute in Addis.*
>
> *So under this framework, every scientific director has created a transformation plan. For three year or for 5 years. So based on that they have implemented the reform program. And so this approach was started 6 years ago. Now it is going on. The government cannot harvest what he wants to get on the ground because of so many challenges. Simply the deployment of foreigners as a position of leadership cannot bring such big change. They need to have a team, a crew who can mobilize the academic staff and administration staff for one objective. This is what we lack because the expats role is extremely expensive. So it is difficult to bring...'*

[126] Interview 21
[127] Interview 21

In terms of the policy focus on innovation, the IoTs play a central role. The insinuation here was that a lack of capabilities and funding is prohibiting them in this role[128].

> *'Innovation is one of the major issues for many IoT. They need to focus, they need to see the potential. Especially a person who is dealing with research, they need to see how to tackle the challenges. One is imitation, copy innovation and the like. Research cannot be done only for personal profiles. They need to support the other stakeholders as well. So there is ladder to do innovation, first as I said before, engineers need to touch everything, need to feel what it looks like the thing. Need to use all his senses. They need to build this practical knowledge, practical skills and the like. Then after that, they can go to imitation, copy, innovation. For this purpose we need have enough time, you need to have a dedication for practical things, need to have of course a budget.'*

To summarize, the goals of the AAIT are formulated in national policy on different levels of governance. The overarching policy is presented in the GTP 1 and 2, which show the higher education system has a general goal of providing a workforce for the industry and creating an effective process of technology transfer to support the industry, with the ultimate goal of becoming a middle income country. Policies for the higher education system in general therefore include 1) staff capacity building, 2) building a national research agenda, and 3) institutionalizing stakeholder engagement. If we look specifically at the policies regarding the IoTs and therefore the AAIT, we see four relevant policies emerge: 1) staff capacity building and program reform, 2) increasing effective governance, 3) increasing technology transfer and 4) increasing university and industry linkage. For an overview of policies, see Figure2.

4.2 INPUTS

This chapter discusses the views of students and staff in the civil engineering program of the AAIT concerning material inputs into the program. First, I discuss the curriculum.

4.2.1 Curriculum

The focus of this section is whether the curriculum provides opportunity for students to gain knowledge that allows them to join the workforce after completing their program, whether students are able to conduct research relevant to the industry, and whether entrepreneurship is sufficiently promoted and taught, as is reflected a**s** the goal of the program. It also shows how the curriculum is set up, considering the new autonomous structure of the university as mentioned in the goals and aims. An interview with a staff member gave insight into the general structure of the curriculum of the AAIT [129]. The civil engineering program at the AAIT is built up of a five-year bachelor program and five postgraduate programs covering the topics of structural, geotechnical, road- and support, construction and water engineering. The classes in these programs are built up out of theoretical classes and tutorials, the latter providing insight into field- and laboratory work. The bachelor program is finished with a thesis project and an internship in the private sector in order for students to gain more practical experience. However, interviews with students have shown many feel this does not provide them with enough practical experience for the field.

An interview with a staff member[130] gave insight into the way in which the curriculum is revised under the new autonomous status of the AAIT that was described in the last chapter. As

[128] Interview 21
[129] See appendix 1, quote nr 2
[130] Interview 3

it turns out, the freedom to change the curriculum is limited by some far-reaching standardized demands, which cause them to only make minor revisions based on their own goals as an institute. The fact that this revision process is lacking also shows in the curricula of the different programs, both the undergraduate and graduate curricula show that not much attention has been given to revision. For example, many curricula have an incorrect number of postgraduate programs presented in their introduction, showing it is an old text where the new programs are not yet included.

With the students, topics were discussed regarding practical experience and research skills, and whether they feel entrepreneurship is promoted through the curriculum. First of all, students explain that they feel practical experience incorporated into the curriculum is not sufficient. There are four ways to gain practical experience: First, there are classes that are meant to increase practical experience through lab experiments and research. Second, there is an internship at the end of the 5th year of civil engineering, in which students are linked to companies and they will join them for one semester. Third, students carry out extra-curricular activities, often consisting of internships during the summer. Finally, students will write a thesis at the end of their bachelor program, which sometimes involves lab work. In the textbox, first year postgraduate student Abeba explains how he experienced this curriculum[131]. Mary, a 5th year student in the civil engineering department, explains how different this experience was from what she had expected [132].

Abeba: 'Eh.. yeah.. ok the thing is, AAU is usually intensive on the theoretical aspects. Regarding the practical aspects they give us a semester to go out and experience the internship program, so for me personally, I tried to look at the different aspects of civil engineering so in the summers I used to do intern in a company that worked on multi-partner buildings, so buildings related to civil engineering work, so I tried that. And on my former internship program I did highway related projects. And so on my thesis I did material related type of testing. So as much as I can I try to look at different things. But looking at these things I think it's safe to say that the practical aspect of the engineering course at AAU is not.. as good as it should be. So yeah.. the internship is ok but it's not good enough.'

Mary: 'Actually, 70/30, 70% satisfied. And.. I think it's a shame that we haven't practiced any things, especially the things in laboratories. We are taking water treatment, water supply courses, soil mechanics courses.. but we haven't.. I was expecting to learn a lot. I was excited to get into labs, and actually getting my hands dirty, do something.. but I haven't got the chance to do that. So I'm sad about that but still 70% satisfied.'

[131] Interview 15
[132] Interview 9

In terms of promoting entrepreneurship, one course was mentioned to promote and prepare students for entrepreneurship in the future. Mostly however, the course was not experienced as sufficient to actually become an entrepreneur after graduation. Still, many were planning to start their own companies in the future[133]. I discuss this further in chapter 4.4.2 on behaviour.

> *'We just started entrepreneurship last year, they started with our batch. But I don't know about the other people, it sounds.. something fake. You can do this.. this.. this much to build huge things.. it's not practical. We listen, study for exams but we don't have good examples out here, like people who make honest money like that. So you don't know that.. we know honest money does not exist so..'*

In sum, the curriculum is developed on a national level, while the AAIT is autonomous in the curriculum revision process only to a limited extent. Within the curriculum, efforts are made to provide students with entrepreneurship, practical- and research skills but students still experience a lack of knowledge in these areas. The next section provides insight into what facilities are available to support these efforts and what may be part of the reason students still experience a knowledge gap in practical terms.

4.2.2. Facilities

In any university, facilities are provided to be able to offer the curriculum developed for the programs. When students were asked about facilities, they were often unsatisfied with the laboratory facilities and the number of teachers provided to teach the curriculum. This results in classes that are too large and very limited experience gained from the laboratory courses. In the latter, experiments are demonstrated to the students by the lecturer in a lab. Students get to see experiments but due to their numbers and the limited facilities they are only able to demonstrate and not practice [134]'[135]. This was also addressed by staff members, as is shown in the textbox[136].

> *Student: 'The lecturers, they try the hardest. They try to make it practical but there are no resources, no.. materials or laboratories enough in the institute. So it's all theoretical, not so practical (…) There are lab classes, but they are not that much.. When you go to the lab there will be 60/70 people with one instructor so you don't get to do the things, we just watch.'*
>
> *Staff member: 'This used to be all practical experience students would conduct themselves, but the number of students has multiplied by 8 now (when I graduated we were 86, last year we had 792 graduates). Most experiments are now only demonstrated by lecturers due to a lack of capacity in this school.'*

Interviews from staff members usually reflected a shortage of funding for the hiring of sufficient and competent staff, funding for research and laboratory facilities. One staff member who

[133] Interview 16
[134] Interview 9
[135] See appendix 1 quotes 3 to 5
[136] Interview 1

started his own technology company commented the following on not being able to acquire research funding through the university for his own research project [137].

> *'Eh… there isn't such regiment. Not here. Now there is a new trend, like there is.. the university has established an incubation centre. That started, to take tenants and realize their ideas and turn it into business. I was one of the selected tenants, the selected people to join the incubations centre. But it has been 3 years now…. Nothing else happens. Nothing happens at the university so I opted for*

4.2.3. Students

One of the most influential features of the AAIT civil engineering student body is that the number of students has grown tremendously over the past years, often not in line with the Universities' capacity. This is a problem often addressed in interviews with staff members. One example is a staff member commenting there was a focus on ambitious numbers, influencing the quality of education[138]. Luckily, the same staff member does see improvement in the past and coming years, to do with an increase in the number of Universities offering civil engineering programs. This allows the students to be divided across the country more according the places available [139].

Unfortunately, graduating the required number of students each years has influenced the quality of education in a different way as well. As is shown in the textbox, incorporating more students means students from a different educational background also need to be enrolled, and subsequently graduate[140].

> *'I mean, the university has to be a level where they really incorporate all different students coming from different backgrounds, so for some it may be easy and for others it's not. But they graduate anyways.. eh.. hundreds.. I mean.. yeah.. like I said. To pass the exams, once you do the system, for example you have a certain scientific concept, and you have certain questions, based on those questions for the exam you will be prepared, so for example if you don't want to bother with all the questions or the science and everything, last resort you can look at how the questions are done. and then you can sit for the exams, a number or 2 might have changed, and then you can just practice it. Almost everybody has done a course like this. Without really understanding the science. You just pass the exams because you've seen some questions being done.'*

[137] See appendix 1 quote 6
[138] See appendix 1 quote 6
[139] See appendix 1 quote 7
[140] Interview 15

As a staff member commented, after coming from a marginalized area these students experience this marginalization within the university as well[141]:

> *'Students from Addis they tend to do pretty well because they had a good English background. When it comes to writing, expressing themselves, presentations, that kind of stuff, anybody from the city is going to do well because they are more comfortable. The other thing about Addis Ababa University is.. if you are from Addis, you already know the area, you are familiar with it, you have a circle of friends who can help each other out, they tend to live with their families and have more comfort. The students from other parts have some issues with housing, with this kind of things. So usually the Addis students tend to do better, they tend to help each other better, even cheating. They can work together on exams, everything. So the background matters in engineering.'*

Another relevant factor is the motivation for students to join the program. We see that there are several factors that influence students' choice for a scientific discipline. It starts with certain programs being more popular because of their future employment opportunities and the acquired status of that sector, and ends with assigning students to certain programs on a national level according to the 70/30 policy[142].

> *'Well.. you see.. it's kind of a thing here that if you have good grades, science stuff gives you value, familywise, your family wants an engineer, or a doctor or something. So.. it's like.. they put up some pressure from the family and the whole society pushes you to that so yeah.. in high school, there is like 20 only art students, and in engineering and medicine we have like.. what.. 60 or something. So it's like.. what can I do'*
> (so that's the 70/30 policy playing out?) *'Yeah! We went through that, man!'*

This process, where limited options are given to students, ending in assigning them to programs based purely on grades instead of motivation is said to influence students' creativity and attitude towards their education [143]. The same student explains[144]:

[141] Interview 3
[142] Interview 16
[143] See appendix 1 quotes 8 and 9
[144] Interview 16

'Eh.. just.. we need change, innovation. We need something that help us motiv... I mean most of us in engineering.. they don't even know why they're here, they're just killing time. And at least we need like.. honestly I just know about the calculations.. if I do this column by this proportion.. blabla.. but I have never seen anything done in a new way, any buildings built in a different way.. it's just a box building, but if we just saw something different, even in pictures, it would motivate. But we don't have that. (…) We need inspiration! There is nothing inspiring around us. There is one building around Piazza, an old-school building and everybody, if you ask them they will point out that. If only we had something…

There is some things that you love .. over time. You do it for a very long time, at some point you get into it. But here you don't have anything that makes you want to go on.. it's just hard work.

And about the motivation of students.. I feel like when we are young we have so many ideas, so many creativity, we are motivated to make choices. But as we get older we get less choices every year. In the end we lose out motivation to do new things and be creative.. I think that is a shame. Because we get no choices.'

4.2.4 Staff

This sections concerns the staff members hired to support the goals and aims of institute, using the available curriculum and facilities. First of all, there have been some issues with the implementations of the expat-management system. Students had little knowledge when asked about the management system, but a staff member commented[145] their influence has been limited. The reason he mentions is that although expat knowledge sharing is relevant for the institute, putting expats with limited experience in Ethiopia in a leadership position is 'underutilizing' their transformative capacity due to cultural differences, which obstruct the effective implementation of policy. In the section on goals and aims it became clear that policy makers see the reason for this is mainly a shortage of funding, which prevented them from hiring a competent team to support the expat scientific director. Regardless of the explanation, the last scientific director was German and had resigned before end of term. An Ethiopian professor has now replaced him, although the official policy still requires an expat scientific director.

Second, the data concerning teachers in the program showed an inconsistent picture. The quality of teachers differed greatly. Part of this has to do with the limited time in which the policies of the GTP are implemented. Especially in the beginning of GTP1 implementation, teachers were recruited straight after graduating from the bachelor's program. They started teaching first-year courses immediately, due to a lack of quality graduates available. This was reflected in student experiences [146]'[147]:

'Most of the teachers are not practised. There are graduates from the university, they will be our teachers. '

[145] See appendix 1 quote 10
[146] See appendix 1 quotes 11 and 12
[147] Interview 18

Another reason for the inconsistent behaviour of staff members could be found in their motivation. Similar to students, a first reason for limited motivation for teaching was how teachers are recruited based on grades only [148]. These graduates often became teachers because the university paid off their student loans granted for participation in the Bachelor's program. Without paying off these loans students would not receive an official diploma and are not able to enrol in other educational programs nationally or abroad[149].

> *'The thing is, you know what, when students graduates and if they got a 3.9 or 3.5, they are very distinctive students, the interest will be highest for them to become instructors, but it shouldn't be that way you know. Right after they get hired to the university to be instructors they get a chance to get a master's degree. Some people, I can say most of them. Got into this profession to get their masters you know, to get that, to benefit themselves, not to teach those students. So this culture should not be developed, that's why..'*

A staff member[150] commented on how the facilities, specifically teachers' salaries, also reinforces a certain attitude towards education[151]:

> *'Code of conduct .. well.. I'll be honest here but.. there's not that much structure that we follow. There is a problem with the academic society. We think that we are better than everybody. Everybody is kind of arrogant and they don't want to follow structure. Everybody thinks they are doing some kind of favour, because the salary is too small. They are kind of subsidizing the university, everybody feels that way. So with the code of conduct, for example attending classes regularly, eh.. you don't get to see everybody doing that. So coming to class on time.. getting out of class on time.. nobody follows that. Eh.. especially civil engineering is kind of different from the others, because the industry is big everybody works outside so nobody indulges in his professional activities in the university.*

Among students, there was some degree of understanding for the position teachers at the university find themselves in. As it turns out, the low pay given to teachers by the government leads them to be less motivated and forces them to take a second job in the private sector [152]' [153]:

> *'Yeah.. I think.. they are not careless but they have a lot of work to do, a lot of students. It's an overload of students.'*

[148] See appendix 1 for quote 13 and 14
[149] Interview 19
[150] Interview 3
[151] Interview 3
[152] See appendix 1 for quote 15
[153] Interview 18

In sum, what I found was a very heterogeneous group of staff members. It was a mix of teachers either missing motivation or education, and teachers having either one or both. A lot of this had to do with the shortage of teachers in the country and a shortage of funding to acquire quality teachers, also leading to a lack of motivation among existing staff members. On the other hand there are some professors who have been educated abroad and some expats hired in management positions. These were, however, argued to be under-utilized in the positions they were in now, either because the idea of expats in leadership positions is difficult or because of a lack of funding to solve this problem by hiring a qualified Ethiopian team to support management.

4.3 PROCESS

An important influence on the output of innovation culture is the learning process within the AAIT. Here, students are instilled with certain attitudes and skills needed to become an innovative workforce able to do relevant research.

4.3.1 Mindset

From the curriculum, we have seen that students received theoretical knowledge from classes and practical knowledge from lab experiments and an internship. The data presented here revolves around the question of how innovative the mind-set is that students gain from their program at the university as part of the learning process. Looking at the goals and aims, innovative efforts should be aimed at relevance to the industry; so practical knowledge and attitudes are crucial. Questions were posed in the way students learn, what they learn and whether this allows for this mind-set.

From the perspective of a staff member who has experienced the AAIT over the years as a student, teacher and now as part of the staff, the development of a research mind-set has improved significantly[154]. A younger staff member however, commented that students still were usually more experienced with theoretical knowledge, where practical research skills were limited[155]:

> *'Eh. From my point of view eh.. there is eh.. I can say that it's not as such. Innovation.. eh.. at this time the government encourages adopting new technologies or inventions, but when you see practically it's not as such.*
>
> *Eh.. I think they (the students) have good theoretical knowledge, but practically I think they will develop it after they start working. Eh.. because just here we don't have any.. we have.. but not in the scale we want it, the laboratory facilities or any other facilities, they have to learn by working so theoretically I think they are capable, but practically I think just.. after they graduate*

Still another staff member[156] claimed that in the current situation, it is mostly the nature of the students that determines whether they come out of the BSc program with a research mind-set and skills. Curious individuals take action to enhance their knowledge, sometimes supported by motivated staff members [157]. This implies that from the perspective of staff members, there is the possibility of gaining a certain research mind-set and the knowledge and experience necessary for that, but this is dependent on individual motivation and actions.

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[154] See appenidx 1 for quote 16
[155] Interview 2
[156] Interview 3
[157] See appendix 1 for quote 17

Among students, insights were gained when they were asked about the assignments they were given, and how research oriented they felt the program is. This confirmed how students do not feel pushed for research by the program. Dependent on individual student motivation, some do the extra effort to gain knowledge and experience in research and some mainly focus on graduating their exams [158]' [159]' [160]:

> *'No, it's really not. We just have to get the materials and copy paste that. We are expected to do that, we don't do any research. (…) I want to do that, but I just read a lot to do that. It's just kind of difficult right now because what we learn is not what we are expected in the job place to do.'*
>
> *'Eh.. you can say it's half-half.. usually the motivation comes from the students, they want to do new things, they want to try new things.. for example last year we do our thesis in reinforced concrete, in fiber-reinforced concrete polymers. There's this material that you put in concrete and then it has a chance to not make a concrete crack. When we first talked to the doctors in the institute, they didn't believe we could get the material because it is so costly. So the thing that we do is we contact some company, they sponsored us. So the initiation comes from you first, if you want something go for it and you will get it. So..'*

Although still limited, the focus on research seemed to improve in the postgraduate level. When PG students were asked to compare the UG program to their current program, it was clear that more attention was paid to practical research methods and projects [161]. This can also be explained by a higher quality team of staff members, where in PG more classes are taught by professors instead of fresh graduates.

4.3.2 Incorporation of new knowledge

If students are to develop an innovative mind-set conform to the goals and aims of their education level and research, they need to be presented with new knowledge and innovations in their field. The interviews with staff members have shown that the university often does the incorporation of new knowledge and keeping themselves up-to-date with their fields, but not as a requirement. It appears to depend on personal preference [162].

The same showed when students are asked about the incorporation of new knowledge. The experiences were very different. It was again clear that in postgraduate programs, where the education level of teachers is higher, the situation was better [163]. This is in line with what we see in staff members, there was no clear code of conduct regarding keeping up with actualities in the field and it depends on individual motivation and educational levels [164]:

> *'No basically they follow the materials they are given, there are some as I said. There are some teachers who add some things and try to show you some things.'*

[158] See appendix 1 quotes 18 and 19
[159] Interview 8
[160] Interview 19
[161] See appendix 1 quote 20
[162] See appendix 1 quote 21
[163] See appendix 1 quotes 22 and 23
[164] Interview 12

From the section on curriculum and revision it is clear that new knowledge is also not sufficiently incorporated through the official curriculum, as there is a low level of autonomy to do this in general, and the revision process is very limited.

4.3.3 Teaching methods

Teaching methods have a far-reaching influence on attitudes towards knowledge and research. A first finding in this area was gained through attending undergraduate and postgraduate classes. Here, I found that especially in the undergraduate classes, learning is very theoretical and teacher-centred. There is limited attention to interaction in the classes and when students are asked questions, which happens more in some classes than in others, they are often very unresponsive. Part of this has to do with the fact that teachers did not receive any training and did not have a uniform method of teaching, as we have seen in the previous sections. Another part of it can be explained by the relationship between teachers and students, which is influenced by power relations and culture [165]:

> *'Something about the culture at the institute, something you really should know, is that usually teachers eh.. in addition to be respected most teachers are feared because.. because you really don't want to play around with your grades. So students are really eh.. not exactly willing to challenge teachers and ask as many questions as they would have liked.. and with some teachers they.. I had some incompetent teachers, and with them students just don't see the point in asking question because they wouldn't be exactly answered. So for those two reasons classes are usually not interactive. So… yeah in this cultures usually goes to the PG classes. In UG the teachers know this so they don't ask questions, or they say if you have any questions raise your hand but nobody really raises any challenging questions. It is not as interactive as you would find in many different places.'*

The lack of organization, motivation and teacher training has led to a complicated relationship between students and teachers, where teachers are not approached for advice or criticized on behaviour and abuse of power [166]. Some teachers struggle to break this culture. One of the younger staff members commented on his approach to change the situation and creating a more informal interactive situation in the classroom[167].

[165] Interview 15
[166] See appendix 1 quotes 24 to 26
[167] Interview 3

'Eh.. I don't know.. I think the past.. it depends when they get to know you, most of them because I think I am young and I think I am eh.. tiny so.. everybody is not kind of eh.. they're not scared of me and they can talk to me and they can think of me as one of their friends. So after 2,3,4 classes they become friends with me and they start talking and they become more comfortable. And the thing is.. the thing is like I don't take attendances I just want students to come, and if they are interested they come. So most of my problem is eh.. sometimes the classes get full but it's not my students, its students from other sections.. so in that case most of the students become curious. So then they are interested by themselves, so I don't know if it's me or its just students who are curious but eh.. there are very good students.'

The previous culminates in a methods of teaching and learning that was called 'exam-focused', this was often mentioned in contrast to me asking about their experience of the AAIT as a research-focused education system[168] '[169].

'Mostly.. no it's is almost exam-centered teaching methods. The.. teachers mostly focus on exams and how a student can pass the exam on this program and course. And another.. even the students only focus on how to pass the exam. So mostly no.. it's not a god.. teaching methods. But.. I am speaking frontly, I speak what I feel haha'

'In the UG it was.. here it's individual work so you put your thought into it, but in the UG it's like.. groups, groups of 9, so some people do the work. Out of 9 only 2 people do the work. You work and the others just follow you and just put their names in honestly. '

4.4 OUTPUT

In this section, I discuss the 'observable' outputs of the innovation culture, namely innovation discourse and behaviour. Behaviour concerns both present and future behaviour as explained by students. Discourse concerns the conceptualization of innovation, what it is, what it should be and how it should be used. The 'unobservable' structures that influence this discourse and behaviour are discussed in chapter 6.

4.4.1 Discourse

For this section, students were asked about their conceptualization of innovation and the possible role of the AAIT therein. Further, questions were posed on innovation in Ethiopia and in the rest of the world, to see where students fit in the economic growth – sustainable growth continuum.

Students did not provide an official definition of innovation as used by the AAIT, but all had some ideas about what they feel the concept should entail. Staff members also do not give an official definition in interviews. This implies the AAIT does not have an official policy concerning teaching about innovation [170] '[171] '[172].

[168] Interview 11
[169] Interview 16
[170] See appendix 1 quote 27
[171] Interview 15
[172] Interview 8

'Innovation I believe that it's doing something in a more creative manner. eh… in a more.. effective and eh.. in a manner that really improves the way things are done. So innovation.. you can have innovation in virtually every aspect of work or education or anything. You main objective is to improve what is currently done. So.. yeah.. I'm not sure.. I don't think it's exactly similar to creativity but their similar, that's how I understand it. '

'I don't know.. I think its related with technologies and new things to be invented and problems being solved by invention. Using the science we know to solve problems. I think that's it.'

This is striking, as there is in fact an official framework for innovation developed by the government, where imitation and adaptation are central to the current process, while innovation contributing to the global knowledge base is set as a goal for the future. The policy maker that was interviewed argued that staff members at the AAIT should all know about this framework[173]. However, none of them mentioned it in interviews. Unfortunately it was not possible to ask them specifically for the framework before leaving the field.

Interestingly, the same policy maker acknowledges that students do not know about this framework. It is not included in the curriculum as he felt that students would see this as a distraction from their education. It is argued that education is student-centred, and because students would not like to be imposed with this framework during class, it has not been offered so far. Students are seen as exam-focused and cannot be distracted from this because they have to struggle for opportunities in the job market. However, he also claims the now resigned (expat) scientific director was asked to communicate the framework 2 years ago but has not done so. Again, there is a question of whose responsibility and decision it is to implement certain policies or, in this case, framework.

Still, I found a positive development in what students felt innovation should look like and what purpose it should serve. They mostly presented a very functional and inclusive picture. This means that even though it appears there is no official definition promoted by the institute, students still see innovation as a tool for development, which is in line with the more general goals and aims from a policy perspective [174] '[175]. This inclusive picture however, is paired with a very top-down approach of implementing the innovation process, where universities and government are usually mentioned as viable actors [176] ' [177].

[173] See appendix 1 quote 28
[174] See appendix 1 quotes 29 and 30
[175] Interview 18
[176] See appendix 1 quote 31
[177] Interview 16

'Hmm… in my idea innovation is to create and existing thing. That must be helpful, to improve the world, the innovation must be important for the world. If it's not important it's not innovation for me. (…)To be innovative you have to experience some terrible, just to think of something to be innovative. So for example, to invest in light, you need a lack of light. There are many terribles in this country. We have to do something for this culture, we have to think about something to be developed. Like they do in Kenya for example.'

'At the end of the day I think you need some connection to the government, because everything here is controlled by the government. From television, to electricity, water, telephone.. in other countries you have like more companies for this, here we only have one! So it's kind of new to me that that is different from other countries, here everything is controlled by the government.'

There were exceptions to this top-down way of thinking about innovation. It was argued that people who have more experience with poverty would have better ideas on how to come up with innovative ideas for inclusive development. Still, the initiative was seen as having to come from government, or possibly students [178] '[179].

'Ok, for example what I see is that in remote areas students that come from there or their families are farmers, they know better ways. So they are more innovative than us, the other students that live in town and cities. So when a person comes from a place with a lot of difficulties, it is much easier to be innovative because they see a lot of problems. So, according to their knowledge, they can come up with solutions, so they are more innovative.'

4.4.2. Behaviour

This section concerns present and future behaviour of students concerning innovation, and how they look at current innovative behaviour in Ethiopia and by the university. Students had little confidence in their abilities to become an innovative workforce in the industry or as entrepreneurs. They often did have innovative ambitions but in practice felt taking another direction could bring them more benefits and safety in the future.

Goal 1: An innovative workforce

In the previous section I explained students had an inclusive look on innovation but most do feel the process should happen top-down, with universities, government and industry being the lead actors. It also became clear that students felt there should be a change in the innovative behaviour in the engineering sector and the university. Current behaviour in the private sector was not seen as innovative, although foreign investors were seen as brining innovations to the country. The cause identified for a lack of innovativeness was that companies are run by uneducated business men, corruption and a certain mind-set towards 'new things' [180] '[181].

[178] See appendix 1 quote 32
[179] Interview 17
[180] See appendix 1 quote 33
[181] Interview 16

'There is no change, honestly though.. Just social-wise, but in the building stuff not that much. There was one convention I went to, they try to promote new systems, but I don't think it's practiced yet. They were just promoting it not using it so.. I don't know.. people don't like change here so much. So far what I've seen people don't like change. It's like.. something new comes and we say no until we get so many people telling us it works and then only it's accepted. That's why. We don't want to risk anything.

Technology-wise there so much improvement and stuff. At least during the old times they were honest, here it's like corrupt.. For example building-wise, you may have seen the condominiums. It takes 3 years before it cracks and stuff. So there it's not about doing new stuff it's just all about the money, in the big organizations. And the old stuff, the old buildings at least they are still standing. The new ones are cracked everywhere, it's like.. bad paint and stuff. So it's like people focus more the money rather than change.

(Government allows this because..?) *Oh.. Well.. we don't want to ask. It's like something.. it's hard to ask. Yeah, I mean.. ok.. the money they put into the building, like for example a couple of million, like for example 5 million, they put in 3 and keep the rest. So they find shortcuts to get easy money but don't care about the actual building. If you're not going to live in it what's the point of building it in the first place? I honestly don't see it as part of development because.. you can do that same thing the right way. It would last! I want to live in it.. not… I've even heard of one condominium was actually sunk before people moved in. How does that happen? That's just wrong..'*

It is clear students felt the civil engineering sector is currently not facilitating innovation processes. These students could offer great opportunity to transform the sector in the future. Unfortunately, many students did not feel they had a good chance of becoming an entrepreneur, or even being hired by a company. This became clear when they were asked about their capabilities and possibilities for the future. On the one hand, students felt companies do not take them seriously because of their lack of practical experience[182]. On the other hand, corruption and the hiring of family members makes it difficult for students to be hired by companies. Others claimed the problem lies in the fact that with so many graduating in the past years, the job market is already saturated [183].

Because of this, students often felt their opportunities in the job market are limited and they should focus on entrepreneurship. One of the policies in place is that entrepreneurship is promoted among students. Many indeed saw this as an option, and are planning to do so in the future. Others however, argued that their capabilities developed within the program does not prepare them for this [184] '[185].

[182] See appendix 1 quotes 34 to 36
[183] See appendix 1 quote 37
[184] See appendix 1 quotes 38 to 41
[185] Interview 13

'Yeah.. I think because most of the peoples working in this sector are not professionals still now. So the curriculum give this much students to replace those peoples and make the.. sector strong. Also I don't think it became full. Actually, I'm planning to build some private works. It's also possible I will get a government job.

It's hard to get my own company, but I am planning to do that. If I don't work in the private company it is nice to join in these works and start my own company. Yeah.. but that's what I am thinking about. I know there are some problems to get more experience in private sectors but I think my experience working in this association, I have a lot of contacts with the companies, construction companies, I don't think I will have a problem.'

However, some also claimed there is no mismatch between graduates and the job market, but that the problem lies in misinformation on what students' future careers should look like. Students receive very limited information about what the job market looks like[186]. The policy maker that I interviewed confirmed this claim [187].

Goal 2: Producing relevant research output

The other goal of the AAIT is to do research that is relevant to the industry. We have already seen that a problem in the inputs of the institute and a lack of motivation often causes students and staff to lack in this respect. A comment by a staff member gave insight into the innovative output of the institute [188].

[186] See appendix 1 quotes 42 to 44
[187] See appendix 1 quote 45
[188] Interview 1

'Ah.. I think.. it's good if you see it in 3 layers. In terms of capacity building, skilled or training, the institute is working very well. Especially in producing MSc level graduates. This is assisting the other federal universities in the regions, because there is so much shortage of faculties. Especially for the UG education. So in terms of this, I believe the institute is playing a very important role. In terms of producing educated people. Not PhD, but at masters level. This is one. And in terms of assisting the industry, in terms of consultancy, not research, but consultancy, there is also a moderate role. I won't say it's exemplary, I will say it's contributing at a moderate level.
Yes, I believe we are playing a good part in this regard. The issue with regard to PhD education and research. Innovation is part of that, almost I can say we are not touching this. We are trying to do some research, with almost no funds. No funds. So the research office, I would rather say, it has not grown much. I cannot say we are playing an important role in terms of eh.. like innovation or terms of producing our research and really using the industry for Implementing research outputs, I don't think we are using this.'

Other staff members confirmed that especially concerning research outputs, requirements are low and there are no consequences for not following the code of conduct, although research requirements are included in these [189]. Students also commented on the university's behaviour concerning research for the industry and innovation, both by students and staff. Usually, they either didn't know about research being used by the industry or didn't think relevant research happen at all. As I visited the library and noticed there were many thesis projects done by students, I decided to ask students about this myself. It turned out that whatever relevant research is done, does not leave the institute but stays in the library, leading to problems like project repetition and not learning from previous experience [190] '[191].

'They just.. do the exact same thing. Their papers are exactly similar actually. I saw the titles of their papers because I was interested in doing some research but its.. exact same thing they do similar things every year. And don't see any new things, any innovations on sites, on construction sites and so on. So I don't think they are making much of a difference but I think they can, actually I think they can.

A teacher in electrical engineering claimed this is not a problem just in civil engineering, but in the whole AAU. He argued there are many great projects being done but bureaucracy and incomplete policy implementation like the presentation of clear guidelines hinders the innovation process[192]. The result is that when innovative output that is relevant to the industry is proposed or even produced, the effects of these are still limited because the knowledge is not diffused. As it turns out, part of the problem lies in the private sector, but part of the problem comes also comes from within the university system itself.

I noticed the same mismatch when I look at the research done by students. Research is often being repeated or is very theoretical due to a lack of knowledge, motivation and/or

[189] See appendix 1 quotes 46 and 47
[190] See appendix 1 quotes 48 to 50
[191] Interview 8
[192] See appendix 1 quote 51

resources. In addition, there is a problem in spreading the knowledge and delivering relevant results [193]:

> *'Actually, whatever you do in the campus, it stays in the campus. The school has full right on it, it owns it basically it owns it. So even if you want to implement it somewhere else, you need full cooperation with the institute, the school.*
> *(They are not cooperative now?..) No, not at all.(…) No, you have to do more. More than the school to implement it.'*

A staff member explained this by comparing the institute to another institute in the city, with a focus on architectural engineering. These showcase projects and have a more extensive influence on the industry that the AAIT. The number of teachers and staff compared to the number of student entries, amount of structure and incentives was argued to make the difference [194].

One of the interviewed staff members feels this apparent mismatch between university and industry can only be solved through outside intervention and organization, specifically by government actors[195]. This is in contrast with where policy makers feel the responsibility lies. They explained to the universities and industries themselves as having to take action[196]:

> *'The academicians, the university guys, the technology faculty guys, need to go to the industries to get practical knowledge to support the industries. The industries experts need to go to the IoTs to give, to contact, practical training as well. The students who are learning they need to have one full semester of qualified internship program. They need to go to the industries, they need to learn the cultures before they graduates. They need to see, they need to touch the machines and the like. So all these linkages can be established under university-industry linkage'*

Challenging the status quo

Finally, I want to discuss some initiatives here that came up during fieldwork that show promise in changing the current innovative behaviour described by students, in both the university, the civil engineering sector and society in general. Most of these efforts are relatively new and still in the starting blocks, but offer significant opportunities for change. There are 6 initiatives I want to discuss here. First, an initiative called the URRAP, a government effort that was meant to improve infrastructure in an innovative way, both in technology and materials used, and organizational innovation. Second, there is the Ethiopian Association of Civil Engineers, a scholarly effort for introducing new technologies to the civil engineering sector. Third, the students association of the civil engineering department at the AAIT, set up a few years ago by a student and supported by the AAIT. Fourth, I want to discuss the electrical engineering lecturer at the AAIT that started his own engineering company with a mechanical engineer. Fifth, I want to discuss an individual effort of an engineer living outside of Addis Ababa, who creates his own innovations from his workplace in Hawassa. Finally, there are some promising projects done by

[193] Interview 10
[194] See appendix 1 quote 52
[195] See appendix 1 quote 53
[196] Interview 21

individual students that present a certain level of initiative and motivation that could make a big difference in the innovation culture.

1. Universal Rural Road Access Project (URRAP)

The URRAP project is one of the initiatives that can be seen as an effort to promote entrepreneurship among new graduates. The idea was to create small groups of graduate students with a few years' experience in the private sector. These groups could acquire funding from the government and would be assigned parts of the country that needed improved roads, in order to improve the infrastructure in countrysides. The aim was to use local materials and include local communities in building to roads in order to increase a sense of ownership over the roads and simultaneously give these remote areas an economic boost. Unfortunately, the project was experimental and some elements were not sufficiently thought through. This resulted in issues that we also see in the private engineering sector and in the AAIT: corruption, a lack of rules and regulations and, more generally, inefficiency. An AAIT staff member commented the following[197]:

> *'It's a program that started like 5 years ago, now it has expired. It was a 4-year program. There is what we call Woredas in each state. Like Oromia state, Amhara state.. all these states. They are the lower administrative units , the Woredas. So they wanted to connect each Woreda to the other with a road. So that was about 75.000 km of road projects. And it's going to be an all Woreda access road, so it has to be gravel or earth road. And what they did is, they formed companies, they wanted al engineers with 3 years' experience to come up and form a company.*
>
> *So I remember, I have a lot of friends that have that company. They opened up that and you come with 4 civil engineers, 2 civil engineers, one surveyor and one material foreman. They could come up together and form that company. And then they are given one road project, they were 20 km road projects. When they started it was a labour intense project, so that the local community can also benefit from the job opportunity.*
>
> *But later on, they thought like.. after you get into it, the contractors or the companies didn't think it was a wise way to involve the locals because it took so much time, they didn't have the skills from the labourers that was needed, so the road.. if you have machinery you can finish it in 3-4 days. So even the clearing of the site.. it became machine based, and then it was funded by the world bank and.. it became corrupt and eh.. somehow the money was gone and the roads were not built. I think they managed to get about 25-30.000 km of road, from the 75.000.'*

2. Ethiopian Association of Civil Engineers

Another national initiative is the Ethiopian Association of Civil Engineers. This is a private effort to gather graduates in civil engineering and discuss and introduce new technologies, both local and from abroad, to the civil engineering sector. So far, it has been successful to certain extent. Conferences have been organized and knowledge was shared, but the practical application of

[197] Interview 3

these technologies in the private sector is still limited. Still, this effort shows great promise and it is likely that interest from the private sector will increase over time [198].

> *'There is an effort, we have an association called the Ethiopian Association of Civil Engineers, and we have a journal, publishes for the industry. The members are practitioners, civil engineers. There was also a paper presentation last week, a conference, and the paper I was just talking about, that I submitted for the conference.*
>
> *Most of the companies are just owned by people who have just money only, but those who have this educational background they are very interested on this new technologies and these conferences. there is also a chapter of the American concrete institute, the Ethiopian chapter. They also prepared up to date technologies at the conference. In that time just a few contractors participated and just.. grasp some knowledge.'*

3. Student association (AAIT)

Besides national initiatives, there are things happening within the university as well. A good example is the Civil Engineering Student Association in the AAIT. It was set up a few years back by an individual student and has been growing significantly since then. Now, groups of students are undertaking initiatives to increase students' research skills and the university-industry linkage. They do this by searching for relevant internships, inform students about their opportunities in the job market by organizing a job fair, and trying to present and/ or publish thesis projects that excel in their relevance and content [199].

> *'Actually, in our student association, we are working on that. We are talking about how to make a journal, how to improve it. But it's really hard, we now have a project we are working on. We innovate students ,we will give them a research title and anyone who is interested in doing that topic will come, and we will connect them to a good teacher, a good advisor, good examiners, and we are trying to develop the research skill of students. Unless we do that, they gonna be like us. We were really dumbfounded. Last time, we were sitting around and thinking about doing this and this for our thesis papers. And what about this? A title comes up and, no, we cannot do it. Why? Because we do not have the fund, it's going to take a lot of chemicals, a lot of excrements, so we cannot do that. But now we are trying to ask the department to help these kids, ask the department to help these kids, just 5 or 6 students in structural and construction management.. in all streams of civil engineering to do research and develop their skills of research.*

4. Students

Besides group action taken by the student association, there were individual students challenging the status quo by increasing their own skills and trying to do things differently. An

[198] Interview 2
[199] Interview 9

example is students who undertake extensive action to do an innovative thesis project [200]. As was reflected earlier however, these are usually never implemented in the industry [201].

> *'There are signs but most of them are usually done as requirements for graduation. And I know that there are students with independent projects, independent research, that will be published under the university. But are these enough to spread these researches to the students? Not quite. But there are signs that it is beginning. You have student councils, and different journals that are published that contain those researches. They pick the most interesting ones that the students may find it interesting to read. Then they display it and they publish it.*
>
> *'My friend he is a mechanical engineer, and he was creating a machine that can do Injera, so it can make 8 Injeras simultaneously. It was energy saving. It was his thesis for graduation, and he do it, and also some people are saying they will sponsor him to do this machine to produce on a large scale, they promised for him but in the end they didn't. So he was.. he got a scholarship and he didn't get support so he continued his education and went abroad. I don't know the place but he is not in Ethiopia.'*

5. Getachew innopia (AAU)

In the previous section I presented some data on one of the lecturers in electrical engineering, who wanted to do research and innovate products in areas he felt would be most useful to Ethiopia. Going through the university incubation centre led to a bureaucratic process that eventually caused him and his colleague, a mechanical engineer, to take action and start their own private company outside of the university. One of their projects, a mobile medical clinic, was funded by USSAID because they won an innovation contest. Their company shows great promise, but still they are running into trouble trying to sell the mobile clinic to NGOs and government. They both show interest, but administrative reasons prevent full implementation of this innovation [202]. Please find his story on the next page.

[200] Interview 15
[201] Interview 12
[202] Interview 4

'So our company is Innopia. So that basically means 'Innovation in Ethiopia', we merged the two words. So it's founded by the two of us, I am an electrical engineer and another a mechanical engineer. So we sat together and said, there are a few stuffs that can be considered as a gap in Ethiopia, and these could be an opportunity for us. So we talked like that and we started this company.

So then we have 3 major areas. The first one is the health sector. In the health sector we see that there are gaps in the medical furniture. The medical furniture is very important. And it's possible to do most of them here, locally and in cost-effective way. The other thing in the health sector is this mobile clinic, a mobile clinic is a clinic that is mounted on a truck basically.

The other stuffs we do are textile, in the textile sector also there are traditional weavers who produce clothes, but that's very tiresome, one meter long cloth takes half a day to manufacture basically. It's done manually. So we made a simple pattern making device. So it's like 5x faster now with our kit. So that kit can be added to an ordinary weaving machine.

The other thing is gauze, medical gauze. That also is imported totally, imported to here. The gauze requires some specified spacing between the yarns. So we have a kit that controls the spacing between the threads and by including that kit on an ordinary weaving machine you can produce that gauze.

CHAPTER 5. INTEGRATION, DIFFERENTIATION, FRAGMENTATION

In this chapter I discuss the data presented in the chapter above according to Martin's three approaches discussed in chapter two: integration, differentiation and fragmentation. These perspectives give insight into the innovation culture from different perspectives, allowing a complete analysis and the identification of relevant structures and opportunities for change.

5.1 THE INTEGRATION APPROACH

Integration has a focus on consensus and discusses culture from and for a managerial perspective. This means a culture is seen as 'strong' when cultural discourse and behavior is in line with the goals and aims set by management, and 'weak' when there is much divergence from these goals and aims (Martin, 1992). In the case of the AAIT, students and staff should be innovative and should see innovation as a tool for development [203]. This should then result in research outputs relevant to the industry and students should be innovative when entering the workforce after graduation. In addition, entrepreneurship should be the goal of a good number of students. Looking at the innovation culture at the AAIT from an integration perspective, we can speak of a culture that is weak in several respects, but strong in others.

In terms of discourse, there are great similarities between goals and output. First of all, both students and staff feel innovation should be used to promote development. Most also paint a very inclusive picture, where marginalized groups should be the focus of innovation[204]. However, they do not mention these marginalized groups as a consumer base per se, as they would if they were pure 'Jugaad' innovators [205]. They are also not seen as innovators themselves, as might be the case when using the concept of frugal innovation[206]. What is interesting is that students and staff do not have an official definition for innovation. When first asked about a definition many hesitate and are quite uncertain about how to define innovation[207]. What is interesting about this is that in the available policy documents like the GTP and ESDP5, we see the same. Innovation is seen as a tool for development across different sector, but is never officially defined[208]. This implies that students are indeed instilled with the discourse provided in national policy. However, from the interview with a policy maker concerned with engineering education specifically it became clear that at that level, there is a specific definition and current strategy concerning innovation, a process where products from abroad are adapted to fit the Ethiopian context, after which innovation 'from scratch' can ensue in the next stage of development. However, this definition is not mentioned by any student or staff member.

An advantage of not having learnt an official definition is that students have a very open definition of innovation, similar to the one I used for this study (see chapter 2.1). Innovation is seen creating new things, or changing processes, anything that makes things go faster, smoother or more efficient. This can be knowledge copied or adapted from other countries or can consist of small improvements in for example agriculture[209]. Students' conceptualization of innovation and how it should be used can be defined as inclusive for this reason, but is still very open to influence that could be instilled through policy concerning the civil engineering program. In this inclusive conceptualization of innovation, most students do feel that for Ethiopia, the innovation process is most effective when implemented from the top down. Official actors like government and university usually came up as the most important actors in the process[210].

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[203] See chapter 5.1 on Goals and Aims in Government Policy
[204] See chapter 4.4.1 on Discourse
[205] See chapter 2.3 for explanation on: Radjov, N., Prabhu, J., Ahuja, S. (2012): *Jugaad Innovation: Think Frugal, Be Flexible, Generate Breakthrough Growth.* Jossey-Base, San Fransisco, USA
[206] Bhatti, Y.A. (2012): *What is Frugal, What is Innovation? Towards a Theory of Frugal Innovation.* February 1, Imperial college, London.
[207] See chapter 4.4.1 on Discourse
[208] See chapter 4.1 on Goals and Aims
[209] See chapter 4.4.1 on Discourse
[210] See chapter 4.4.1 on Discourse

If we look at innovative behavior, we see that current and expected behavior is often not in line with specific policies, although it is in line with higher levels of policy. First of all, we see that in terms of numbers, national policy implementation was successful. The number of students graduating in the past years has increased dramatically. Students are assigned to programs according to the requirements formulated by policy makers and the engineering workforce has increased significantly[211]. However, within the university innovative research is very limited with student projects. This results from a lack of facilities and a certain 'exam-centered' attitude towards assignments and projects. As a result, many projects are repeated and/or only theoretical. At the same time, the projects that are relevant to the outside world are stored in the library with the rest of them, so knowledge is not diffused. In terms of staff members, there are many who do research and innovation projects, but this usually happens outside of the university in the private sector, where it is easier to get access to funding and the salaries are higher[212].

In terms of future behavior, we see something similar. In discourse it became clear that students feel innovation is important for development and they would like to change things in the industry. However, innovation in the private sector is seen as very limited due to different factors. There is talk of corruption and un-educated people designing and constructing buildings in the public sector. Both students and staff mention a culture where easy money is made by creating low-quality buildings and infrastructure with no attention to research or innovation. In addition, students see companies as having little confidence in the quality of students and prefer to hire experienced staff, or family members. This combination of factors leads students to have little confidence in the job market in general, and even more so in changing the way things are done in private sector through employment in these companies. They see a lack of capabilities on their own part, and a lack of willingness to change on part of the private sector[213]. It must be said however, that in terms of employment the problem may also lie in the fact that students have very limited knowledge on the job market and it is often said that they feel an internship, a low-paying job or a job in a remote area is not what they want, which is why they stay unemployed for so long. The program does not inform them on their option is climbing the ladder in the engineering sector and what kinds of jobs they may expect when they finish the program[214]. Due to different opinions but no access to additional sources, it is still unclear whether the job market is now becoming saturated, or whether this concerns a knowledge gap on the part of the students.

A solution to job market saturation and the ownership of companies by un-educated people is the promotion of entrepreneurship as presented in policy. We see the result of this in behavior, as it is a goal for many students to eventually become entrepreneurs. There are some programs available to become an entrepreneur, but knowledge about these and how to become an entrepreneur is still limited. Here, students often plan to work briefly in the private sector before starting an own company to increase their skills. It is quite unclear however, where they are supposed to get the knowledge to be able to become a very successful entrepreneur. An example of how these government-funding programs may fail without much guidance can be seen in the example of the URRAP project mentioned in chapter 4.4.2.

In sum, discourse reflects a strong culture in most areas, especially concerning policy documents from higher government levels. The behavioral aspects of the innovation culture also have elements of a strong culture, as there is a positive attitude towards entrepreneurship. However, most students are not equipped and/or motivated to turn this into actual behavior thus far. In addition, the goal of creating and diffusing knowledge through the university is unsuccessful due to an exam-centered attitude, a lack of enforcement of rules and regulations,

[211] See chapter 4.2.3 on Inputs, Students
[212] See chapters 4.4.2 on Facilities and 4.3.1 on Mindset
[213] See chapter 4.4.2 on Behaviour
[214] See chapter 4.4.2 on Behaviour

low quality and de-motivation among staff members due to limited access to research funds and low salaries.

5.2 THE DIFFERENTIATION APPROACH

Looking at innovation culture from a differentiation perspective means a focus on subcultures and dichotomies between these. The subcultures can primarily be found in terms of behavior. Dichotomies are, first of all, found in the 'othering' that is done by students in interviews. When they describe the general student population and innovation culture, they tend to speak about 'the other students'. Students' own behavior to challenge the status quo is often contrasted with what 'other' students in the general population practice[215]. This is usually about exam-centered learning, cheating; future plans in engineering and the effects of not having free choice for which program to enter. This could imply that the students interviewed belong to different subculture, or it could be the effect of the social setting of the interview, where students do not want to apply negative opinions on themselves. In any case, they describe a dichotomous divide between them and other students. From the data, a few bases for the formation of subcultures emerged.

One important is the national divide. There are signs that students from different nations (of which there are more than 83 in Ethiopia) tend to group together, providing benefits for some (especially those from Addis Ababa, who form the largest group) while marginalizing others[216]. Groups coming from outside the city often already have a disadvantage from having lower quality education, which is especially relevant in terms of language. Officially, all higher education should be in English. Practically, this is sometimes different because of the language barrier in explaining complicated theories. Still, as most classes are in English and students from the countrysides often have a very limited knowledge of the English language, this disadvantage is very relevant in their education. Subsequently, grouping together according to nationalities increases the marginalization of these groups. On the other hand, a focus on groups from marginalized areas might influence the community service status of the university, as a comment from a student who studied in Jimma, a rural area, notes. She stated these students have more practical experience with the problem in the countryside, which allows them to have better ideas on what innovations might be relevant there. We see here what Martin[217] mentioned on marginalized groups, as they might be a relevant source for changing a system from the bottom up.

Other subcultures found are organized groups that attempt to make a change. Within the student population, the student association is the most relevant. Outside of the university, we see the URRAP project and the Ethiopian Association of Civil Engineers as group efforts to undertake action to create and diffuse knowledge for practical use in the civil engineering sector. Unfortunately, we see some of the same problems that were mentioned about the AAIT. There is a lack of interest from the industry in innovation and corruption can become a problem when rules and regulations are not enforced[218].

In sum, there are subcultures within and outside the university that challenge each other. The largest is the group that is mentioned in a dichotomous opposition with what should happen in the university: the students that cheat, do exam-centered learning, are not passionate about change or even the profession of civil engineering. Then we have students that form the student association and try to appropriate change. Of course, the boundaries of these cub-cultures are vague and people can belong to multiple groups at the same time. Because of the social situation of the interview the dichotomies between interviewed students and other groups may be exaggerated.

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[215] See chapter 4.4.2 on Behaviour
[216] See chapter 4.2.3 on Students
[217] Martin, J. (1992): Culture in Organizations: Three Perspectives. Oxford University Press
[218] See chapter 4.4.2 on Behaviour

5.3 THE FRAGMENTATION APPROACH

The fragmentation approach revolves around individual ambiguity. As opposed to the integration and differentiation approach, individuals can be 'heroes' that have the capacity to change things through their behavior, where in the other approaches change is seen as a managerial or group effort. One of these individuals affecting change in the AAIT is, for example, is the student who founded the Civil Engineering Student Association[219]. This was a single student who acquired support from the university and was able to set-up this association and, now after a few years, create a subculture that creates significant changes in very relevant areas. We see the same among other individual students, within and outside the student association. These take action to acquire relevant knowledge and skills outside and independently of the university. These do not act directly to change the system, but provide an addition to the workforce and possibly the staff at the university later on, which can provide a 'natural' change as opposed to revolutionary change.

In terms of ambiguity, this can be found in all aspects of the innovation culture among students. They often have an opinion about the system being exam-centered and cheating being bad, but still some students admit to doing the same things every once in a while. This can also be seen in ambiguity between discourse and behavior. Some students see the problems in the university and society and feel these should be changed, but they are very unclear about how they want to address changes in the future. However, there are some students with far-reaching ideas on how they want to change the private sector in the future. An example is the injera-cooker mentioned in chapter 4.4.2 on behavior.

Among staff, we see similar individuals[220]. One staff member takes action to change certain things within the program, based on his own experience in the Japanese education system[221]. He also utters critique towards the expat management system. Here, we see the value of foreign knowledge being applied to this context, and it is illustrative to see the difference between expats with no experience of Ethiopian culture and native Ethiopians having experience abroad. Although he sees affecting change in the university as a difficult and tying task due to de-motivation and bureaucracy, he sees a positive future ahead and is passionate about change. Also, we see individual ambiguity in the younger staff member that tries to get a more personal connection with students to increase the interactivity of his classes[222]. Finally, the electrical engineer that created the mobile clinic is an example of individual action, although take outside the university system. In students, we see that some see the gaps in their knowledge and take individual action to change their knowledge base.

Summary

The integration approach gave insight into how successful, or 'strong' the innovation culture is from a policy perspective. The extent to which consensus is accomplished on important content themes is used to measure consensus. In the AAIT, some aspects can be labeled as strong while others are still weak. The differentiation approach has shown the dichotomies between different subcultures as elements in the innovation where change takes place or opportunities for change can be found. In the AAIT, we see marginalized groups may possess knowledge relevant to innovation with the goals of community service and we see groups have been formed to address knowledge gaps and increase the university-industry linkage. The fragmentation perspective gave insight into individual ambiguity and verifies that the 'innovation culture' is not a static, uniform entity running through all individuals in similar ways. Many see the problems in university and private sector, but not everyone takes action. The ones that take action do so in a myriad of ways. Some promote collective action, some try to change the system from within, and

[219] See chapter 4.4.2 on Behaviour
[220] See chapter 4.2.4 in Staff
[221] See chapter 4.1 on Goals and Aims
[222] See chapter 4.3.3 on Teaching Methods

some take individual action to promote their individual future careers. Altogether, the three perspectives were successful in providing a holistic view of innovation culture, approached from different frames of reference. They provided a relevant assessment for policy makers, while offering significant opportunities for change.

CHAPTER 6. IDENTIFICATION OF UNDERLYING STRUCTURES

In this chapter I discuss the structures that emerged from the data as having a relevant influence on the innovation culture in place. In the previous chapter we have seen that groups and individuals are affected and respond to different structures in different ways.

From integration perspective the innovation culture is strong in terms of discourse, but relatively weak in terms of behavior, due to structural factors influencing the implementation of policy. From an integration perspective, we see different groups can be identified within the university, some marginalized, some privileged due to their background. We see some groups trying to affect change, some groups following the exam-centered teaching methods and going through the motions of the educational system. Then, from a fragmentation perspective we see this same ambiguity in individuals. Throughout these perspectives, there are some structural factors that keep emerging. Even though people respond to these in a myriad of ways, the structures keep emerging as an important influence. The combination of structures and how people respond to these through discourse and behavior is what shapes the process of innovation culture. In this chapter, I discuss the three structural influences that appear most pervasive in the civil engineering program.

6.1 POLICY CONTEXT

One of the structures that are clearly identifiable throughout the gathered data, is the policy context. This concerns all layers of organization with an influence on the institute, from government, through the Addis Ababa University, down to the institute and then the civil engineering program specifically. The policy context is therefore a combination of the original organization of the institute combined with the way policy is currently implemented.

Looking at the policies in place for engineering education specifically, the problems addressed are in line with the issues at the institute identified by students and staff members. There is a shortage of qualified staff[223], management is not effective in enforcing rules and regulations[224], research is not practical enough to lead to significant technology transfer[225] and the industry-university link is still relatively weak[226]. It is clear that these issues are recognized and addressed. However, these policies came into place in 2004 and eleven years later, the same issues are still rampant. This implies there are problems in terms of policy implementation at the institute. In chapter 4, two explanations were offered. Policy makers view a shortage of funding as the main problem in hiring expat staff to increase staff capacity and knowledge sharing in terms of technology transfer and practical research. Meanwhile, staff members are required to establish a university-industry linkage.

When talking to staff members, I received a different explanation. A staff member views the problem here as mismanagement, where cultural differences make expat leadership in general ineffective and too costly, while expat consultancy is offered as a solution[227]. Here lies an issue of responsibility. Questions should be posed on where responsibilities for policies lie and who is responsible to enforce and evaluate implementation. This problem can be identified in all layers of the institute. Staff does not feel responsible for research outputs and other elements of the code of conduct. Reasons for this can be found in a lack of enforcing the code of conduct and in the low wages staff receive. This decreases their motivation and also limits their time, as most also have a job in the private sector that pays a better wage. The same can be said of students, who are often focused on passing exams and getting their diploma. This is a combination of demotivation because of limited choices in terms of careers, and a program that is often not in

[223] See chapter 4.2.4 on staff
[224] See chapter 4.3.3 on teaching methods
[225] See chapters 4.3.1 and 4.3.2 on Mindset and the Incorporation of New Knowlede
[226] See chapter 4.4.2 on Behaviour
[227] See chapter 4.1 on Goals and Aims

line with their educational background due to the great number of student entries from different regions of the country. Problems with motivation and responsibility may also be an explaining factor for the bureaucratic processes in the university, causing demotivation for example, for acquiring research funding and conducting relevant research.

The policies that are effectively implemented originate mostly from higher levels of government. The policies in the ESDP5 and GTP are mostly concerned with creating a large workforce to support the ever-growing civil engineering sector, in order to create civil infrastructure and housing throughout the country[228]. We see this in the evaluation section of the GTP, where only enrolment rates are discussed as a measure of success. Policy goals concerning enrollment rates and graduation rates are indeed achieved[229]. This means that from a higher policy perspective, policy implementation is actually rather successful. However, in terms of their innovative mind-set and practical knowledge, graduates still experience a knowledge gap due to the reasons described above. A focus on numbers in this case clouds the qualitative evaluation of the higher education system.

This may also be one of the reasons there are problems in taking responsibility at lower levels, as the policy outcomes here are deemed successful enough by higher levels of government as long as the numbers are met. Students and staff, who commented 'they got their numbers', also reflect this in some statements[230]. Another problem this causes is that there is limited attention to students coming from different background, leading to further marginalization within the education system for students with a lower educational background[231]. Still, these students do graduate because a certain amount of graduates is required. This causes low quality graduates and staff members diverging from the required use of English to dampen the language barrier in teaching.

A focus on numbers is, besides issues of responsibility and motivation, another reason it is so difficult for management to maintain a code of conduct and limit the role of culture in the relationship between teachers and students. The shortage of staff members and facilities is explained by a dramatic increase in student numbers in a brief period of time, therefore is difficult to keep up with changes in autonomy, management, staff hiring and research requirements from the industry[232]. This causes policies like innovation policy to be underrepresented and this shows when we look at innovative behavior[233]. The discrepancy between discourse and behavior could be explained in this way. Higher-level policies are implemented and spread through society in an effective way, which is why we see that students see inclusive development as one of the main goals for innovation and the government and university as the main actors herein. At the same time, innovative behavior should come from experience and knowledge gained from their education at the institute. Although lower level policies are aimed at a certain framework for innovation and teaching students to do practical research for the industry[234], implementation and qualitative evaluation at this level is lacking. This could the reason for behavior to diverge from discourse.

Certain individuals and groups do show divergence and ambiguity to improve the situation on a small scale. Still, within the rigid and bureaucratic organization where a sense motivation and/or responsibility are often lacking, support for these initiatives is mostly dependent on the ones taking action and still receive limited support and attention from the government, the institute and the industry. This can also be explained in part by the presence of a hierarchical culture, where critique is often not appreciated. A strong organization could

[228] See chapter 4.1 on Goals and Aims
[229] See chapter 4.2.3 on Students
[230] Interview 3, see appendix one
[231] See chapter 4.2.3 on Students
[232] See chapter 4.2 on Inputs and 4.3 on Process
[233] See chapter 4.4.2 on Behaviour
[234] See chapter 4.1 on Goals and Aims

prevent these types of behaviors and limit the role of culture. This culture is further explained in chapter 6.3 on culture as a structural factor.

In sum, policymakers recognize the issues in the institute but have so far not been able to successfully implement measures that go beyond what the overarching GTP and ESDP5 formulate quantitatively. The required numbers of graduates are met, but management and staff are still lacking, the university-industry linkage is still weak and research is not practical enough for technology transfer. Discourse is partly adopted by students, but behavior is still coming up short. Reasons for this are a lack of funding, issues of motivation and responsibility, and a general focus on numbers when it comes to policy evaluation from above. In the end, the focus is on quantity instead of quality. This focus on quantity is a problem that is also reflected in the civil engineering sector, which shows this may be a more widespread problem in Ethiopian development policies.

6.2 IDENTITY

Ethiopia is seen as one of the least developed countries in the world. Most activities by the government are in the light of development, attracting FDI, developing infrastructure and the like. In chapter one I explained how their main strategy is one of 'collective communal participation'. It is clear that this also concerns development strategies. Discourse on development is entrenched in all layers of society. In the three months I spent in Ethiopia it became clear that most citizens are concerned with development and follow Ethiopian developments as presented by the government. In this context, the Ethiopian identity is heavily influenced by the identity of being a developing country and the main policy goal of 'becoming a middle income country'. In this section I argue that this identity is one of the structural factors with a great influence on the innovation culture at the AAIT.

One of the most important reasons we can speak of a strong culture from an integration perspective is that discourse is in line with national policy goals and aims. When speaking of innovation and research, both staff and students see it as crucial to development and see it as a relevant factor in the development of the country. When asked about it and what it should be used for, Ethiopian development is always the first use for research and innovation. The need for innovation is formulated by most in terms of what marginalized groups in the country need and what would aid national economic growth[235]. We can therefore speak of a conceptualization of innovation geared towards using it for inclusive development. In addition, most feel the innovation process is more effective in Ethiopia when exercised in a top-down manner. The key actors mentioned are the university, large construction companies and primarily the government as a lead- or facilitating actor. This is not entirely in line with international scholar's view on how we should exercise inclusive innovation, and is specifically not in line with Jugaad and frugal innovation styles[236]. As is presented in the introduction however, this is how the Ethiopian government traditionally works and how policies are presented and implemented flowing from the GTP1 and 2, through the ESDP5 and the EECBP to the institute. However, we have seen that the organization of the institute is not always supportive of the creation of this discourse, as it does not present students with the official innovation framework for development and does not represent a strong university-industry linkage. This means this discourse on innovation can be associated with an identity that is so strong that discourse is still adopted within the civil engineering program by students and staff, independently of the attention paid to the concept within program.

The identity of being a developing country is also clear in the way students feel responsible to take part in the program. Next to the cultural factor of status gained through graduation, they often feel they are the central actors in the development process. So even

[235] See chapter 4.4.1 on Discourse
[236] See chapter 2.3 on Innovation as a Tool for Development

though they are given limited choice of careers, some students still feel they need to enter and graduate from the program in order to strengthen the workforce. Others however, feel less responsible and have other career plans after graduation. These limited choices can clearly also lead to demotivation in spite of identification with Ethiopia as a developing country. The influence is not as strong in everyone as brain drain was also mentioned as an issue, many of the most successful graduates moving abroad[237]. One can pose the question here, if collective identification with Ethiopia becomes less strong if individual opportunities for economic development are offered. The fragmentation perspective confirms individual divergence in collective identification, where we see that identity is weaker or stronger among individuals, which influences their behavior in different ways. People coming from the countrysides like Jimma or Wolaita have an increased feeling of responsibility for specifically the development of marginalized areas and groups. In Addis Ababa, the focus is often more on national economic growth, infrastructure and housing in the city. A difference lies in just how inclusive the picture of development is.

In sum, the national identity is a combination of cultural heritage and identification with being a developing country in a world of globalization. We see that although innovative discourse is not sufficiently promoted through the university, it is often still in line with policy. The identity of being a developing country is instilled in students from when they were young and this takes central stage in daily lives and future ambitions in the country. This identity makes innovative discourse very inclusive among students, although behavior is only enabled through the organization to a limited extent. Still, we see identity is ambiguous on an individual level, as we see students with very different career plans and there is also a pervasive brain drain problem throughout Ethiopia.

6.3 CULTURE

In the sections above, we have already seen some brief influences of the national cultures in Ethiopia. This is especially relevant in the structural influence of organization, where cultural habits take over when the organization is not strong enough in formulating and enforcing rules and regulations.

The first thing I noticed in terms of the presence of culture is hierarchical thinking when it comes to the development of anything. First, there is discourse. Even though students have an inclusive view on innovation or development, they do not think about bottom-up approaches like international scholars do. When introduced to the idea, many are not entirely against it and some do see the benefits of some knowledge coming from the bottom up[238]. However, when undertaking any action in terms of innovation or otherwise, they do see the government as the one and only central actor, who should be involved in any kind of change or process. There are some exceptions to this, but I believe it should be considered that in the hierarchical context of Ethiopia, steps taken towards innovation might indeed be much more fruitful when including the government. This does not have to do with their efficiency, as there are many complaints about corruption and bureaucracy at lower levels of government, but it seems to be about credibility. People see the government as an actor that can implement anything even in remote areas, whereas individual or foreign actors would probably have great difficulties implementing innovations among farmers in remote areas, who are said not to be prone to 'trying out new things'.

In terms of behavior, the importance of hierarchy is seen in the organizational 'ladder'. Bureaucracy and corruption can be found in lower level governmental institutions and in the structure of the AAU in general. These are often the result of this same hierarchical thinking. Everything goes through all hierarchical layers of organization, which causes management and government processes to become lengthy and prone to mistakes. This hierarchy removes a

[237] See chapter 4.4.2 on Behaviour
[238] See chapter 4.4.1 on Discourse

sense of responsibility in both students and staff, which leads to divergence from the code of conduct and exam-centered learning[239]. People who are motivated to change often feel this is difficult because critique on higher levels of management is frowned upon, and taking the regular routes takes too long or is even not an option.

One example of how the rigidity of this hierarchical system inhibits the management of the expat system. The expat scientific and managing directors from Korea and Germany were unsuccessful in appropriating meaningful change so far and the last managing director even resigned after two years. There is not enough budget to create a quality Ethiopian team to be able to fill this cultural gap and appropriate the desired changes expats have in mind. On the other hand, putting them in a leadership position without this team caused too much friction on a cultural level[240]. However, I feel one of the most important influences of this hierarchical thinking is in the learning process. The relationship between students and teachers is fraught with feelings of inequality or even fear. This inhibits interactive learning as students are afraid to speak up and it causes low quality teachers to go on without improvement because critiques are not uttered. Even for motivated teachers it is difficult to improve the learning process without receiving any feedback from students.

Another clear structural influence of culture is the way students feel responsibility towards their families to provide better futures. Family is important in Ethiopian culture and it is seen as a responsibility of youth to take care of elder members of the family. It is also common for educated family members to support life and education for the rest of the extended family, often inhibiting their personal development within or outside Ethiopia. Besides identification with family, Ethiopia and it's development, students study because education is seen as a status symbol. This is often why students with career plans outside civil engineering also choose to enter the program and finish it. This provides them personal status and more credibility in other sectors as well.

Culture is also relevant from a differentiation perspective, because the cultural divide is one important element of the formation of subcultures[241]. The 83 nationalities of Ethiopia all have their own distinctive cultures and languages, with the national language being Amharic. There are a lot of struggles related to nationality and marginalization in Ethiopia, related to the nationalities of government and the prime minister, and certain policy choices that are made concerning these. This can also be seen in the university. Students are not unfriendly, and especially compared to other universities (according to students) there is little conflict. Still, study groups etc. are divided along national lines, which give groups with a lower educational background an increased chance of marginalization. This is exacerbated because of the language barrier, as Amharic is their second language and English is their third. The English language is often underrepresented in education in agricultural areas. Effective organization could solve this problem to an extent, but as we have seen organization is more focused on achieving the required numbers and quality and equality are not prioritized at this point.

Finally, it was sometimes claimed that Ethiopian cultures are not prone to innovation. On the other hand, this can be said for many contexts, which was indeed mentioned in the interview with the EECBP policy coordinator. Introducing a new innovation or equipment is always difficult without first confirming its usefulness to a certain sector. In the Ethiopian context, students and staff mentioned the cultural factor about most local companies in the private sector, but also about government, small-scale farmers, villages and in general all citizens[242]. The culture in the private sector is one of fast money and little consideration of quality. Corruption and hiring only family members is embedded in the civil engineering sector and is seen as a great hindrance for students in the job market, and also for positive change in quality assessment in the sector. It can be argued here that again, the issue lies in credibility. If

[239] See chapter 4.4.2 on Behaviour
[240] See chapters 4.1 and 4.4.2 on Goals and Aims and Behaviour
[241] See chapter 4.2.3 on Students
[242] See chapter 4.4.2 on Behaviour

innovation and research was accepted as credible and relevant, promoted by the government for example, this may change behavior.

In sum, cultural practices are relevant in the AAIT in terms of hierarchical thinking, responsibility towards family, national cultural divides among students and a focus on fast money, family preference and corruption in the private sector. These issues could possibly be solved by a strong organizational style that enforces rules and regulations. If these include the promotion of innovation and research this also solves the credibility issue when dealing with cultural notions of innovation. As we have seen in chapter 6.1, this is still lacking due to a focus on numbers and a weak management system.

CHAPTER 7. DISCUSSION AND CONCLUSIONS

In the previous chapters, issues were discussed concerning the relationship between innovation policy and the innovation culture at the AAIT. There is a discrepancy between the goals and aims of the institute and the output of discourse and behavior. And explanation for this discrepancy can be found in structural factors pervasive throughout the institute. These structures influence the general culture, subcultures and individuals in different ways. These subcultures and individual ambiguity offer opportunities for change. In this chapter I first discuss the way policy is implemented and why this leads to a discrepancy between the goals of the institute and the output. Next, I discuss where I see opportunities in place that could be used to create a more enabling environment for an innovative mind-set among graduates and innovative output of the AAIT in general. Finally, I argue how students' views on innovation in Ethiopia provide useful contributions to theory on innovation as a tool for development.

Policy and Implementation

In the previous chapter it became clear that there are some flaws in policy implementation that cause a discrepancy between goals and outputs concerning innovation. Higher-level policies are more successful but concern a focus on numbers only. Lower, qualitative goals, are not met even 11 years after policy implementation commenced. Because only quantitative goals are met, the AAIT's resources are under strain due to the great number of student entries contrasted with only limited change in terms of inputs and changes in learning processes. The problem is that in the context of Ethiopia being one of the least developed countries, there is no budget to successfully execute policies like the designed expat management system or to improve funding for facilities and staff, thereby changing the system and improving the quality of education. It is therefore important to look for solutions that are not costly: a frugal organizational innovation strategy.

The way policies are designed and implemented in a top-down manner is not facilitating enough of bottom-up ideas from groups and individuals trying to affect change, although there are groups and individuals undertaking efforts that are beneficial from a policy perspective. Some ideas do not reach policy makers due to the hierarchical culture that does not appreciate critique from below, as we see in the case of staff members' comments and the expat management system. Other ideas are affecting change but could be facilitated further and/or even adopted by the university or government.

Opportunities for change

The important thing in this context is that there are motivated policy makers, staff members and students who aim to achieve inclusive development and hope to improve the issues raised about the institute's innovative output. These offer opportunities for frugal organizational innovations that increase motivation and a sense of ownership and responsibility without increasing the budget significantly. Promoting these initiatives could be such a frugal policy that may be very successful. I would recommend these being promoted through the government, in order to increase credibility and affect quicker change.

The opportunities for change can be found when looking from an integration or differentiation perspective. The groups and individuals diverging from the general status quo can appropriate changes in the structures, described in chapter 6, that seem to hinder a general enabling innovation culture. If policy is implemented in a less hierarchical fashion with more openness to critique in a more dynamic setting, the initiatives mentioned in chapter 4.4.2 show great promise. In addition, decreasing the focus on quantity can lead to a better learning process, with quality staff members and facilities for an appropriate number of students. One could argue that a smaller but quality workforce may have more value considering the problems with quality in the private sector.

The model

The model for qualitative analysis of innovation culture at Universities was developed to offer a tool to address the knowledge gap on using innovation as a tool for development. The idea is to gather more context-specific knowledge in order to formulate relevant policies to achieve goals and aims set concerning innovation. In the case of this study these goals and aims concern government policies, but it is possible to use the model for goals and aims set by different actors.

The use of the model in the context of the AAIT turned out to be very successful. Collecting data according to the different sections of the model was a useful tool for developing topic lists for semi-structured interviews and simplified the process of subsequent coding of the data. For the analysis, the three approaches integration, differentiation and fragmentation provided a holistic overview of general cultural perspectives, and divergence and ambiguity within the innovation culture, which results from differential responses to underlying structures. These underlying structures could be identified according to the description of innovation culture from these approaches.

I expect that the model will be a most helpful tool in other studies of innovation culture. At the same time, it is important to note that the model was revised multiple times during the fieldwork conducted for this study. This makes it perfectly adapted for the context of the AAIT, but it will be important to use the same model in different context to with some scrutiny in order to determine its viability as a one-size-fits-all model. On the other hand, the model was designed with no attributions of value to different elements and a relative openness to the kind of data that is used for the analysis. This shows promise for providing a tool fit for different studies.

In the end, one of the most important contributions that can be made by using this model is to offer results that allow further theory building. In the next section I explain how using it in the case study of the AAIT has allowed theoretical contributions to emerge.

Theoretical Contributions

Currently, scholars argue inclusive innovation may be the way to go for developing countries. This means including marginalized groups into the general economy will benefit the country as a whole. These groups can be seen as consumers, or as innovators themselves. It is clear that students at the AAIT feel the same way, arguing the most important contributions would be on infrastructure and housing for the poor in cities, and farmers in marginalized areas outside the city. Their approach to the methodology however, is different than most scholars would argue. They do not consider informal markets or bottom-up initiatives as the way to go at this point. Instead, they see the government as the only actor with enough credibility to actually implement innovations. I see this as in line with what is mentioned about Jugaad innovation: We should not be looking for a one-size-fits-all solution. In some countries Bottom-up approaches may be more beneficial than always looking at the government as a lead actor. In Ethiopia however, government is a very pervasive force in all walks of life. We see that most citizens identify themselves with Ethiopia in relation to its development. Government policies concerning development are known by most and often people feel responsible to play their part in these. In addition, society is very hierarchical and indeed, the government is seen especially by marginalized less educated groups as a credible source of information. It is often said that other actors would have difficulty in making farmers believe their innovations are useful. I would argue therefore that in the context of Ethiopia, especially foreign actors would be better off going through government to implement innovations like this.

The question of whether this pervasive undemocratic government role is a bad thing may be a different discussion, and revolves around the question of whether pure democracy in the Ethiopian context would be a good choice at this point. Many are still uneducated, also on the concept of democracy itself, and often see different viewpoint as a point of negative conflict. In addition, in a developing context choices need to be made very quickly. Processes like referenda

and consensus among multi-party systems increases the level of democracy but are also costly and can be time consuming. Discussion on this topic is, however, more fit for a separate study. The current system in Ethiopia on the other hand, facilitates bureaucracy and corruption at lower level government, and gives the ruling party a far-reaching degree of control over national resources. In the end, both pure democracy and the current strategy have their downsides, but it is important to remember national autonomy and ownership. If you hope to change something from the outside in this specific context, they way to achieve these is to go through government. I argue that although there are flaws to this system, these are recognized and efforts are made to address these. For example, we see that frugal innovation and adaptation instead of high-tech R&D is the way policy makers want to go. This is in line with what scholars argue, but is so far not implemented successfully. I therefore would advise to support these effort instead of going around them by going straight to marginalized groups and taking pure bottom-up approaches to innovation at this point. There are plenty of people who recognize the issues and make efforts to change these from within. These should be supported by addressing the inhibiting factors in the structures mentioned in chapter 6. In this way, government is respected according to the national tradition and the frugal organizational innovation can take place through a system owned by Ethiopia itself.

Theoretically, we need more consideration for specific contexts. There is no 'good' way to innovate that works everywhere. Basing our information on Western countries' experience clearly does not work, but in the spirit of Jugaad innovation[243], finding another one-size-fits-all solution is just as detrimental. We need to gather more data on context-specific innovation and innovation cultures, to be able to determine per case what approach would be best. The model provided in chapter two of this thesis can be a first tool in the direction of this approach.

[243] See chapter 2.3, section on Jugaad Innovation

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APPENDIX 1. ADDITIONS TO CHAPTER 4

1. Goals and Aims

1. *'Eh.. like once you finish your 12th grade you get to take a national exam, the national entrance exam for college. Eh. .so if you pass and you have your grades and then you get to choose what you want to study, so for any kind of placement. So you choose for example medicine, or engineering. So once you do that, luckily for the government any science students would either choose medical or engineering as your first or second choice, because the other sciences are not so big for example chemistry, biology and these things are not that big in Ethiopia. You can't get a good job afterwards or you don't get to do any kind of research. You would probably become like a high school teacher or.. nobody wants that.. so either people choose medicine or engineering. So once you choose that eh.. and then you choose where you want to study at the university, from the 33 universities. And then, from that building right here (pointing) like.. that does the placement. (…) Yeah, everybody comes and then for example medicine, you have to get the best grades. So they are going to put some threshold value on that. The grades are 700, so you get for medicine the students have to be above 550 or 570. And out of that 550 they are going to choose students who had medicine as their first choice. Engineering is at 350 or 450. So anybody who chose engineering and got that grade will go to engineering. (…) Then the government will do 70 percent science and 30% arts, and out of that 70% eh.. it's 40/50% has to go to engineering.'* [244]

2.1 Curriculum

2. *'Yeah.. its changed I mean.. just basic change that we did was reshuffling courses and giving them additional credit for some of them. And using some of the credits from minor courses, making some elective courses. And.. eh.. like some rearrangement on the internship program, on the bsc thesis and we have what we call an integrated civil design course. So we did some.. minor modifications.'*[245]

2.2 Facilities

3. *'I think it is just the curriculum, and we do not have enough experienced teachers. I think that's the problem. The curriculum is the main one. It does not have practical.. it's like lab practices.. because we are to many students. There are 9000 students in here, so it's too much.'* [246]

4. *'There are no laboratories enough for us… when we see them talking it's not much different from watching a YouTube video..'* [247]

5. *'Eh.. I think they have good theoretical knowledge, but practically I think they will develop it after they start working. Eh.. because just here we don't have any.. we have.. but not in the scale we want it, the laboratory facilities or any other facilities, they have to learn by working so*

[244] Interview 3 (staff member)
[245] Interview 1 (staff member)
[246] Interview 8
[247] Interview 13

theoretically I think they are capable, but practically I think just.. after they graduate they develop that.' [248]

2.3 Students

6. *'Eh.. to be honest I don't know the second GTP because I didn't like the first GTP that much. It has an effect, especially with our masters programs. Part of the GTP was for example to train more than 4500 civil engineers master at different universities and the lions share was taken by Addis Ababa university, like 1500 of those graduate students went to our campus, but we don't have enough professors for them, we don't have enough advisors for them, we don't have enough facilities for them so.. the GTP usually was making up with numbers, instead of real numbers they came up with ambitious numbers. They didn't really understand the background. So for some reason it kind of has lowered the quality of education. So the 70/30 is also about the UG students going to engineering schools, without enough facility, without enough infrastructure it was pretty hard to do that. So I think it has an impact on the quality, the quality of education. Even, we get to hire the lecturers, they are fresh graduates from campus, so they give senior courses because we didn't have lecturers by then. Now it's better, but back when they started it there was not anybody who could offer these courses but fresh graduates.. teaching senior courses. There was pretty much repercussion on the quality of education. But quantity-wise, I think they managed. They got the figures they wanted.'* [249]

7. *'Yeah. Somehow the government policy changed, and also the other thing is that all the 33 universities now started offering civil engineering. But eh.. the first years they did not have enough universities to offer engineering so they sent a lot of students here. But now they are trying to give us according to our spaces. And if you have seen at 5 kilo* [250] *there is a shortage of classrooms and space. The laboratories.. everything. It is like.. you know my dad actually went to school when there were only 30 students. They are still the same facilities when there were like only 30 students, but last year more than 6000 civil engineers. And the biggest challenge is the masters programs in civil engineering. We have more than like.. 1500 students.'* [251]

8. (Does being assigned to a program influence your education?..) *'At first, it had some influence on me. But now, I just love it! (…)I think it would be more productive if we made our own choices. Yeah, that would be more productive. But like me, some people don't like it at first but we have no choice, so we have to love it!'* [252]

9. (For others..) *'it has so much influence. I know some of my friends from back in high school, they are still learning what they don't want to learn, just because these policies and strategies. Eh.. they wanted to learn.. they wanted to study health but now they are studying engineering. And this kind of psychological effect is so great to explain the performance of the students, and also on the work of other projects. Yeah I think there is great influence in that area.* (…) *I think*

[248] Interview 2
[249] Interview 3 (staff member)
[250] The area where the AaiT is located is called Amist Kilo (5 Kilo), the campus is often called the Amist-Kilo Campus)
[251] Interview 3 (staff member)
[252] Interview 6

it is because of the system, where the students are only interested in getting the tests, making the exams and when they finish, they just forget about all the school stuffs.[253]

2.4 Staff

10. *'It's not about.. changing individuals at leadership level. I don't believe that can bring change. Usually what I feel is when.. if you know the history.. initially we had a scientific director from Germany. And next, usually the dominance was a German dominance, and then it shifted to the Korean dominance. There is no problem bringing in some expat expertise. There is no problem. But how we should benefit from expats. That is the most important question. Eh.. leadership requires understanding culture. So eh.. if we bring expats without having the knowledge of the culture, it is very difficult to work as a leader for them. Just only as leaders, it's very difficult, this culture. In my point of view, when we bring these expats as leaders, we are underutilizing them. We are not utilizing their potential. That's what I feel. Rather, we are underutilizing them because we put them in a leadership position, which requires a cultural component. But if we bring them as consultants for example, or if we bring them on as ordinary staff, researcher for example, people learn by watching. People learn by what others are doing. So if there is someone coming as a researcher for example, he knows where the funds are running, he knows how to do research. So those are experiences, people can learn by example. But leadership somehow.. the cultural component has to be well integrated. So that's the main reason why these people don't bring a change.'* [254]

11. *'In this organization? Hm.. actually there is no rule. The students will wait even for an hour for a teacher. But actually not all instructors are like that, there are some but it depends on them personally.*[255]

12. *'Some teachers they will give you an explanation. But sometimes, for example last year we did a foundational engineering course, our final exam wasn't even graded. When we approach the teachers who is like.. there's nothing I can do I have already transferred the grade. He hasn't even transferred the grades! But he wouldn't listen anything from us. You cannot confront that teacher you cannot go to the department because they are friends. And if he hasn't.. if he like.. last year he taught us foundation so maybe he will teach us something next semester so you cannot do anything. '* [256]

13. *'There are, there are.. the problem in AAIT is, if you have a GPA of 3.5 and above, you can be teacher. So it doesn't matter if you are hard-working, some people get this 3.5 GP cheating. A lot of people, that's the main problem. I really get furious thinking about this, because we work really hard, but the teachers don't even pay attention when a student has his laptop out and just copies the answer from a laptop, they don't even care. So.. not all lecturers are really qualified. So they have to have some kind of screening for they do that, but if you have a GPA of 3.5 or above, you can be a lecturer. That's why… The current system is really bad'* [257]

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[253] Interview 13
[254] Interview 5
[255] Interview 19
[256] Interview 9
[257] Interview 9

14. *'There are 2 ways to pay back the cost sharing that the government paid during our study. We can also pay in cash just by working on other things but for lecturers it is privileged, it will be covered by your service. But the main reason is not that, I join the university because of my interests.'*[258]

15. *'Yeah.. it was easy but most of the teachers are.. not enough to give that courses. They are working in some other businesses, and most of them are part-timers so they don't have time to teach the course. Some courses will be for 2 or 3 weeks when the schedule says they are for 4 months. Most are finished in 1,5 months. Because they finish one chapter within a day, and this makes the courses difficult if you don't know how.. you don't have to cover all the chapters. When we study we are only focused on exams. We are exam-focused. And that's the problem.* (Teachers..) *are busy to fulfil their own.. things. They are not much approachable. Because they don't want the.. this student teacher thing. Because they are not that much free to talk to the students.'*

3.1 Mindset

16. *'That is a very interesting question, because it has changed a lot actually. Before, definitely no. We gave them simple assignments and we would teach them the process of doing things (Q: by doing things you mean, for example, build a road?; Yes), but not about creating knowledge or solving problems. It is interesting because I did my Msc and PhD in Japan, where I learned very different things. They would immerse students in complex problems, not so much to generate output, but to teach them to think differently, create a research mentality.*
After discussing, we introduced master-level problems to undergraduate students and we got very good results, sometimes they were even able to solve the problem better that master students. Now we do it a lot, and I think students are now more active and take much more initiative than before. As I said we have our limitations, but now I am actually in the process of grading two papers (points at papers on desk) of undergraduate students.. I mean.. UG's writing papers it's amazing.' [259]

17. *'Yeah but eh.. it's only the few, the curious ones, you get to meet them in the 5th year when they do their Bsc, they usually start even before that. I had a couple of groups that wanted to do research on material science, like road material sciences, so they started during the summer when there was not class, and then they do it for the entire year. So you find those curious students then there is that research setup. Like Firesenay, they had those kind of students who really did research with them for an entire year, but for most that is not the case. Very few who want these research skills.'* [260]

18. *'Eh.. yeah.. ok the thing is, AAU is usually intensive on the theoretical aspects. Regarding the practical aspects they give us a semester to go out and experience the internship program, so for me personally, I tried to look at the different aspects of civil engineering so in the summers I used to do intern in a company that worked on multi-partner buildings, so buildings related to*

[258] Interview 2
[259] Interview 1 (staff member)
[260] Interview 3 (staff member)

civil engineering work, so I tried that. And on my former internship program I did highway related projects. And so on my thesis I did material related type of testing. So as much as I can I try to look at different things. But looking at these things I think it's safe to say that the practical aspect of the engineering course at AAU is not.. as good as it should be. So yeah.. the internship is ok but it's not good enough.' [261]

19. *'Actually we don't do any research. We do only tests, papers. At the end of this year's program there is a one semester program and we may do some designs and write our thesis. If the topic is strong, you may have some contact with other companies and such things. (…) most of the papers and research are repeated by students. Even the students don't want to do anything more than what they have said before. This is one the problems. (…) There not that much students interested in doing new things. Most of our.. just want to finish this program and do some business stuff, or do some scholarships. Or some.. some of them might join their family business. Because more and more students are coming and no one wants to do difficult things.'* [262]

20. *'Oh.. you can much learn from the BSc, but there are research proposals but no research. Like in my program, the graduating projects, around graduating time, I am doing a project by simply doing a calculation or simply doing designs. Not laboratory tests or anything. (..) in the BSc there is no research, students cannot do research. At this* (postgraduate) *level students can do research. This is a big difference. After this time I see it more different.'* [263]

3.2 Incorporation of new knowledge

21. *'There is no limitation. Normally we do, just in practice if we believe or w think it's important we add things. (…) We update ourselves, as you can see (points to stack of scientific articles on the table). We always update ourselves just for our students also just to increase our knowledge up to date. (..) It's not a must. It's just for our sake. (…) Not all lecturers (do it), but I can say that most of them update themselves. (For the ones that don't..) I think one reason I can mention is because since payment here is just.. small they just work separate on other industries so I think it's due to time.. that's one reason'* [264]

22. *'Only the doctors and the professors, can better understand the stuff. Some of them really incorporate it, they want you to go and research, they want you to get it.'* [265]

23. *'Yeah, yeah. They are all doctors and most of them are working in private sector or government projects or writing, so most of them are updated and most are learning in the news. They keep us updated.'* [266]

3.3 Teaching methods

[261] Interview 15
[262] Interview 13
[263] Interview 20
[264] Interview 2 (staff member)
[265] Interview 10
[266] Interview 17

24. *'It relates to the quality, actually. Quality starts from the little things, right? I told you I'm sorry for being late today.. being on time is a small thing but the quality starts from that. Respecting your teachers and the students to come on time that's.. shows the respect for your students so there is a problem in that.*
(That problem comes from..) *Lack of motivation is one thing. And also, the culture over here is that they are used to grow like this. As your parents teach you it's ok to be late, you learn that that's a good thing, you know? You accept it as a norm. the norm has an effect. If you appoint someone at 10, most of them will come after one hour so.. such things should be.. it has a relations with the culture..'* [267]

25. *'It's like, we don't usually communicate with our teachers. They are the higher people of the school, of the compound, so we don't usually communicate with them. We are afraid of them, it's like that (laughs).'* [268]

26. *'I don't know, maybe it's because the groups are large but I think the main reason is that eh.. there is this difference between the teachers and the students. The teachers are like eh.. how can I say? They're like eh.. privileged in the classes of the school community and it is not easy to go and ask them if you don't understand. Of course, you can but it's just not that simple.'* [269]

4.1 Discourse

27. *'Eh.. innovation.. eh.. for me innovation means it is discovering a new thing, which you will help for development. Just simply it is eh.. my belief is eh.. there is nothing new just in the world, but eh.. there are things which are not invented before which has not come to practice. Then innovation means just simply discovering those things and bringing them to the practical world.'*[270]

28. *'The government is now focusing on imitation and innovation. If it is coming from abroad, out TVETs or engineering background academicians look at it. Then we need to modify it in a very nice way. We are not aspiring to have innovation, first imitation and innovation. This is coming from abroad, so we need to do it in our workshops. But we didn't do so far as such. First imitation, then innovation. I think this is the approach of India, I was in india as well. To make or produce any shoes, one small enterprise is doing this parts, the other one this one., the other one.. but they are organized in an organization, they are supported by the iots. Because iots, for example when we are talking about shoes there is design, we are talking about leather. There are insitutes for that that support the communities' small and micro enterprises. Ultimately these small units are producing shoes, we are getting very nice and world class shoes.'* [271]
(Staff members..) *They know, they know. They know, by the way.. most of the senior professor have developed, discussed this framework. On how to organize and develop these government issues in the faculty of technology. There is a taskforce. In this taskforce, most of the professors were included. They know! They know!*

[267] Interview 19
[268] Interview 7
[269] Interview 6
[270] Interview 2 (staff member)
[271] Interview 21

(Students do not seem to know?..) *The students are really changing now and learning. Every year students are coming. And the remaining as is. Maybe you met the new ones, fresh students*.

(I met all levels so far, same result? ..) *And the culture difference as well. Maybe in your country, in Europe or Korea as well. The students are more open, and keen enough to know what is going on at their institutions. From down to.. (..) but here in Ethiopia most of our students they are very much shy. So they are giving high priority, more than 95% only for their education. The grades.. and study and study.. they are not worrying about structures, leaders and the like. Because this is the culture that we have. We need to change a little bit. Because the structure that we have is student oriented. If the students are not satisfied enough, if the students have challenges, problems they need to be resolved as soon as possible. As far as our curricula, all our movements in the IoTs are student oriented. But they need to perceive and understand the logic of our IoT and our programs. But they are giving more attention for other things.*

(Should it be in the curriculum?) *Eh.. yeah.. absolutely. What we did is we push the scientific director at least 2 times a year to promote, to communicate the strategy of the IoTs. To give for all stakeholders, for all communities under the IoTs to give full information what achieved so far, what challenges so far. For what stakeholders are expecting what. These things need to be done by the scientific director, we give an order, and they did it by the way. They did it. But not in an intensive manner you know, they didn't push it accordingly.*

(And presenting it during class?) *Of course, of course. But the students won't be happy. That's what I mean, we need to change the perception. Because they do not want to hear anything besides issues of engineering.*(…) *Get the grades and go out. You know? They are struggling you know, to get good opportunities after graduation. But maybe in your country or in Germany they are focusing maybe only on looking and sensing their internal feeling. Internal.. natural.. how do you say.. their gifted talents.*

29. *'Hm.. I think they should go for the small things, like the farmers. Like I said 85% are small farmers, agricultural based. So.. to work on the development of the country as a whole you have to start with the majority of the people, that 85%. So if we create more, if divert more (..) to them, I think there will be a lot of difference.'* [272]

30. *'Since we are a developing country, I think it's on poverty. We have to focus on that. Because there are peoples who doesn't have that much of income. We need to help them by giving them opportunity for work, and also for education. Giving them more.. I think it's only on some universities who have something new things but other campuses, they do not have the material to learn. We meet teachers they say like.. this is the only stuff in the country, at Addis Ababa University.'* [273]

31. *'You create something from the government, they develop something. You can take something from another country where they are developed so when you come back to see the government of Ethiopia, there are some programs that focus on the farming. Developing some cities, like the other countries. So they.. maybe we can eh.. you can.. for example you come from Nederland, like there are many things in Nederland so when you do research for the government there are some programs so you can do something for that.*

    (Foreign innovations should go through the government because…) *we have to help the government. For the next step.. the first will be government. After you help them then they will*

[272] Interview 9
[273] Interview 7

have knowledge, and after that they understand the things that will have any purpose for anything. If you want to build something like.. a company.. they know that for any kind of company they understand the projects. And they only give you anything you need to build that company. So the government has the first step.' [274]

32. *'Actually it starts from students, innovation. It starts from learning. If someone is in the process of learning, that's where the idea comes from. But eh.. if the people have an idea it's not enough. The government should help those innovators. The government has to help them, has to support them in every way they need. So there should be a very great link between the innovators and the government. If the government is not willing to fund them or help them, it would be a waste. So the link should be very strong. That's what I think.*
(…) Actually not only with students. But you can get a lot of chance in the university with young students. But also there are a lot of people in the job who have very innovative ideas. So you have to contact all the people but I think a lot of.. you can get a lot of innovators in the university. That's what I think.' [275]

4.2 Behavior

33. *'People do their job just to do it. In our country people do their job just to get money. I think, that's what I think from what I saw. Not that much innovations. (…) The thing is there are some people who don't even got a degree in civil engineering who do those things. These students stop their school and they will fake a certificate and then they do that. It seems easy for them, but there is a serious issue, a critical issue, that there is no quality. No quality in this profession. They think anyone can just build a building. That's not right. There is a quality problem in our country, that is why the condominium thing is happening. (…) Hmm… I don't hear anyone being punished!*
(About students' future behaviour, I think that..) *the thing is in your personality. If you do it just to get money, you will do it and you will get into these insane acts. But you personally if you think what you do is to glorify God.. what I mean by glorify God is that you do it honestly. Not to get only money you know? In our country civil engineering is being most.. people think you can get good money in this profession. So people are leaving their profession, and getting into this profession just to get the money! Peoples mind is really controlled by this idea, so if they don't change the personal thing, I don't think it will be different.. it will continue like this.*
The problem is most of the companies here, only a few are engineers. They are businessmen who hire engineers. So they control the money and engineers just do the task. Few engineers have their own companies that I've known of. I know you need a license for construction or structural design. You can't have both. That's what I know. I have a license for structural design, but if I want to build a building, I cannot. Because I don't have a construction license. So it's like.. they might have a reason but I don't see what that is. (…) Yes, it's very short-term thinking, only about right now. But the thing is.. I mean there might be honest people in the government, but like.. the lower parts.. you may focus on the big part but the smaller parts.. people are corrupt and that's where it goes wrong.' [276]

34. *'When I check some other countries, even in Africa, they are very hard workers and they know more than us and compared to the other institutes in Ethiopia, we are kind of good but I don't*

[274] Interview 14
[275] Interview 19
[276] Interview 19

think I am enough and I'm not satisfied. As an engineer I should be able to solve all kinds of problems, but I am not that much.. we miss that practice. (…) I expected a lot of things especially about the practical parts. A fresh engineer.. their levels in construction companies.. they know which one is a fresh one and which is a senior one. And these things are coming from these kinds of problems. And I didn't think eh.. this problem would be when I entered the AAIT. ' [277]

35. (on working outside the University in general..)'*No, actually it's a whole new world when you go out of here. Totally different side of the country. So we have no idea what to do after we get out.'* [278]
(on becoming an entrepreneur) 'I don't know, I think I want to work under a company for a year or two just to know how to do things and after that I want to do my own thing.
(on becoming an entrepreneur) *'Yeah, you're not. It takes about a year or two. Even in the companies they do not take you seriously. Especially in the engineering, in the road.. stream. You have to work for 5 years before you re considered a real, qualified and professional engineer.*
(..) It's really hard even the graduates from last year most of them don't have a job.' [279]

36. *'Eh.. yeah I think that if there is something that makes them.. appreciate or something, if they are given a chance, there are strong students because most of the.. AAIT are high scorers from different parts of the country. They have the ability to do these activities But after going through institute, they are different'* [280]

37. *'It is, actually. In the GTP1 there was one of the things they discussed about that 70% of university has to be about development, engineers. That is why last year they graduated about 900 students, for this implication I think. The problem, I think is when they constructed this GTP 1 they haven't really thought about that in the construction companies, there is really.. really. Really bad corruption. It's all about the money. When you see for example, there is a company called (EGG???) construction, the people working in that company are all relatives. That's why a lot of people are not.. are unemployed. But the national develop strategy is very good, because we have seen a lot of transformation. Even from when we were freshman, there wasn't a lot of this much infrastructures and stuff. But now there is really good improvement. But I don't think they thought about, that after graduating these students, where are we gonna put them? I don't think they thought about that.*
(…) it's really bad. It sucks actually. You know, we are 5th years and now we are graduating next year. The thing we thought about since freshman.. is when we graduate, where are we going to get a job? Because its…really much corruption in the construction industry.' [281]

38. *'Eh.. no. we take a course on entrepreneurship but I don't know I didn't take it but I will. They did have a global training for entrepreneurship last year, for the graduates. Eh.. I don't really see us do some things but we should actually, because the number of graduates was like 900, civil engineering only. So.. it's a large number and its…it is not possible'* [282]

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[277] Interview 13
[278] Interview 10
[279] Interview 6
[280] Interview 13
[281] Interview 9
[282] Interview 8

39. *'In the future, I have to have my own company. I want to have my own company, a structural company. With that, I want to have an organization which helps needy people in our country, the elders, the women..'* [283]

40. *'I am not sure about that, but I think I want to go for the PhD. (…) Because, as you have more education you have more opportunities and eh.. I want to know more. Plus, if you want to do something on your own like start a construction company you have to know more about the business and how you run it so I think it's better to learn more.'* [284]

41. *'Actually, there are some companies which makes.. the group of students in one team and they produce something new, they promote them to become an entrepreneur.. like small business. That kind of thing is really appreciable by government.*
(Do you feel pressured to become an entrepreneur?..) *Yeah but.. as I told you the number is becoming too large that's why the government wants to use this system. They give them their own project and staff, and ask some kind of budget.*
(..) Yeah.. it fails actually sometimes. Most of the student go to these kinds of things but they don't have.. they didn't.. go through it and I'm not.. I don't have those kinds of students or parts of students are not effective an fail. Because what you said.. it's not from the inside..' [285]

42. *'Well, I believe you shouldn't start big, you have to start small. People just want to be in the office you know, doing this high status thingy. But.. that's not the case you have to go lower sometimes if you want to get by. You just need to go from the bottom and work the way up.'*
(Do you think that explains unemployment among graduates?) *That's what I think, yeah. And you don't need to be hired in your own field first. Sometimes you need to get out of your field, your comfort zone. And if you've had a few jobs, you know who the people in your field are and then.. you will know how to make your own company. First you have to try some other things, research some other things as well.'* [286]

43. *'With regard to civil engineering? Yes.. yes.. eh.. I mean.. the pay scale may not be eh.. to our liking, but I believe that.. I mean, if you want jobs you can get them. It's just a matter of how much effort you put in it. I mean.. virtually the whole city is under construction, so it's a kind of process that continues to grow. Ethiopia has still yet to grow, because Ethiopia has still yet to grow when it comes to development, so I think that jobs are still being created.'* [287]

44. *'Yeah.. the thing is last year I was a president in our student association. So it's the first time in the AAIT or the country that we created a job fair event, so at least students can get a good job. So.. I think at least we have created awareness that there is job in companies, and we created a network between the students and the companies. (…) Actually to tell the truth there is a problem. Most of our friends are trying to get a job at this time. But the thing is you have to call yourself. Even if there is no work you have to go and approach people. You have to show them how you want a job, and that is how the connections comes. So I think even if there is no opportunity, you still have to go out and apply and approach.*

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[283] Interview 19
[284] Interview 6
[285] Interview 13
[286] Interview 10
[287] Interview 15

(There is no job training in the AAIT, ...) *just our association. Actually I had the chance to approach this company called VEGA, it's on engineering, architecture and urban planning. And the thing is they understand there is a quality problem. A quality issue in our country, so they selected 5 students. We have to select them by getting an entrance exam. So we give them a training in collaboration with this institution, and then sometimes we used to go site visit, in order to enhance the industry know-how. So we tried our best to do.. to equip our students and fill in the gaps.'* [288]

45. *'I think this is the mind-set or a perception problem. What I did immediately after graduation, I am not looking for work for money. I am looking for work to secure, to get practical knowledge base don my education background. So I am not preferring, and running for money. First where I can get, acquire knowledge to be a full engineer, you know? But here, maybe these kind of people that gave you information about a shortage of jobs and the like maybe they are aspiring for this kind of office. For engineers to sit around in this kind of office is not easy. First you need to work, you need to work. If a civil engineer needs to go on site visits, working with the daily labourers, he need to check. Everything should be done by their senses, looking and touching. After a while you know, they can get the knowledge, they can run for money. Without that simply sitting down here.. for example I am a civil engineer, I am running a small project, but I am sitting by myself. I know everything, I can bring you a blueprint I have I am looking it, I am hiring simple labourers who can work. I can say very nice do this work, do that work, according to the structures, the blueprints. If you have technical knowledge, you can manage it. But for this purpose you need to have at least based on your profession some knowledge.so the money come to you, you are not going for the money. But now, after graduation everbody is waiting as his or her home for good jobs, good opportunities, and this cannot be! They need to go outside of Addis, they need to go to rural areas to build a road. They need to acquire knowledge. It brings for them you know.. an opportunity working with different consultants, working with different NGOs, working and construction of roads, hydropower.. you know? Everywhere..'* [289]

46. A teacher comments: '*I do research, because it's my interest. For example I have.. yesterday I submitted one paper for a conference in Tanzania on advanced in cement and concrete technology in Africa. And its my interest I also worth a proposal for financial support which I believe will be helpful for the industry. That's in the area of material engineering material science. So.. in my side I want just to do research and do new things.'*
(How much time are you supposed to spend on research?) *From the university? Normally there is no clear direction. Just simply it is teaching. Eh.. it is our effort just to spend our time in research.*
(Most staff members do this?) *Eh.. no. just.. in those who are PhD-holders there are people who do research but others just.. it's not as such. (…) Yeah.. yeah. They don't have time they spend much of their time in the industry. They* (the University) *encourage by.. just words and simply they.. there are policies just to support research but practically it's not.. yeah..*
There is a lot of room for improvement. (Is that because of the relevance of research or because of disinterest?) *I think it's both. Just eh.. the research work is also very limited. Sometimes research are done for the purpose of academic fantasy not.. to address the problem of the industry. And there is also lack of interest from the industry.*

[288] Interview 19
[289] Interview 21

(About the researchers' attaining PhD's for status only..) *Yeah.. because just.. after when I see some PhD owners after they earned their PhD they just don't do any research works, so.. that tells something..'* [290]

47. *'Yeah, that's a thing.. I don't think we are required to do research. Now they came up with a couple of things.. they came up with.. they said it used to be there back in the days, but not anymore. They want to restart it, is that you can only stay in one rank for so long. So you can only be an assistant professor for 6 years. Then you have to become an associate professor. And you can only be an associate professor for 8 years, then you hae to be professor afterwards. So that basically means you have to do some research. If you want to promote to associate to professor or from lecturer to assistant lecturer. So that's about what we have. Eh.. when you go for example to Adama University or Addis Ababa science and technology university eh.. they have this rule. They are under the science and technology ministry and they have this.. they sign contracts every 2 years. So if you want to renew your contract, you have to publish two papers. So they have that, but we at the ministry of education government universities we don't have that. So there's not much requirement and that's pretty much why you don't see research activities going on.*

    Eh.. yeah I would say most lecturers don't do it. two or three… I can only think of professors that do research at our university, and they don't even do it here. So they either take a sabbatical and go somewhere else, or take research leaves somewhere else. We don't have a good atmosphere for doing research here. If you are here, you are going to be in a lot of classes, because there is a shortage of teachers, you are going to take a lot of classes, there is no research funding, there is no research facility, even there is no research priority by the university. We don't even have a theme that we want to pursue, or an area they want to excel in. Dr. Esayas is trying to come up with that now. He's trying to come up with specialized themes so that anybody who wants to do for example concrete research can apply to our university. We don't have that, everybody tries to do their own thing, there is no structured research, there is no structured group or theme so with research I think we are lagging way behind.

    (The problem is..) *Eh.. a leadership problem I think. So the.. government came up with this policy, the ECBP, engineering capacity building program, it was studied by the Germans, the GIZ back 5-6 years ago. So they came up with this structure where you have the IoT institute of technologies, somehow autonomous institutes of technologies. So even the autonomy was granted last year. And its still fishy where we are autonomous, an where we are not. Can we do research for ourselves, can we get research funding for ourselves, can we even eh.. order finance by ourselves? So that's not clear in the university and the IoT. The IoT has its own structure, there is its own supervisory board, their own management board, with the scientific director and managing director. And the university has its own supervisory board and its own president and everything. So they wanted t have like a parallel analogous scheme for the IoTs, that is the same as the university, but the only thing that these guys, the scientific director need to do is just report what they did to this president, and the president doesn't have any say in what they can do. But now that's still not there. The university still holds the finance, holds the.. if you want to come up with new research you have to get permission from the university, if you want to get any funding, eh.. if you wanted to come up with a new curriculum, new program, everything has to go through the presidents' office. So that has created some inconsistency. The other thig is, they wanted to for example, the thing is.. now the head or the scientific director has to be an expat staff. So somebody either from Germany or Korea, but when they bring people from there it's a … a culture shock for them. They don't expect this kind of work*

[290] Interview 2 (staff member)

environment and when they come here in order to mobilize everyone, make everybody interested. They don't have that skill… I don't know. You need skills to come into another country have Ethiopian staff, and come up with their strategy and implement it.' [291]

48. *(About student research..) 'I don't know.. I think I don't know. Because I don't see anything. They just write it and the put it in the library. I don't know.*
(About staff research..) I think so.. the professors and something.. I thinks so. I don't know.' [292]

49. *'Ehm.. you can have the idea.. but to implement the idea.. it's really hard, you don't have the resources. You don't have the fund, the materials to do that. For example, we are thinking about doing our thesis paper right now. But all the ideas we have, are really practical. They can change the infrastructural industry big time. But to do that.. we have to have full laboratories, full capacity. We have to have lab funds. But we are not gonna get that. So we are just going to make more ideas. But if someone comes in, just tells us what to do.. just give us funds, materials.. laboratories. That can be implemented easily. The problem here is.. we have enough ideas.. big ideas, innovative ideas. But the way to implement that it's really hard, near to impossible.'* [293]

50. *(About diffusion of thesis projects..) 'Yeah.. nobody ever looks at it again. We.. even.. research is done repeatedly because nobody knows if it was done last year.. it's really like that. But now.. Dr Esayas, the DR., the dean, he told us to prepare something with the student association so that the.. papers are not done repeatedly. But after we do the paper.. t just sits somewhere. It's gonna be put somewhere and there's nobody looking at it.'*

51. *'Eh.. not.. the problem with this institute is that there are amazing projects done by students and staff. There are really good projects that could change lives. But they never go to the market. One reason I guess is that the university doesn't have a clear guideline like.. the IT, the legislation on the intellectual property right is not clearly stated. The possibility of establishing a business entitity at the university is not clearly stated, and so on. That's the reason.. otherwise there are so many innovations. There are many good projects. They may not be sophisticated and cutting edge but there are things that are appropriate to solve local problems. (…)It's a problem of the university, the entire university.*
(Can you tell me about the ideas of management about this?..) *Ah, the director of the AAiT right? Yeah, he had a lot ambition eh.. most of the things didn't materialize. That might be.. I don't know the exact reason but.. it can be because of pressure from the existing status quo. The.. legislations, the university legislation is so strong, it doesn't have any flexibility. And.. when you come up with a new idea that would mean.. we will encounter lots of resistance. Maybe that's why..*
(Do you see motivated people give up?..) *Yes, you can see it like that. From the rules, it is supposed to be autonomous, and able to decide things by itself, practically that's not the case. It still has to get approval from the university for budgeting and big decisions.*
They have started now, the research fund has been announced since the last 2 years. The university announced research funds around 1 million birr. Eh.. but the people that are actually doing the research, the problem they are facing is that the procurement process has to follow

[291] Interview 3 (staff member)
[292] Interview 18
[293] Interview 9

the official university procedures and that takes really long. It's a really long process, and many of them are discouraged to use the fund properly. There is a fund but it is not easy to utilize it. (About innovation at the AAiT in general, the problem is..) *I would say.. eh.. the.. major problem with innovation is lack of connection with the industry. Like.. whatever students or staff do in the university, remains here on the shelfs. It's never open to the public. If that were the case, industry player could get involved and get there projects into application. The same is true with the government. So one major problem is application I guess, and a commitment from the government side to use local innovation. There is gap in that respect.*
(Does it also have to do with culture?) *Yeah, haha that's true. I'm not sure if that can be said culture.. but that's the custom. It's the same* (in government), *yes. Nobody will dare to use stuff for the first time. Nobody wants to be the first to try something. '* [294]

52. (Is the University taking action to spread students' research?..) *Eh.. they are not. I mean eh.. maybe there are other parts. Like civil engineering.. I can say not that much. We don't have enough.. we don't even have workshops to showcase out outputs, students do a lot of research for example for BSc and MSc, and then we don't get to show it to the public, or to the.. stakeholders, we just shelve it somewhere. Eh.. the other is.. we don't prioritize research. Not the government, or even the companies, the big companies prioritize research.. maybe technical engineering might do that, the mechanical engineering department does that, but when it comes to our case we don't do that. Like.. we.. sometimes we are.. if you go the architecture campus, they're pretty good. I know they're architects and.. they grew up with just showcasing their projects.. they do that. Like they.. even when they have a small workshop or something they kind of give a brochure of it.. they give it to people.. they usually have this annual books where they showcase all their projects.. but when it comes to the civil engineering department we don't do much.*
(…) Yeah.. lack of structure, like lack of.. like we have a 130 or something staff, for civil engineering we have about 130 lecturers and professors eh.. the ones you see working would be only like 10.. the others you don't know where they are. So we don't even use our own manpower for those kinds of things. They might be working outside or something but.. if you can mobilize everyone and make them do small things, in just one year we could change it. We have to motivate them, give them incentives. Even some of them don't even need incentives because everybody knows they're here for some kind of.. like I said earlier they think they are doing them some favour. You just ask them to do some work…
(The architecture institute is different because..)Yeah, *they don't get paid more but they have a lot of projects. They kind of try to insent them, motivate them.. they do allowances and they kind of manage them better. But like I said they have smaller to operate with. The number of staff is smaller than us, the number of students are small. They use their students as their labour force. They do a lot of things, showcase products, but in our case we don't make them do a lot of things.'* [295]

53. *'Yes.. actually with the resource that we have, one thing I can say of this institute is that there is potential. There is a potential, actually. I believe in that. People are educated in high level universities like Germany, Stuttgart, my education was in Japan, so there is a potential. But this potential is, I believe, underutilized. Eh.. and.. with this. Some limited amount of research, we are trying to do some research which is really interesting for the industry as well. But the chain is not created. At one point the government expects us to really produce something that can go to the industry. Yeah, maybe this is controversial from my perspective. Because, what I*

[294] Interview 4 (staff member)
[295] Interview 3 (staff member)

understand is, the university has to produce something and the industry should be strong enough to smell what's good in the university and try to take it. Because it's very difficult for a researcher to produce the research and then take is to the university. It has to stop somewhere, the role of the researcher. But there must be someone to pick up the outputs and realize it and practice it. So the chain is not created. Which means the industry that we have now, they can create money without appreciating research at this moment. So there is no incentive for them to really explore. Because the competition in the industry that we have now, is not technology based. Because there is a market with few industry, lots of opportunities. So they can make money. So we do not have an urgency. An example is the cement industry. Eh.. previously there were few cement companies. There were two. At that time, the price of cement had reached 1500 birr. That's quite expensive. But, later on, other factories joined the industry. When they joined the industry, especially.(…?). this urged the other factories to think about their technology. So they came up with an idea like.. ok we should not use fuel as a energy source, we should use coal. So you see, they're shifting because of competition.
But the existing market is not complete at this current moment. Because there is ample opportunity. So eh.. yeah there is no urgency for them to optimize or maximize their profit using research. Because it requires an initial investment. So rather than investing.. they don't. some chain must be created.' [296]

[296] Interview 1 (staff member)